

Decision-Making Under Uncertainty

How System Dynamics Helped Add Millions to a Company's Bottom Line

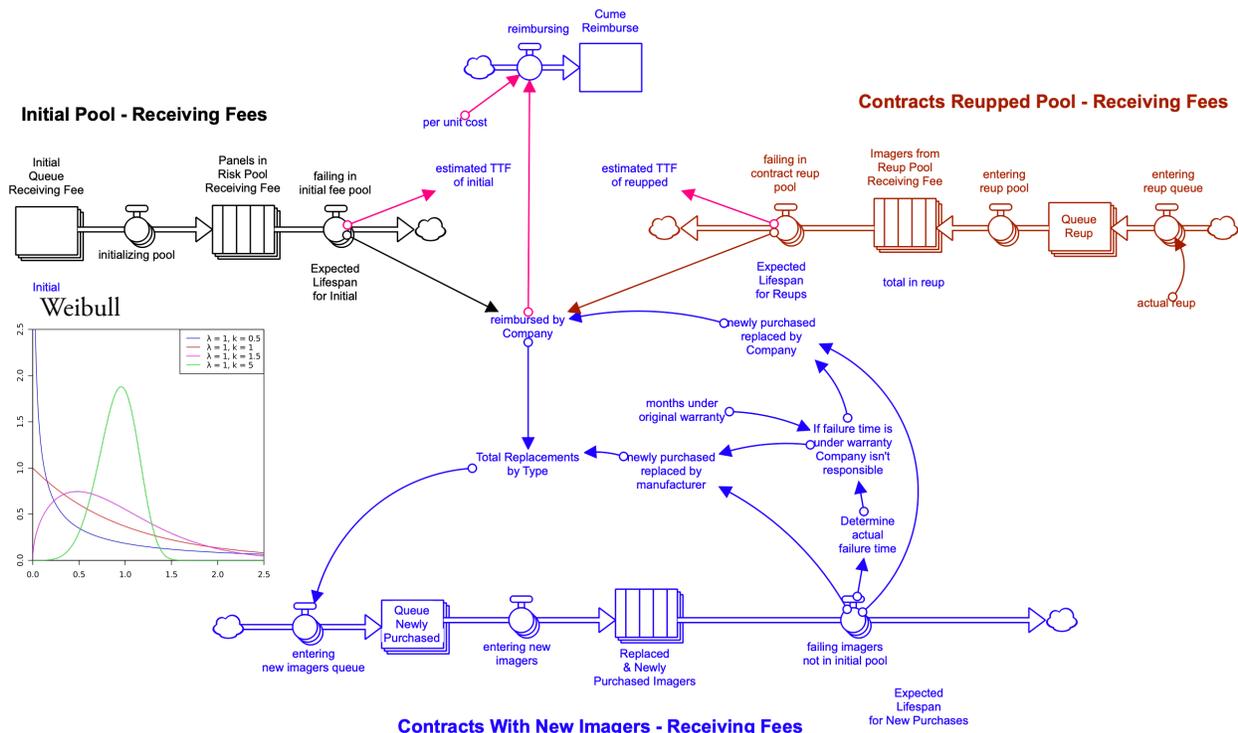
The bottom line of a multinational medical supplies and services organization was suffering from the exorbitant costs associated with high priced warranty contracts. The OEMs for their digital imaging systems – one of their more expensive products – were marking up the sales price by up to 400% of cost *and then* charging excessive annual warranty fees. Leadership at the multinational supplier wanted to know the answer to the following question:

Could they assume the risk for the imaging systems, charge less to their customers, and simultaneously generate more profitability for the organization?

The multinational's analytic team believed that a system dynamics-based analysis was the most effective methodology to explore this strategic question. They hired a consultant from Pontifex Consulting who had the required system dynamics expertise.

The consultant began the initiative by training a small analytics team to build simulation models using the STELLA software. This capacity building was essential, because once the initial model-building was complete, it would need continual maintenance and improvements based on changes to the risk pool.

The team applied a Weibull distribution¹ to calculate the risk (probability) of failure because that distribution provided the most accuracy relative to the risk pool. The team categorized each type of imager by cost, age, replacement costs, and failure rate and loaded it into an input Excel spreadsheet. The spreadsheet data was then imported into a STELLA model that ran 1,000 Monte Carlo simulations. The simulations generated a range of failure scenarios for imagers based on varying the parameters of the Weibull distribution. These Monte Carlo results were then analyzed to determine the likelihood of current and replacement imagers surviving beyond the warranty periods. This allowed them to estimate the associated costs for failures, projected revenue, and warranty savings – the financial risks.



¹ https://en.wikipedia.org/wiki/Weibull_distribution

The team determined they could realize tremendous savings by charging their medical clients less warranty coverage fees than previously – and instead putting what they did charge into a risk pool to replace failed imagers. Using charts generated from STELLA and Excel, the analytic team made this case to senior leadership. Leadership was persuaded, and they stopped paying the exorbitant warranty fees they were sending to the OEMs.

The initiative immediately looked misguided: in the first month, two expensive imagers failed and needed replacing. The analysts were unconcerned, and stood by their recommendations because they were confident with the rigor of analysis they had made. They assured leadership this was an anomaly – because they had used system dynamics and deeply understood the mathematical logic behind the analysis. The coming year proved their confidence well-founded. The company ended the year saving over a million dollars. This annual savings continued during future years as the analysis proved correct – and the team continued to refine the model based on the most recent data they could generate.

All organizations face issues where the future's uncertain, but leadership must still make decisions in spite of that uncertainty. Building the capacity of an organization to rigorously apply system dynamics is a high leverage activity. Organizations with sufficient system dynamics capacity can build confidence in all decisions they make – even when there's significant uncertainty and risk.

