Team 4 - DISRUPTION IN ENGINEERING DESIGN: AI APPLIED TO CAD / CAE / CAM
EXECUTIVE SUMMARY

Computer-aided design, which includes Drafting / Engineering / Manufacturing (CAD / CAE / CAM), has developed progressively since its introduction in the 1960s. Simplistic forms of Artificial Intelligence (AI) have been integrated in computer-aided software since its advent, in a method referred to as Knowledge-Based Engineering (KBE); however, in recent years AI technology had advanced to point where it appears that is poised to significantly disrupt engineering design. In this project we investigate how the design engineering / technician / drafting profession across the mechanical, electrical, aeronautical, and civil disciplines is impacted, in terms of changes in the design process (including roles and responsibilities and review), jobs created and destroyed, and knowledge development and retention. We also briefly discuss the threat of singularity. Finally, we provide suggestions on adaptive strategies to mitigate the disruption.

Our findings indicate that when Expert Systems, a subset of KBE, are integrated in computer-aided design software, the basic data flow remains the same, however particular elements of the control flow between drawings and models can be controlled by the computer system without the interference of expert engineers, who have historically functioned to set the rules and decision-making processes within the software. As machine learning progresses and AI-integrated software is able to learn the rules of design, it is anticipated that the computer system itself may function as a replacement for both Drafters and the Product Design Review Team. It is expected that within the next 3-5 years, computer systems will be able to carry out simple, well-defined engineering design tasks, and within the next 5-10 years, computer systems will be able to carry out complex engineering design tasks, as users begin to adopt. During these timeframes, the largest impact will be felt by "low-skilled" workers and Entry-Level Design Engineers. Despite growing concern over singularity, history suggests that as roles are destroyed or changed, new roles will likely be created, but may require a whole new skill set. If knowledge-based reasoning and decision-making processes are obtained from design experts and are properly implemented, the progressive integration of AI in computer-aided software could serve to shorten the product development lifecycle considerably. In order to remain

valuable and competitive in the workplace, "Low-skilled" workers and Entry-Level Design Engineers will need to be cognizant of and anticipate trends and adjust accordingly. This adjustment may entail diversification of skill sets.

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