Chapter 14
Towards an Affordance-Based Theory of Collaborative Action (CoAct)

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ABSTRACT

Collaborative Action provides a novel approach to modeling interaction among users and machines and IT-mediated collaboration among people to solve problems. CoAct extends the notions of affordance and moves away from idiosyncratic, subjective mental models of the world to the notion that actors with similar capacities to act can potentially discern similar action possibilities in the world. It changes the direction from discovery and alignment of internal representations to mutual attunement of collaborators to build sufficient capabilities, share informational structures, and calibrate selectivity to achieve shared affordances. CoAct has the potential to influence such diverse areas as usability engineering, information overload, and group decision making. CoAct can be used at multiple levels of granularity, from fine granularity of a single interaction to tracking intermediate progress and results of a set of interactions. Propositions based on CoAct are presented. An initial experiment provides some support for an affordance-based approach to information sharing/design.

INTRODUCTION

In complex environments, where not all variables and relationships are known, i.e., where data are uncertain and incomplete, humans create rather than discover their future (Nosek, 2005). They create the future by perceiving affordances within their environment and acting. The subsequent actions, including probing of the environment, lead to changes in the environment that must provide meaningful affordances for other actors, both human and non-human. These behaviors can be immediately perceived by other actors or they can...
modify the environment, such as the creation of a report, to provide affordances at some later time. Human and non-human actors must be attuned to relevant affordances, to act based on them, and to probe for additional relevant affordances. The more important the action, the more dynamic, equivocal the task, the more unreliable the data, the more important group sensemaking (Gephart, 1993; Weick, 1979) to the emergence of socially-constructed capacities to act, sufficiently coordinated to engender effective action (Nosek, 2005).

The Theory of Collaboration Action (CoAct) has grown out of the desire to provide more theory-based direction in information system development, especially in development of collaboration technology to enable creative solutions to wicked problems (Farooq, Carroll, & Gano, 2008). Relying on the assumption of the existence of idiosyncratic, intermediary internal representations, such as mental models, to filter sense-data limits practical, theory-based guidance. Extending this assumption so that collaboration technology must support the creation and maintenance of shared mental models within teams exacerbates the problem. “This all-absorbing concern for the internal, mental model unfortunately led to a neglect of other aspects, of which the most important was the flexibility and variability of human performance (Hollnagel & Woods, 2005, p. 41).” Hollnagel and Woods question derivative folk models, which are based on consensus and “privileged knowledge” about how the mind works (Morick in Hollnagel & Woods, 2005, p. 51).” Examples of folk models include fatigue; workload (Stassen, Johannsen & Moray, 1990) and situation awareness (Endsley, 1995, 2001). Many folk models purport to measure intervening variables representing intermediate mental states rather than performance. Folk models may not be incorrect but are hard to disprove, i.e., they are not falsifiable. Others (Bloor, 1983; Brand, 1979; Heft, 2001; Wilson, 1998) have argued that there are no intermediary internal representations, i.e., no “proverbial little men in the mind,” such as mental models (Cannon-Bowers, Sala, & Converse, 1993; Gentner & Stevens, 1983; Johnson-Laird, 1983), beliefs, cognitive constructs (Adams-Webber, 1979; Fransella & Bannister, 1977), or scripts that are invoked to take-in sensory information and process it. They argue that there is no mind/body dichotomy (Heft, 2001). This view is supported by recent findings in brain research (Yufik & Georgopoulos, 2002).

The purpose of this paper is not to disparage folk models, but to introduce a theory of collaborative action that does not rely on sharing internal, mental models and extend Gibson’s ecological theory of affordance to provide guidance in understanding collaborative acts and developing technology that supports them. The paper provides the following: background for the development of an affordance-based theory of collaboration; explication of Individual Action (IAct) and Collaborative Action (CoAct) Models; propositions and research questions based on these models; results of an initial experiment to test some of these propositions and research questions; followed by examples of how CoAct can be used in design of information systems.

**BACKGROUND FOR AFFORDANCE-BASED THEORIES**

As actors move within an environment, they discern available informational structures that afford action possibilities. These action possibilities, affordances, are available for the class of actors who have the same potential to discern informational structures that provide these affordances from the same observation point (Gibson, 1979). While an affordance is potentially available for the class of actors with certain capabilities, a perceived affordance is what emerges or surfaces for a given member of the class at a specific moment in time as the member moves through the environment to achieve some goal, i.e., while affordances are available to all actors with similar capabilities and
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