

Simulation in Product Development

MAGIC 2018
December 4, 2018
Keven Hofstetter

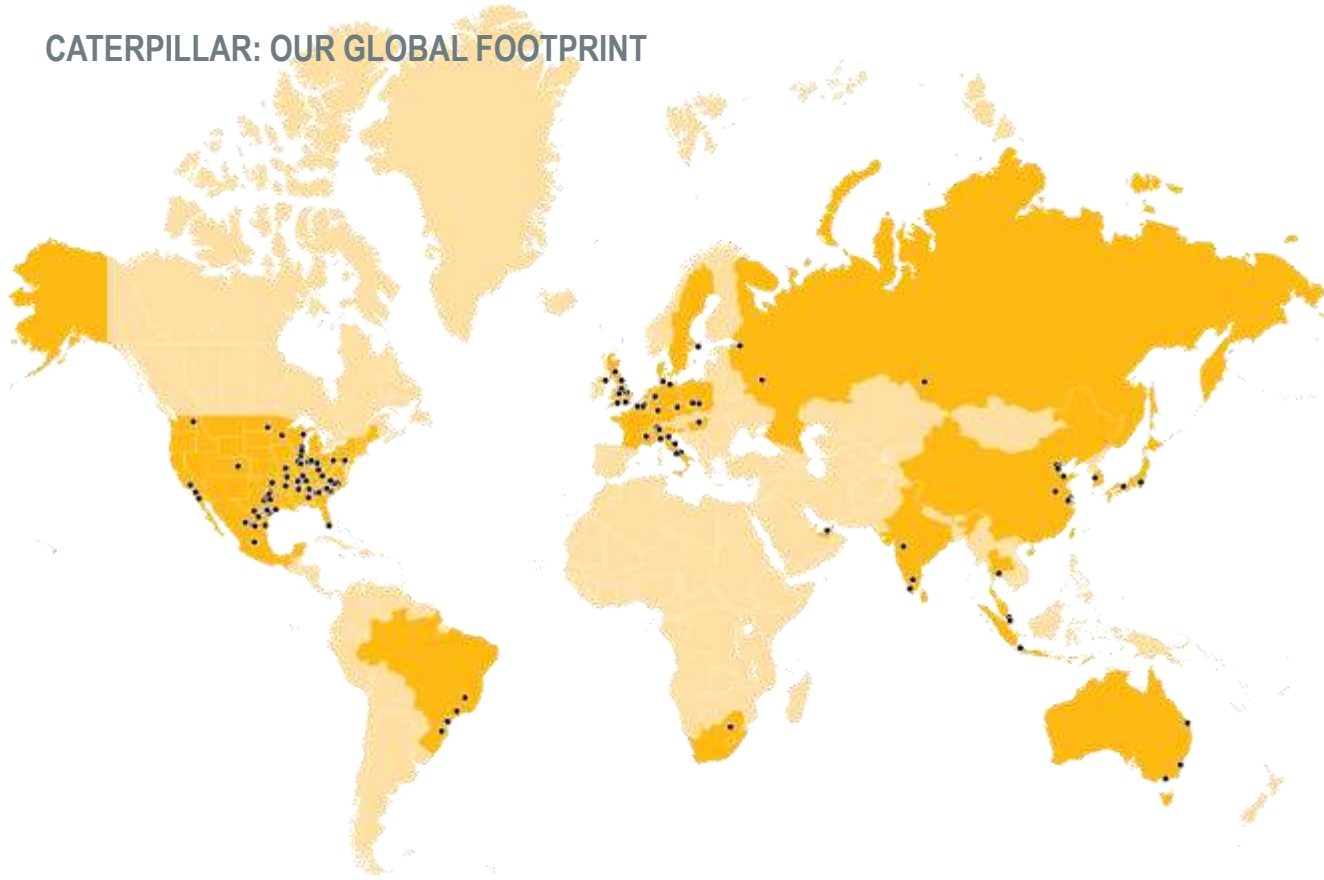
Agenda

- The Product Development Challenge
- Simulation to Meet the Challenge
- Embed Simulation in Product Development
- Value of Simulation in Product Development

