A Flight Simulator for Product Development and Decision-Making BOT Seeking Optimum Strategies

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Extended Abstract

Complex product development projects are chronically late, over-budget, and fail to meet customer requirements. Successful project managers must learn to assess the long term impacts of their decisions including delayed feedback effects. Here we present a new management flight simulator representing modern and complex projects within a comprehensible but elaborate enough to reflect the today's new product development environments and decision trade-offs. The interactive, web-based simulator extends the model of Ford and Sterman (1998) to include endogenous and stochastic introduction of new features in the market affecting customer expectations, precedence constraints affecting the degree of concurrency of different tasks, the short and long-term consequences of schedule pressure that may be imposed by management, endogenous generation of errors and rework, interphase relationships and other realistic features of modern projects that lead new causal-loops as shown in . Players make decisions regarding schedule, staffing, concurrency of project phases, scope changes and so on, which define the decision-trade space for realistic project management cases. In all of these newly added dynamics, a real case study is presented. As the simulator is designed to serve professional managers and students, who can play the game and compare their performance, the "gaming" part of the model is also discussed.

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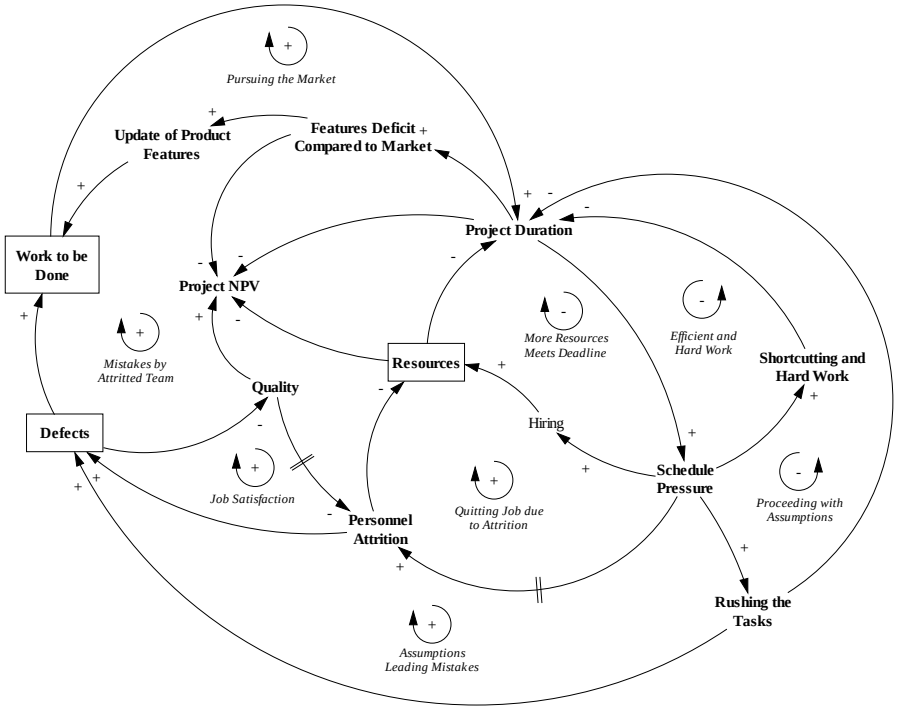

Figure 1. A condensed view of causal-loop diagram identifiable in the new model.

In addition, a project manager BOT based on optimization of Net Present Value (NPV) of the project has been developed. A project management decision framework based on Browning (2014) work on real managers is further employed to implement BOT decisions by adding overall strategy function defined by a logistic function. The BOT is designed to replicate real human players using the realistic parameters similar available to a real project manager so that the BOT is not allowed to "cheat". The BOT came up with highly legit strategies specific to different industries and scenario cover stories. The persistently observed strategies are early hiring of new staff to train them early or starting the project with a challenging "mental" delivery date, then gradually delay the deadline to sustain a mild schedule pressure on the employees. Interestingly, the BOT tried to cease the project by laying off all the employees to minimize the cost of failure, if the BOT "realizes" that the project cannot be saved under the current scenario parameter set. Therefore, the BOT was very helpful to develop realistic scenarios with coherent and consistent model parameters. In addition, the BOT's strategies can help project managers to understand the underlying dynamics of some well-known strategies used in the product development.

References

1. Browning, T. R. (2014). A quantitative framework for managing project value, risk, and opportunity. *IEEE Transactions on Engineering Management, 61*(4), 583-598.
2. Ford, D. N., and Sterman, J. D. (1998). Dynamic modeling of product development processes. *System Dynamics Review, 14*(1), 31–68.