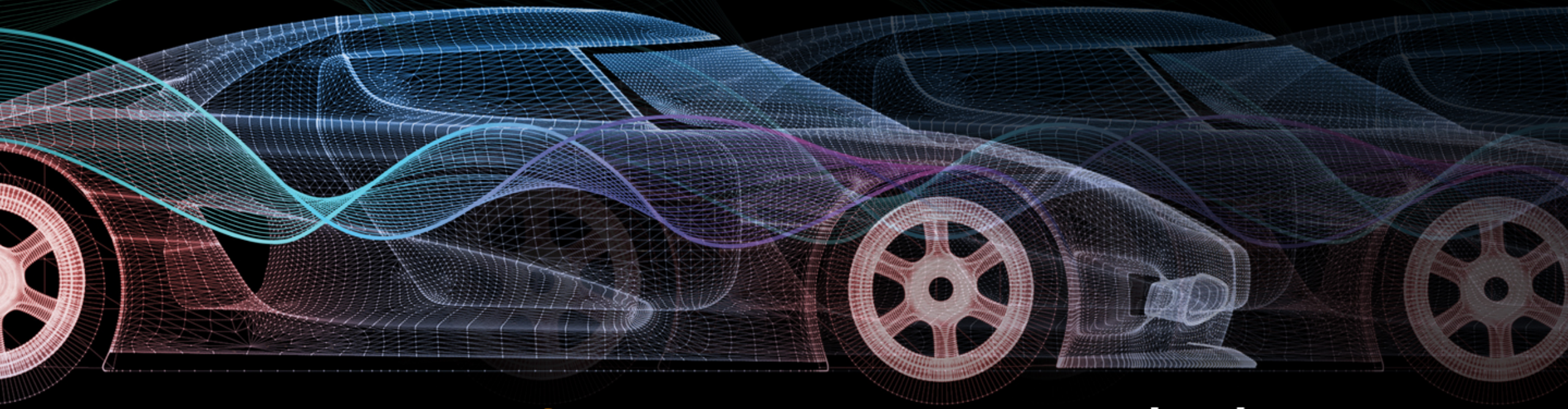
1,500 New Products Annually On Time, On Target

Norbert Majerus



Designing the Future Summit 2018

lppd Lean Product & Process Development

Why Innovate?

1975

1985

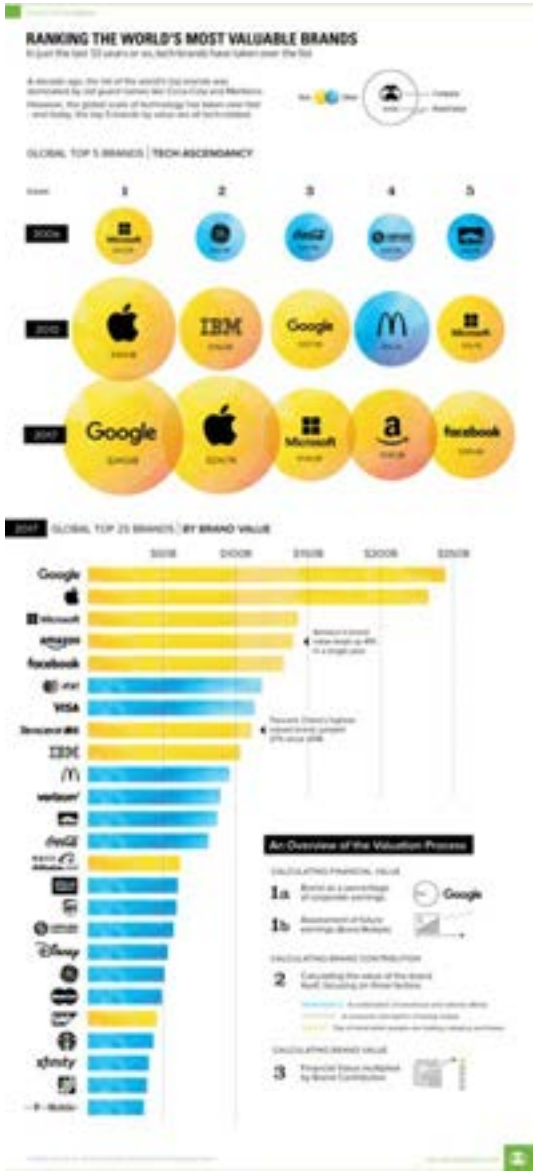
Why do great companies fail at innovation?