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CATERPILLAR: OUR GLOBAL FOOTPRINT



PRODUCT LINE



Construction



Mining Equipment



Diesel & Natural Gas Engines



Industrial Gas Turbines



Diesel-Electric Locomotive



3 Million+
Products at Work
Around the World



98,400
Full-time
Employment*



**We Provide Solutions that
Help Our Customers Build a
Better World**



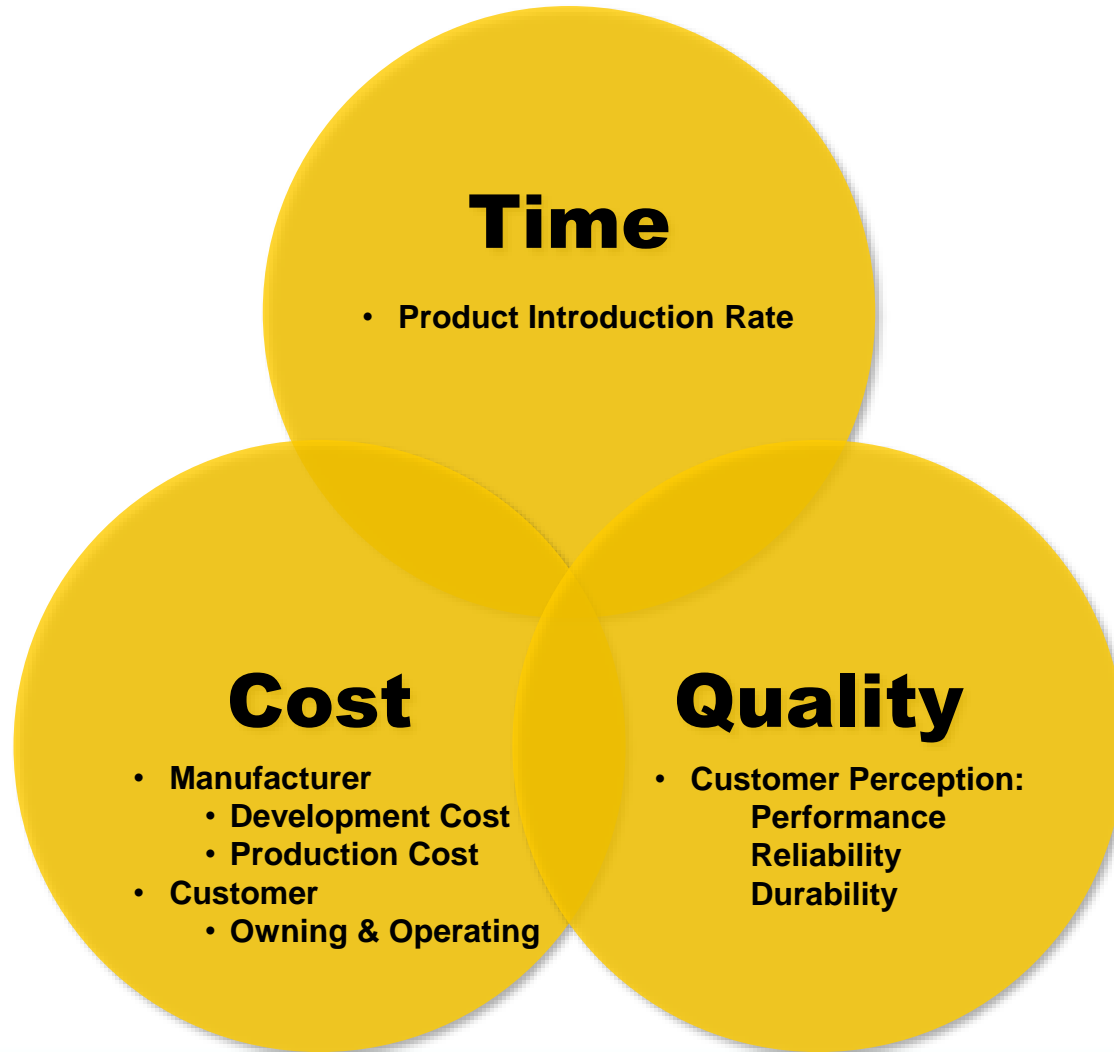
171 Dealers
Serving 192 countries*



500,000+
Connected Assets*

**Based on 2017 year-end data*

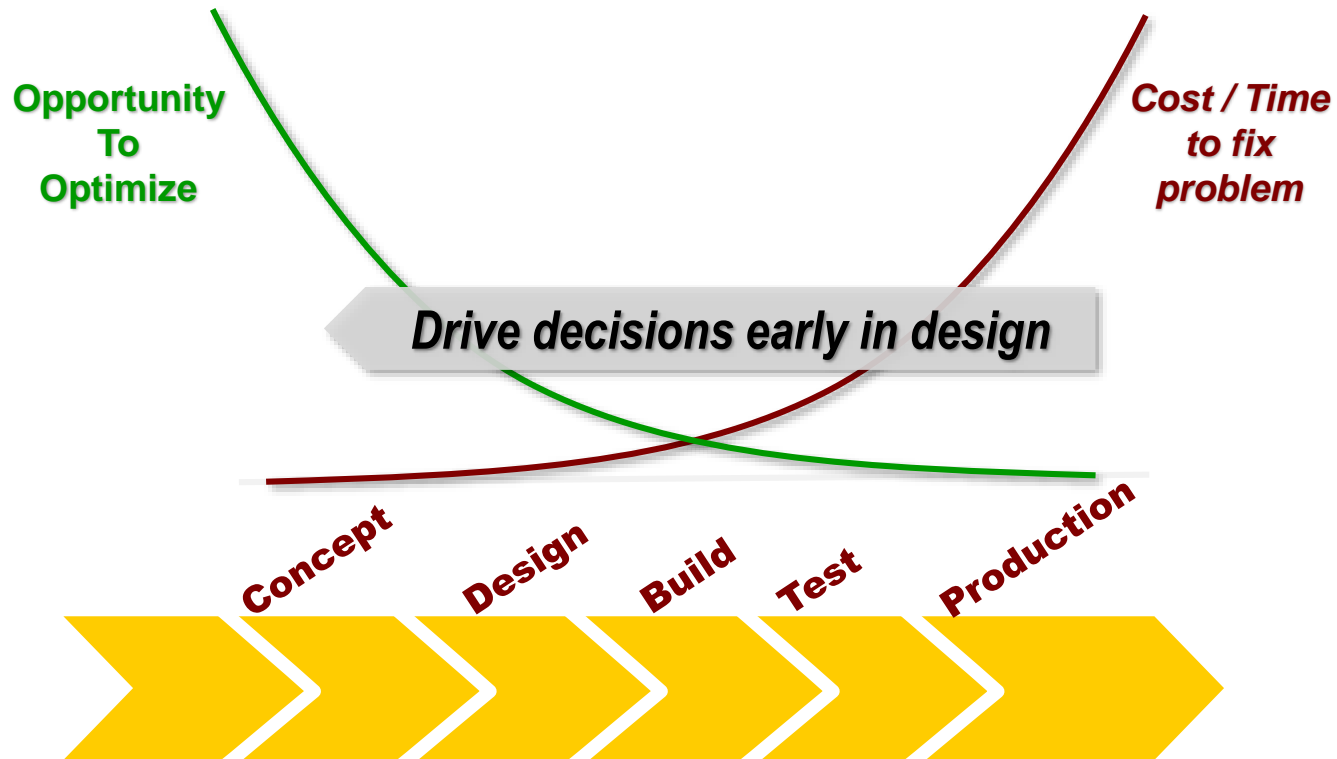
The Product Development Challenge



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Simulation to Meet the Challenge



