New Product Introduction & Manufacturing Optimization

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Vertical

Manufacturing | Pharmaceutical | Healthcare | Portfolio | **Logistics** | Financial | Government | Business

Genre

Case Study | **Project Review:** | White Paper | Technology Overview

Client

Teradyne - Electronic Test Equipment Manufacturer
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Situation

Market demands, industry volatility, and Teradyne stockholder expectations have increased in many areas including profitability, quality, and service levels. Meeting and exceeding these expectations requires aggressive, and potentially conflicting operational goals to be met concurrently (ex. reducing cycle times, increasing yield, minimizing costs and optimizing inventory simultaneously).

The standard practice had been for each functional group to focus on the goals for which they were accountable. However, company performance is dependent upon the simultaneous optimization of the entire system, not just individual parts.

Valuable trade-off decisions relating to these goals could not be made with the current toolset because it provided only static analyses based on averages, and could not account for interdependencies. In addition, the use of spreadsheet analysis did not provide the quantity of information nor the confidence to enable the level of risk identification necessary for today's risk mitigation and response planning.

Teradyne's Operations NPI (New Product Introductions) Team felt that new tools were needed in order to provide improved strategic decision making and the desired increased confidence in the risk assessment for overall company performance. The evaluations would have to account for real life variability and interdependencies as well as allow multiple scenario evaluation and sensitivity analysis.

Objectives

The Operations NPI Team, decided to test ProModel's simulation technology to see if it could provide the level of answers that the current tool-set and methods could not. The initial objective for this project was a "proof of concept" for simulation technology. If the proof of concept worked, then simulation would be incorporated into the Operations NPI tool-set for decision support.

In order to be considered successful, the "proof of concept" simulation solution developed needed to be able to help address the following types of issues:

1. Identify the risk in New Product Introduction with a high level of confidence.

2. Evaluate "production readiness" of new products.

3. Analyze complicated business processes due to a complex outsourcing strategy.

4. Study resource consumption and capacity planning

5. Capable of allowing the NPI team to develop methodologies & tools to analyze highly complex business questions given:
    a. Variability of conditions – real life is not an average
    b. Interdependent variables with complex relationships
    c. Need for sensitivity analysis among input variables
    d. Need for output variability - not a point answer but a range
    e. Need for time variability - response variables for various life-cycle stages
    f. Need for system optimization

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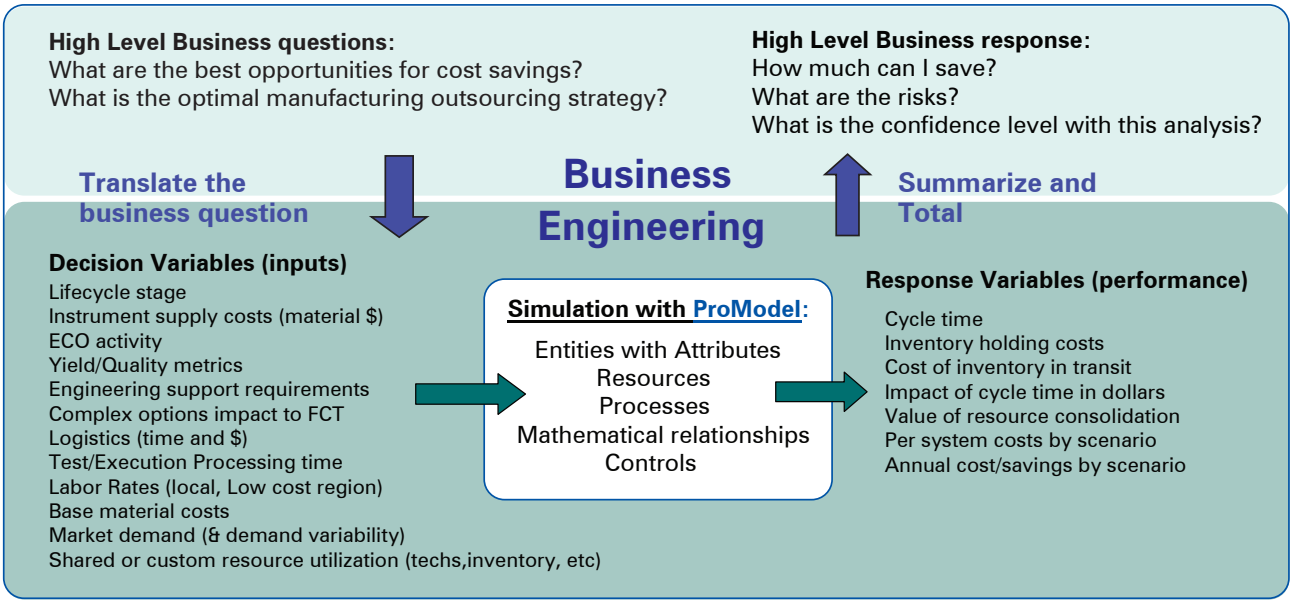
Solution