Companies do not fail because they fail to build a product

Companies fail because they fail to build what customers want*

*Diana Kander, All In Startup, Wiley, 2014

In 10 years



50% of Fortune 500 companies will not be on the list any more….

Why Lean?

GOODYEAR

2005

Safety/quality were good (must continue trend)

Late on almost all launches – only contracted work was on time (less than 20%)

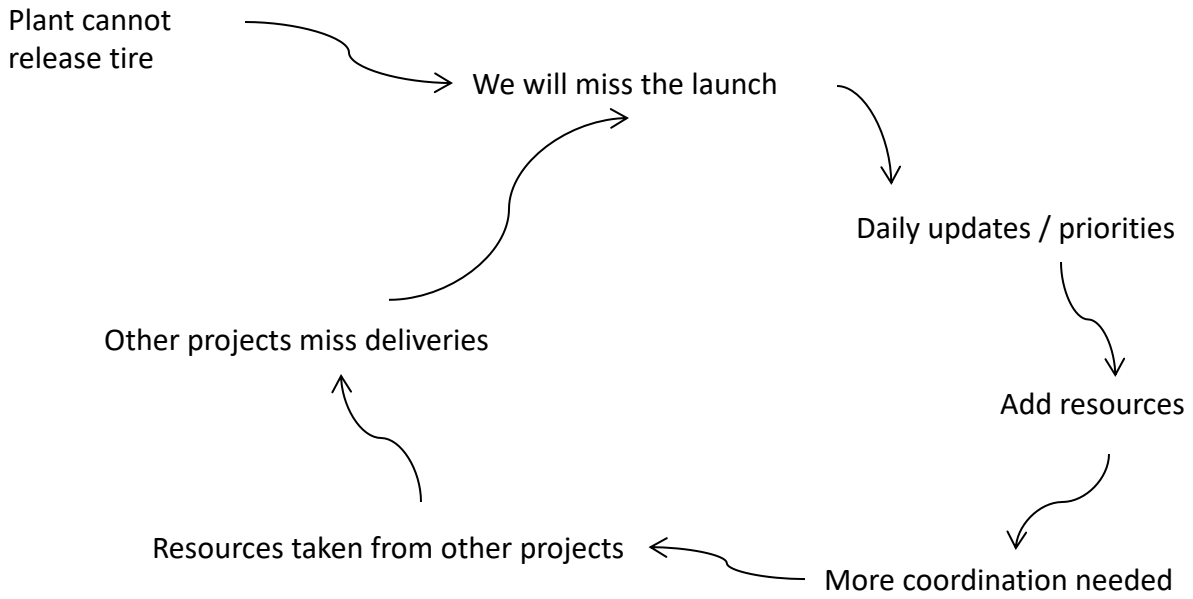
Less than 50% of the new products were profitable

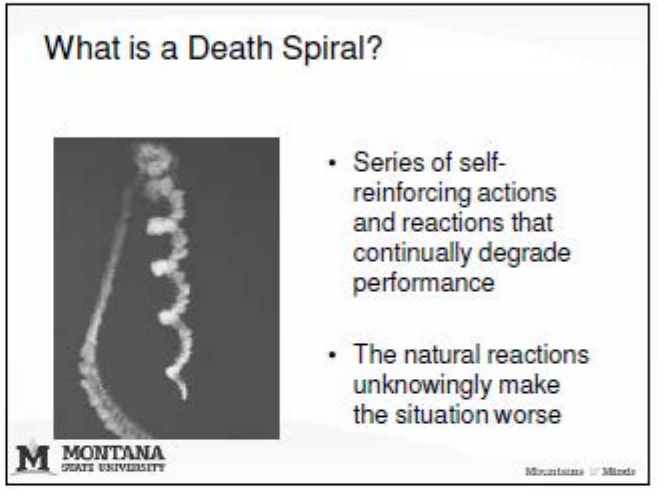
Disbanded all prior improvement activities (BPR, TQC, 6-Sigma…)