Simulation to Meet the Challenge

1D/0D Example



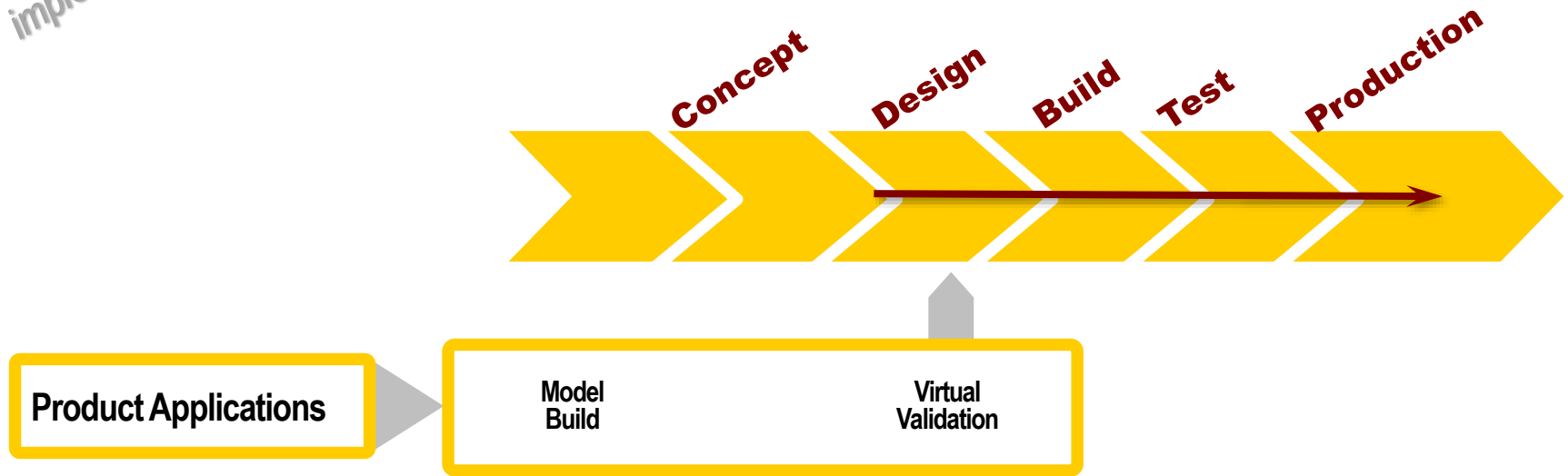
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Embed Simulation in Product Development

