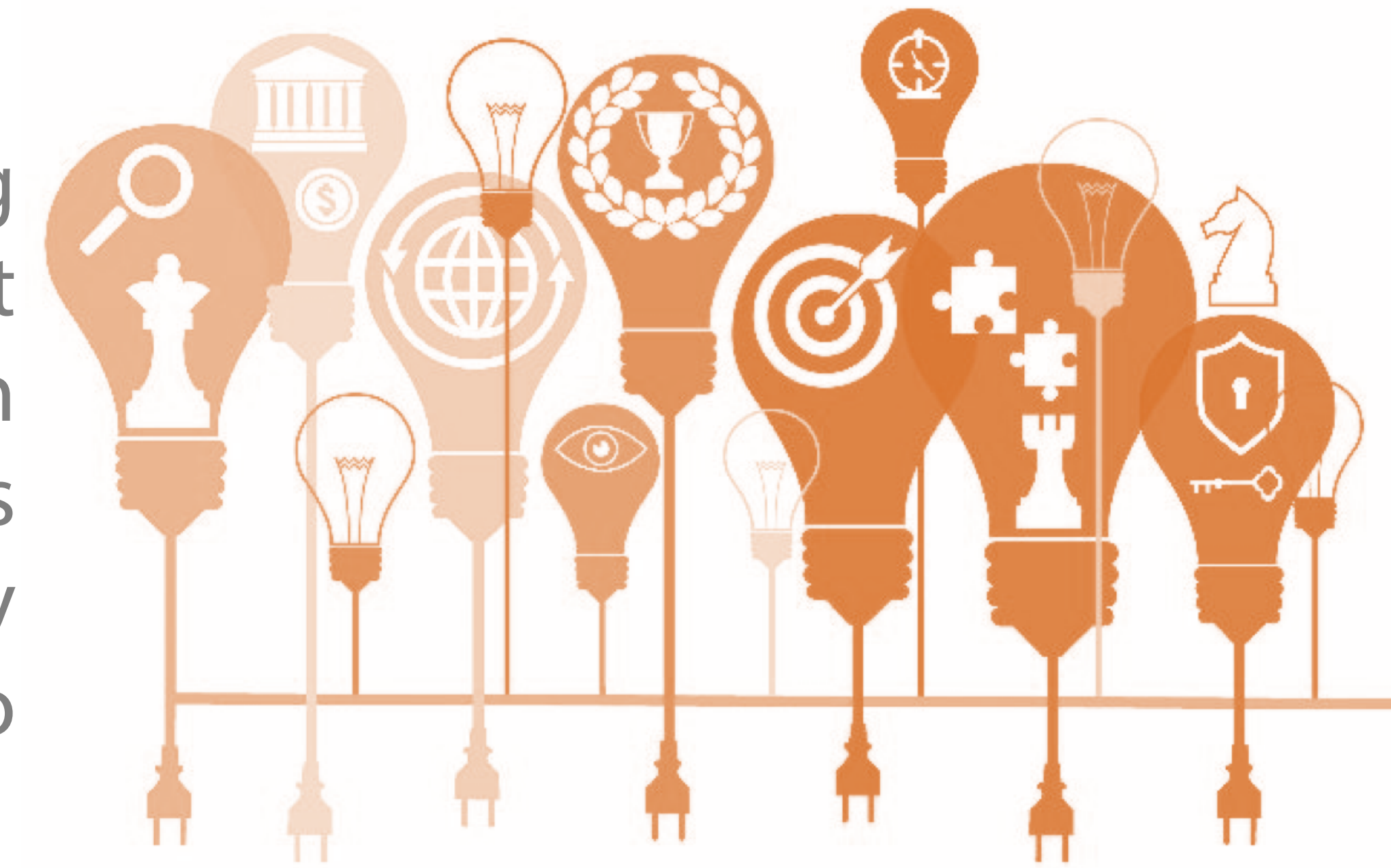


The Ends or the Means? An interface to investigate how novice designers utilize Causal and Effectual Modes of Thinking

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Background and Motivation

Creativity is crucial to the success of the new product design process and is a driving factor in innovation and long-term economic viability. Prior work has shown that effectual modes of thinking, that is, leveraging existing resources to develop an innovative solution, can lead to more creative outcomes. A new web interface was developed to empirically test the impact of effectual thinking on the creativity of early phase design idea generation. A pilot study was conducted using this interface to investigate novice designers' click-level behaviors with effectual and causal information.



Design Goal: Develop concepts for a new, innovative, product that can froth milk in a short amount of time. This product should be able to be used by the consumer with minimal instruction.

Instructions: Before developing ideas, use the following information to familiarize yourself with the design space and requirements.

Causal Information: Data about the goal of the design problem

US Coffee Consumption

Urban Millennials

How to make Microfoam

Milk Frothers on the Market

Effectual Information: Resources and skills currently available.