Engagement scores less than acceptable and people quit for lack of work

“We could help you improve your process if you had one”

The “death” spiral





7 years Later

Safety, quality – all time high

1,500, 95%, 100%

75%

3x

Better engagement

2016 Recipient of the AME OpEx Award

Lean and Innovation Today

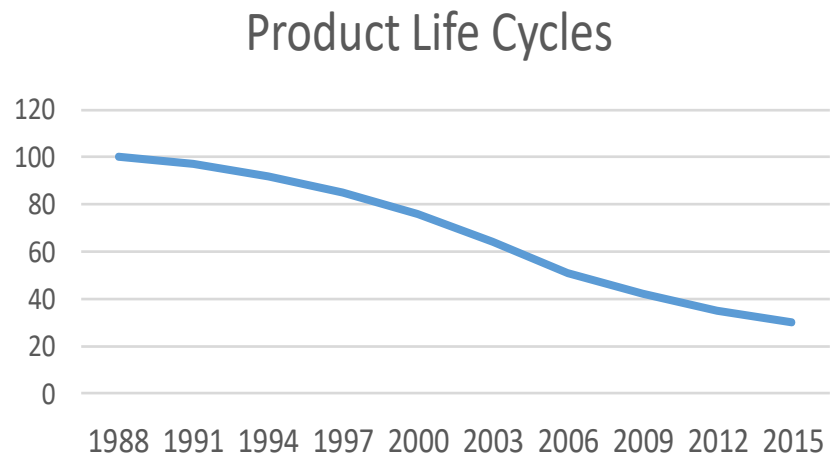
GLOBAL Economy

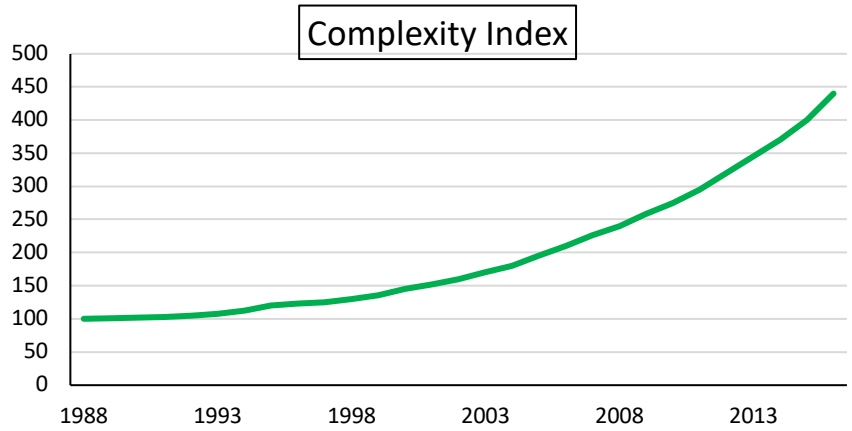
Economic growth is largely a function of:

- Population Growth
- Market Growth
  - **Productivity/Efficiency >>> Lean Manufacturing**
  - **Innovation >>> Lean Innovation**