A method that has worked for 1D/0D simulation

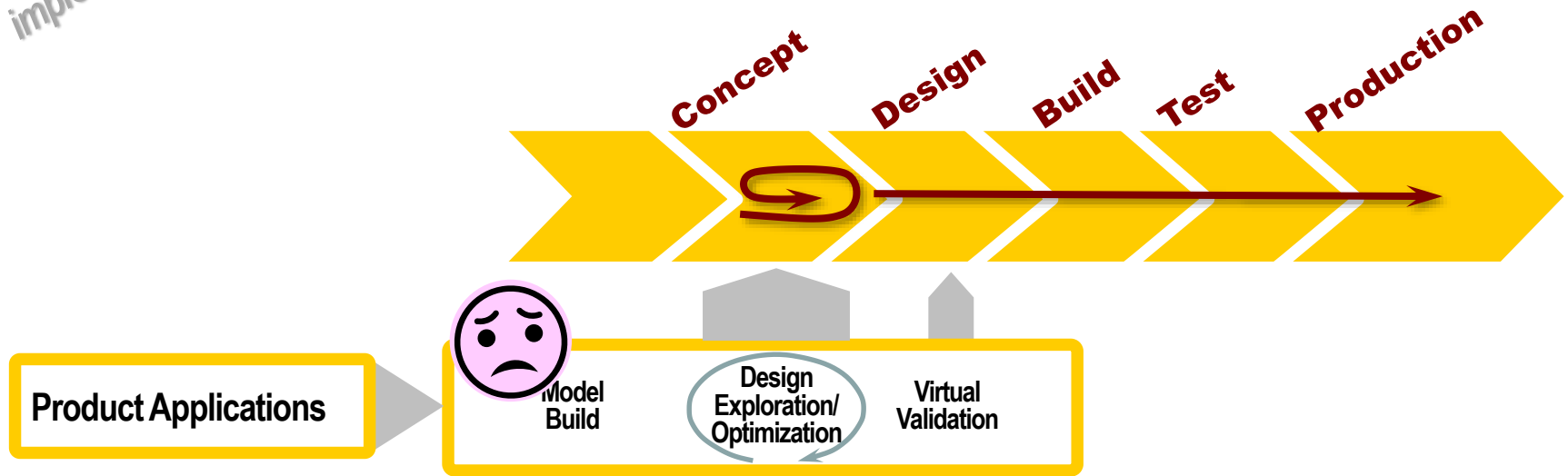
What to
implement



Embed Simulation in Product Development

A method that has worked for 1D/0D simulation

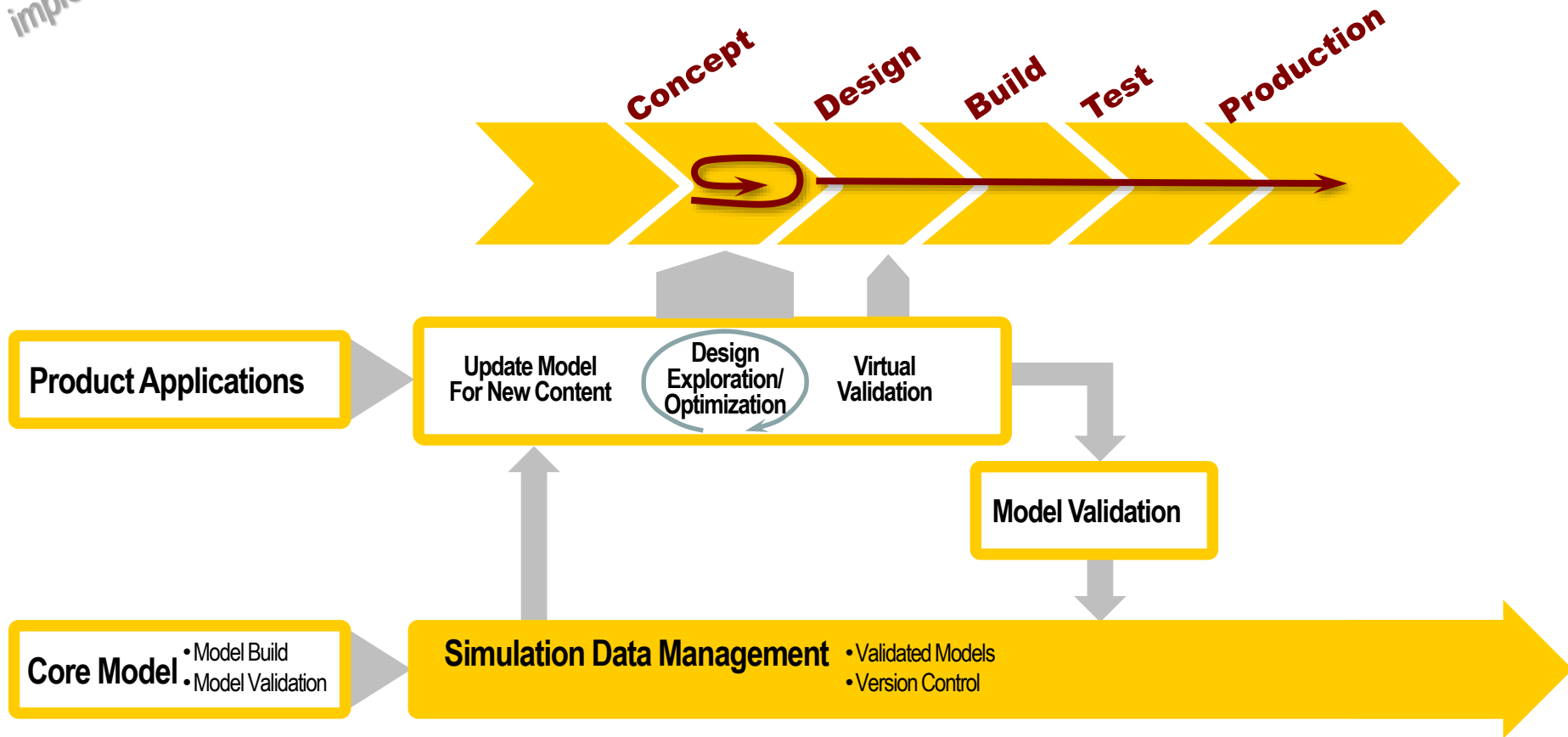
What to implement



Embed Simulation in Product Development

A method that has worked for 1D/0D simulation

What to implement



Embed Simulation in Product Development

A method that has worked for 1D/0D simulation

How to
implement

1 **Passionate Adopter**

- Must have significant leadership role in Product Development
- Realizes old way isn't working
- Looking for a ~~new~~ and better way
- Believes simulation could be the solution
- Willing to invest/risk dollars to make it succeed

Embed Simulation in Product Development

A method that has worked for 1D/0D simulation

How to
implement

2 Right Team

- Product development expertise
- Simulation expertise
- Test expertise

Embed Simulation in Product Development

A method that has worked for 1D/0D simulation

How to
implement

3 Right Deliverable

- Problem looking for answer...not answer looking for problem!