A "proof of concept" simulation solution was created with which the introduction of new products could be evaluated in a risk-free environment. The major questions Operations NPI wanted to answer with this initial model were as follows:

1) What is the cost impact of quality (yield of the manufacturing process) to our internal and external manufacturing partners? Quantify this in terms of technician debug resources, repair technicians, scrap and inventory buffer requirements.
2) What is the cycle time impact of quality (again, yield of manufacturing process). For each point of yield, what is the cycle time penalty?
3) What are the choke points/bottlenecks in the problem solving processes used internally which impact the velocity of the learning curve on the introduction of new products?

Decision makers and model users can modify any input parameter of the model and evaluate the impact on the critical outputs. For example, the users can vary the available capacity, the hourly labor rates, the product yield, etc to evaluate the impact on the product cost, the cycle time, and process efficiency, among other factors. This enables concrete data-driven decision-making and supports the company's TQM methodologies.

The diagram below depicts the flow of the solution and how it helps to answer the relevant strategic business questions.



Results

The "proof of concept" output exceeded expectations to such a degree it was quickly enhanced to become regularly used in NPI decision-making. The Operations NPI group uses the solutions to enable strategic decision making for the introduction of new products into the production environment.

Internal and external groups at Teradyne can now speak a common data-driven language around the metrics that govern the processes of New Product Introduction. Decisions are based on a common understanding of the best interest for Teradyne and not only the individual departmental/functional goals.

The project has more than met the initial objectives as evidenced by the following:
1) The benefits of simulation technology have been understood by the management
2) There are now tools available for the complex decision-making required in today's business environment
3) There is consistency and repeatability in the product-specific requirements for release from NPI to volume manufacturing.

