SIMULATION-BASED MODEL FOR HANDLING ITERATION AND FEEDBACK LOOP IN DESIGN

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ABSTRACT

Iteration is a common phenomenon in design process which improves the design solution and finalizes it for downstream activities as well as for construction. Though iteration is expected, it imposes rework for the design tasks and often delays design completion. In practice, two basic types of iteration can be seen during design. Firstly, activities with sequential dependency can start early if parameter/information produced by the predecessor is estimable. This estimation might not be accurate enough so that reiteration is needed. Secondly, for coupled tasks in complex design process, design can be finalized by "Sit & settle" or through "Repetition" of tasks involved in loop so that design solution converges to a specified workable range. Taking into account the abovementioned issues, probability of rework has been formulated to develop the proposed simulation model. The simulation model has been examined with a few design tasks and found effective quantifying the amount of rework due to iteration and the overall impact on total design duration. Simulation results depict that most of the rework can be scheduled parallel along with other design tasks so that effect of rework is minimal compared to the amount of time can be saved. The results also show that size and position of coupled design tasks have a great impact on design project.

KEY WORDS

Iteration, rework, feedback loop, repetition, sit and settle, simulation model, design completion.

INTRODUCTION

Iteration is a fundamental characteristic of complex design process (Cho and Eppinger 2005) though it is viewed differently by different researchers. As stated in Reinertsen (1997), iteration is a strategy to improve or converge design solution. Similarly, Safoutin and Smith (1996) mentioned that iteration is a technique to solve engineering optimization problem. Moreover, Eisenhardt (1995) conflictingly depicted iteration as a costly problem which should be avoided, a useful means of improving design, or even as a catalyst for innovation. On the other hand, Smith and Eppinger (1997a) describe iteration as the repetition of design tasks due to arrival or discovery of new information which is actually rework of a design task. This rework excludes any repetitive work within a single task's execution (as noticed in Reinertsen) and only

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