- Biggest perpetual design issue that simulation can reasonably solve
- Build core models to solve that issue
- Test data must be available for validation
- Validate core models against test data – drive adopter confidence

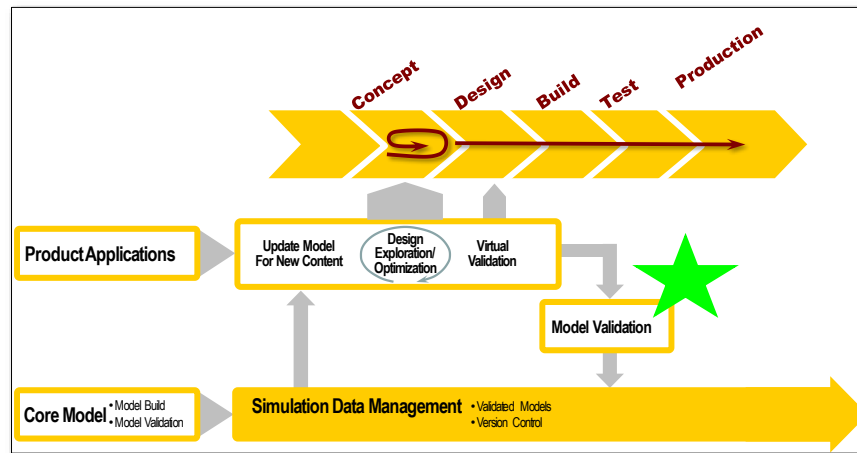
Embed Simulation in Product Development

A method that has worked for 1D/0D simulation

How to
implement

4 Commitment!

- Persistent leader...like a bulldog
- Team must be passionate about both “what” and “why”
- Adopter’s commitment to sustain the workflow



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Value of Simulation in Product Development

**Opportunity
To
Optimize**

- Decreased warranty
- Eliminate carry-over issues
- Optimized design
 - Increased margins
 - Increased market share

**Cost / Time
to fix
problem**

- Avoid test redo
- Eliminate/reduce physical tests
- Avoid component redesign
- Avoid design recycle
- Avoid manufacturing retooling

*Get adopter to calculate and agree on value –
use as motivation for future adopters*



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