> inherent ambiguity in Searle's analysis of the assignment of causal agentive functions between the role of collective intentionality and the role of intrinsic properties. In one line of reasoning …causal functions are assigned and … involve some form of (collective) intentionality. In another line of reasoning he underlines that objects with causal functions can perform their functions only by virtue of their intrinsic properties.

The concept of "collectively intentioned" on the production side of design (the quote references only the consumption side) suggests the shared ontology of house construction. Designing as a community or as loosely associated collective can meet the minimum condition of sharing a domain of discourse.

Wood construction, a side of architecture considered matter-of-fact technology, shows that loose-fit technologies occupy an important boundary condition between technical and social artifacts and offer a point of entry to discuss the *habitus* of practice and culturally-inflected technology. Design intent is clearest in engineering when the problem is well defined. Construction technologies and architectural technologies are broader intentioned design manifested both collectively and individually. Broader design involves production, appropriation, and consumption – function and functionality on the production side and use and usability on the consumption side.

Now, all this might be beside Kroes' (2001) point in setting up the concept of the dual nature of artifacts:

> … the physical description does not already contain (implicitly) the functional description, nor conversely. … This logical independence raises the issue of how engineers in design practice are able to bridge the gap between a functional description of an object (the input of a design process) and a structural description as given in a design (the output of the design process).

However, this focus on engineering will not be able to answer for all of design – the inputs and outputs of the design process are somewhat different for different design disciplines. Many philosophers assume, at minimum, an *a posteriori* association between input and output. Artifacts of other design fields demonstrate considerable resistance to "a functional description of the object", i.e., no clarity of input, and "bridging the gap" is not an appropriate metaphor to relate inputs to outputs. Many design processes do not fit this far too singular and too linear image. So identify these as generalizations about *engineering* design, all right; but identify these as generalizations about all design, most certainly not.

1.4 Resisting an Elective Affinity for Positivism in Technological Development

Starting with technical and techno-social balance and a dual nature of artifacts as both physical and intentional, this chapter has parsed design into production, appropriation, and consumption and has distinguished function from functionality, use from usability and commented on the discourse about intention. This is based in experience teaching design in architecture, a field with a holistic design approach that includes technical and social parameters. Though architectural design is

difficult to define, as an approach it aspires to the multivalent rather than being univalent like engineering design.

Andrew Feenberg (1999) reminds us that technology studies often fall prey to presentist conceptions:

> It is true that, abstractly conceived, technology does bear an elective affinity for positivism, but that is precisely because every element of reflexivity has been left behind in extracting its essence from history. … Those few determinations shared by all types of technical practice are not an essence prior to history, but are merely abstractions from the various historically concrete essences of technique at its different stages of development, including its modern technological stage.

Historians agree. Historians almost always discover that the path of development is uneven, full of different and parallel directions taken. Why certain techniques take precedence, why certain paths were not taken, isn't always clear. The reasons are as much social as technological. In other words, recent historians of technology reject its own version of positivism, that invention was personified in one inventor at one time. Henry Ford assimilated a historical series of technological improvements from the interchangeable part to the assembly line, all essential to mass production (Hounshell, 1984). If, as Feenberg says, philosophers have been slow to emphasize reflexivity, then, perhaps, historians have been quicker. However, for historians the reverse problem holds, the value of abstraction is depreciated and the search for over-arching principles of development has been left behind.

The path of technological development might be in some sense evolutionary (Brey, this volume), or follow some form of punctuated equilibrium as in Thomas Kuhn's (1970) revolutionary model. The trajectory of the case being studied points to an entirely different model of development, one that has general application. It is also a biological analogy, translated for use in anthropology. Brian Stross (1999) has discussed the application and translatability of the hybrid metaphor. It helps explain the wood frame construction system developed on the North American frontier in the nineteenth century, as well as its current dominant position in residential construction (see figure 1).

Both the evolutionary model and the Eureka moment personified in the inventor "bear an elective affinity for positivism" by assuming a technological advance of the fittest, even the revolutionary model of Kuhn assumes a punctuated advance. Each emphasizes a centre line of practice, failing to register the quantity or quality of aberrant and lost practices. In contrast, hybridization with distinct stages of development models the history of many technological artifacts.

2 Case Study: Charting Instumentalization of a House Construction System

Today, nearly 90% of North American houses are built using one method of wood construction (see figure 2). Now, it is probably the predominant practice in the world, displacing indigenous methods of wood construction in places with rich