

Literature Review

Amanda Philbrick

Instructional Science and Technology, California State University, Monterey Bay

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Dr. Sarah Evanick

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Literature Review

Design thinking (DT) is a philosophy of design comprised of five nonlinear stages – empathize, define, ideate, prototype, and test – that aims to creatively build solutions to human problems (Lal, 2021). While DT's initial framework was created in the 1940s and 1950s, its popularity has grown significantly in recent years (Auernhammer & Roth, 2021). This literature review evaluates the repository of data on DT's history, areas in which it has been applied, and areas in which authors have proposed it might successfully be applied.

A more contemporary framework, liberatory design, was first introduced in 2017 (Robalewski, 2021). It integrates design thinking principles with deep empathy and complex systems theory (National Equity Project, n.d.). Given liberatory design's intimate connection to DT, this literature review includes an article that address the implementation of this design philosophy.

Design Thinking History

Design thinking was created within Stanford University's Joint Program in Design when John E. Arnold– a professor in the mechanical engineering department and the graduate business school – was tasked with building a design education framework in collaboration with a team of psychologists and designers (Auernhammer & Roth, 2021). Since its conception, DT has evolved into a human-centered, collaborative, creativity-embracing framework; its implementation has proven valuable in product design and innovation management. The design consultancy company IDEO is credited with popularizing DT in recent years (Lal, 2021).

Design Thinking Application

Examples of successful design thinking application present compelling evidence for future implementation. Ignite, a Duke undergraduate program created to address the 2015

Sustainable Development Goals, required students to work within a community's cultural and geopolitical position to create night light access solutions (Mueller et al., 2020). Altman et al. (2018) conducted a systematic literature review that identified examples of DT implementation in medicine. They cited 19 successful studies, 11 studies with mixed results, and one that was unsuccessful. Deeper evaluation of these studies revealed that successful DT can result in both simple physical and technology-intensive interventions in healthcare. Design school students in Indonesia utilized the DT model to facilitate creation of a characteristic woven pattern for the village of Troso and called on DT tenets to support the identification of alternative uses for unused jeans materials, demonstrating the versatile applications of this philosophy (Caroline et al., 2021; Fajarwati et al., 2021).

Proposed Applications of Design Thinking

Researchers in multiple domains recognize the potential for design thinking to benefit their fields. Earle et al. (2021) proposes that the iterative cycling DT process might be implemented in virtual reality scenarios to prepare business students for the challenge of addressing sustainability. As the field of classical mechanics transitions to mechatronic and cyber-physical systems, Tekaat et al. (2021), asserts that the user-centered DT structure – supported by the growth of model-based systems engineering – can support empathetic, creative problem-solving. Moganakrishnann et al. (2018) also advocates for design thinking – within the framework of liberatory design practice – to support sustainable development engineering, arguing that an empathetic stance facilitates critical questioning of assumed power structures. Rois et al. (2020) proposes that the waste management system in the city of Depok might benefit from application of the five-stage DT approach. The areas in which DT could prove effective are many and varied.

Implications and Future Research

Future research ought to continue to explore the sustainability of a DT framework in the various companies, schools, and entities that seek to conscientiously implement it. To support its continued use, there is further need for randomized, controlled studies to quantitatively demonstrate its utility.

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