

DESIGNING CAAD FOR CREATIVITY

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(KEYNOTE SPEAKER)

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Abstract. Can we design CAAD to enhance creativity? CAAD is often considered a tool that assists architects in design by managing documentation and facilitating visualization. While there has been anecdotal concern that CAAD inhibits creativity, there is empirical evidence that CAAD can enhance creativity. The challenge is to develop principles for designing CAAD for creativity based on theoretical and empirical research on recognizing and enhancing individual and distributed creative cognition. This presentation describes three concepts that can lead to principles for designing CAAD to enhance human creativity: recognition, perception, and diversity.

1. Recognition: A framework for recognizing and evaluating creative design, shown in Figure 1, is developed based on research in psychology and design science that includes novelty, value, and surprise. This framework provides a basis for comparing and evaluating the impact of CAAD on creativity.

2. Perception: Perception affects cognition and therefore interaction design is a critical component of designing CAAD for creativity. The results of an empirical study, shown in Figure 2, using a protocol analysis find that changing perception to include tangible user interfaces has a positive effect on creative cognition. These results lead to design principles for increasing perceptual modalities in future CAAD systems.

3. Diversity: A theoretical framework for social and collective intelligence in design show how an increase in cognitive diversity leads to an increase in innovation. Using this framework we can develop design processes that combine the benefits of individual, team, and crowdsourced design ideas, as shown in Figure 3.

How do we recognize creativity?



Designing for creativity implies that we know when the result is highly creative or is a new design of a style similar to existing designs. Based on research in psychology, philosophy, and artificial intelligence, a creative design has three essential characteristics: novelty, value, and surprise.

Novelty: Novelty is a measure of how different the design is from existing designs in its class. Members of a class are similar across their attributes and vary according to the values of the attributes. Novelty is recognized when a new attribute, a previously unknown value for an attribute is added, or a different combination of attributes is encountered.

Value: Value is a measure of how the design compares to other ideas in its class in utility, performance, or attractiveness expressed as a weighted sum of performance or utility attributes. Value is also a reflection of the acceptance of the design by society. Defining a fixed set of attributes for value is not possible because often a creative design can change the value system by introducing a performance attribute that did not exist before.

Surprise: The measurement for surprise has to do with the recent past and how we develop expectations for the next design. This is distinguished from novelty because it is based on tracking the progression of one or more attributes, and changing the expected next difference. The amount of difference is not relevant as it is in the novelty metric, the variation from expectation is relevant.

Figure 1. Recognizing Creativity

How does perception affect creativity?

Tangible interaction with digital models changes our perception of the design model. Studies have shown that this change in perception can lead to more creative design processes.



Figure 2. Perception and Creativity

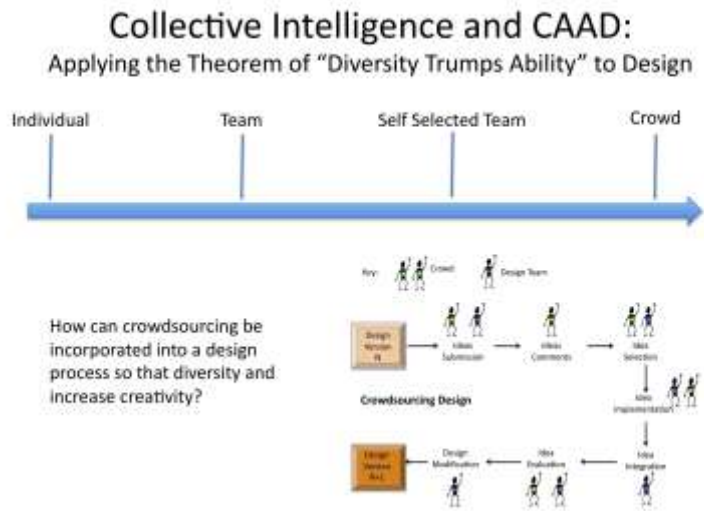


Figure 3. Diversity and Creativity