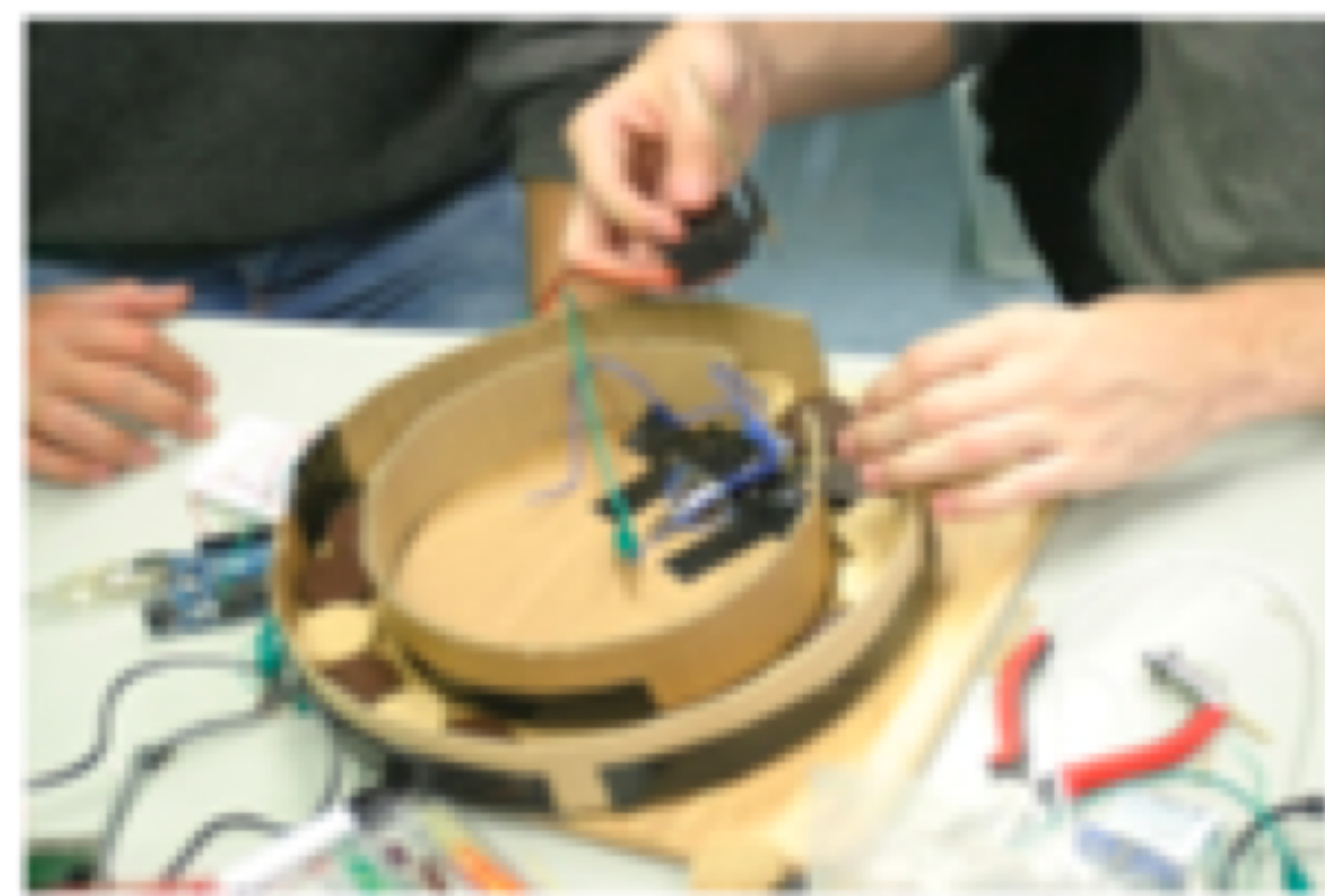
Kitchen Appliances

Manufacturing Processes

Design Skills and Resources

Prototyping Materials

Our company has manufactured and sold small kitchen appliances in the past and has access to small electric motors and prototyping materials such as cardboard, foam, paper, etc. These facilities can be used to mock-up the form and ergonomics of a product.



Web Interface Development

A web interface was developed with **8 clickable elements** that contained pieces of information that were developed by the researchers to help participants understand the problem space.

Causal elements: Information primarily concerned with the end goal, or market opportunity found in the design problem.

Effectual elements: Information primarily concerned with the resources and skills presumed available to the designer in this hypothetical design situation.

Electric milk frothers come in many forms, some utilizing steam to froth milk, others use electric motors to introduce small bubbles into the milk. Others require users to manually agitate the milk using a hand pump.



Hand Held Frother



Hand-Pump Frother



Steam Frother



Electric Milk Frother

Pilot Study

8 students attended a design session in the laboratory and generated **low-fidelity sketches** to the design problem. Participants' **click-level interactions** with the web-interface were captured and analyzed.

Review information about the design problem and design activities

Interact with the 8 elements of design information using the web interface

Participants generate early-phase ideas to address the design problem

Follow-up interview with participants on how used information to generate ideas

Conclusion

The results of this project has resulted in an empirically tested web interface for investigating how novice designers utilize effectual and causal information during early-phase design activities. This interface will allow for the research team to study the influence of utilizing different kinds of information in a controlled laboratory setting. The results of this line of research will shed light on the cognitive factors that lead to creative design outcomes in student designers.