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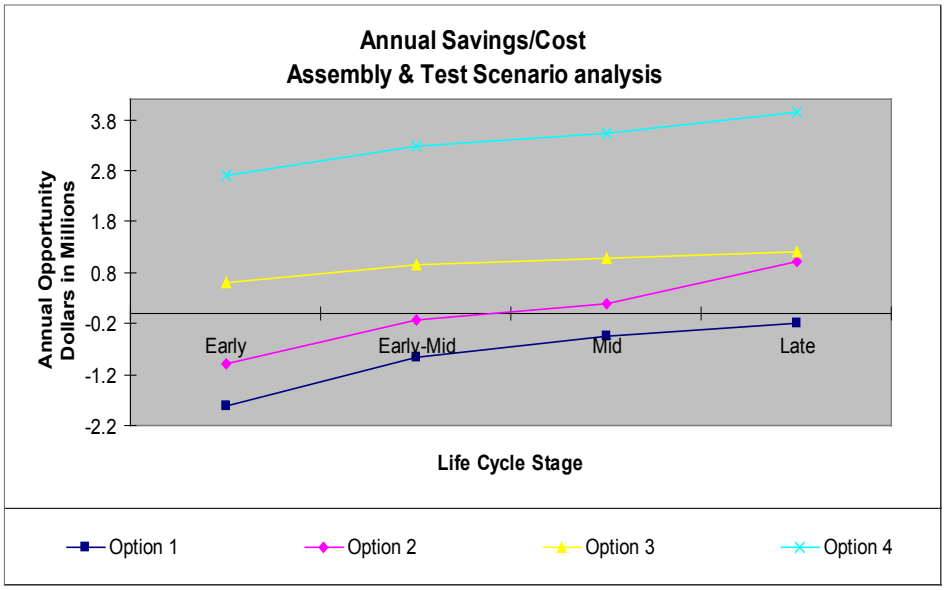
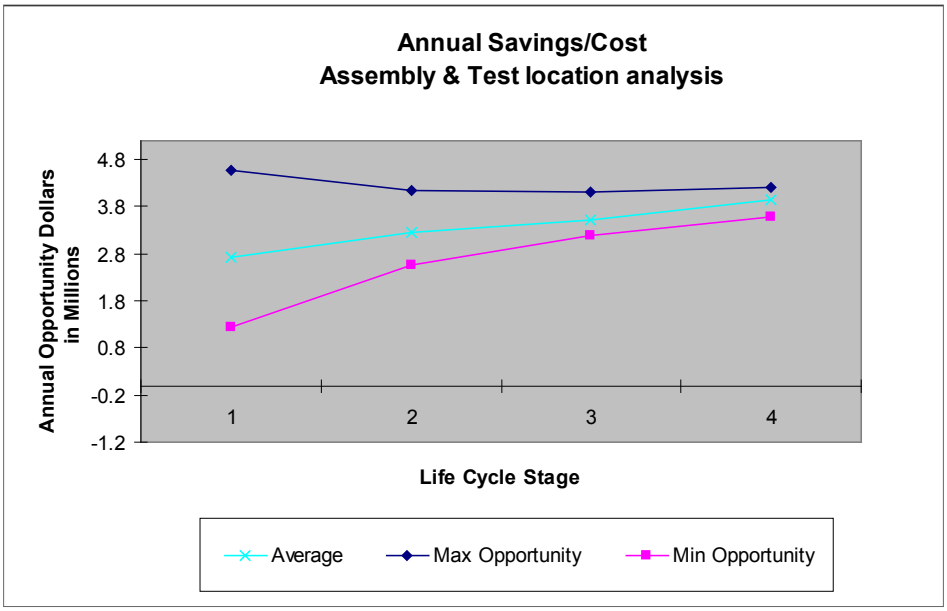
Results

EXAMPLE 1:

The following example portrays the concepts of multiple scenario analysis as well as variability/confidence intervals all of which were considered crucial to justifying simulation technology. After setting up the model, the NPI team was able to easily run multiple scenarios (4 options shown below) to understand the opportunity costs in changing their manufacturing strategies.





Then, for each scenario option, we were able to evaluate the variability of the output – something that was not possible without simulation.

Thus, for scenario option #4, shown above, we were able to understand the best possible outcome as well as the most conservative. This enables proper risk assessment for our decisions. Our analysis showed that later stages of life-cycle offered higher confidence and less risk.

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Results

EXAMPLE: 2
We also used ProModel's simulation to understand the effects of various input conditions on the critical output metrics. For example, shown below is the result from running scenarios in which we varied the industry demand and the production yield. This allows us to understand the sensitivity of the system to all of the critical input factors.

Scenario Evaluation on market volatility

- Doubling the demand will result in:
  - Fully utilized resources (100%)
  - Late delivery increases 200-400% (depending on instrument)
  - Averages of 17 hours queue time for each Instrument A, 36 hours queue for each Instrument B
- Reducing the demand by 50% will result in:
  - 60% under-utilization of technician/engineering resources
  - 80% reduction of queue times
  - 40% excess capacity on capital equipment

Scenario Evaluation on production yield

- An increase of 14 yield points will result in:
- 93% improvement in late delivery
- 54% reduction inventory expenses
- 25% reduction of cycle time