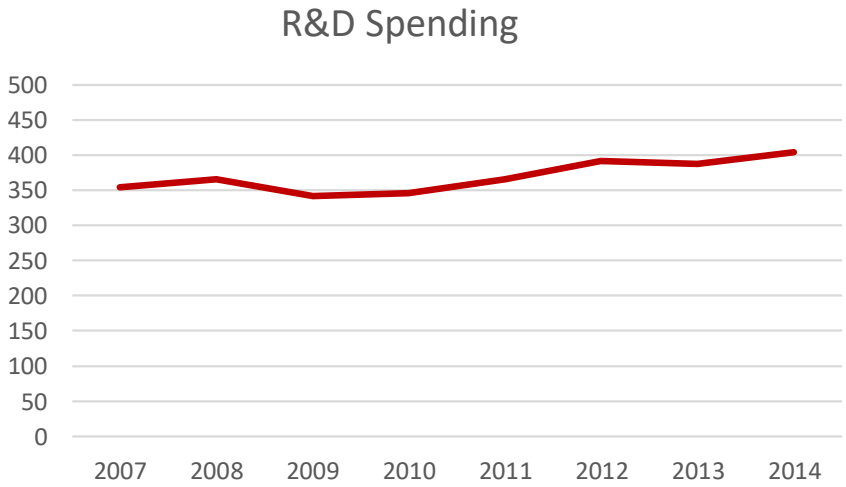
Global Innovation

Global R&D Challenges





Learn to do More with Less



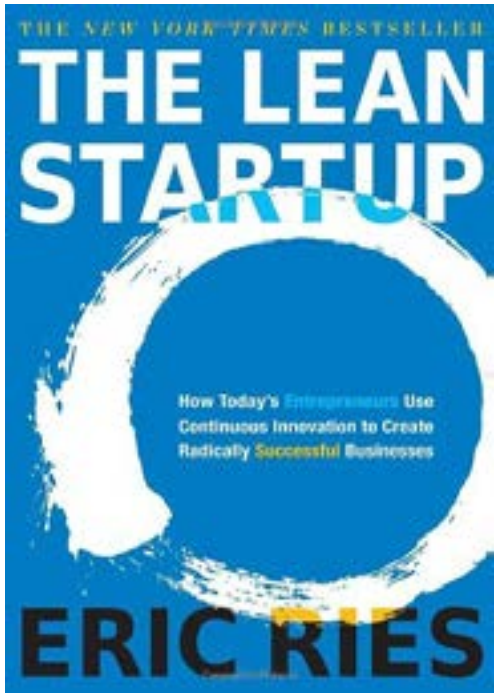
Goodyear data and estimates

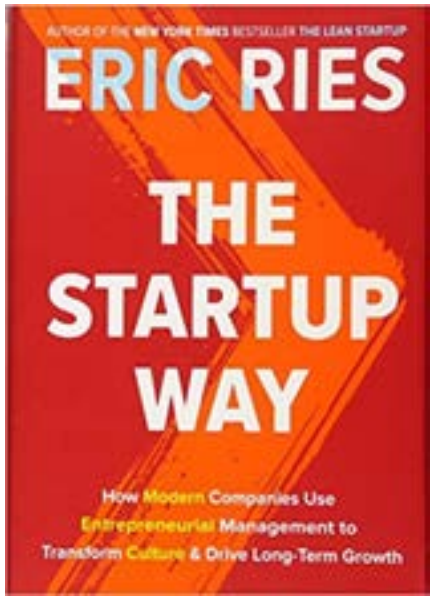
Goodyear data and estimates

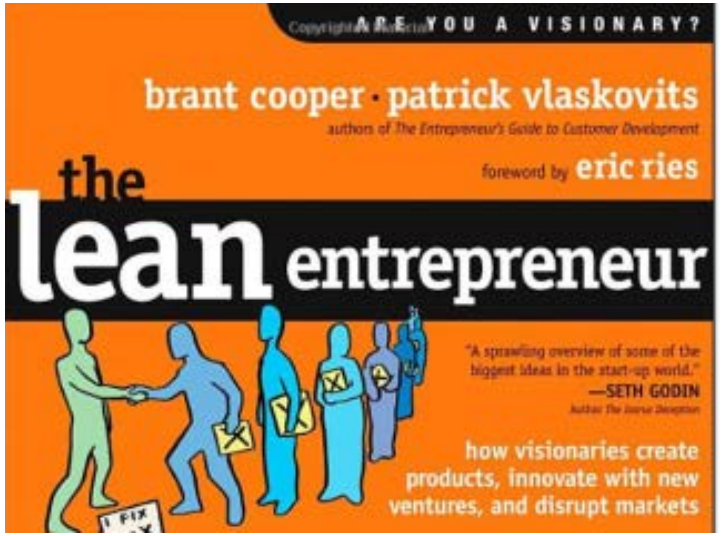
Lean Innovation – The Fuzzy Front End

Lean does not have a good reputation for supporting (disruptive) innovation

The Lean Pivot Point







What I (we) learned

Prerequistites

Process

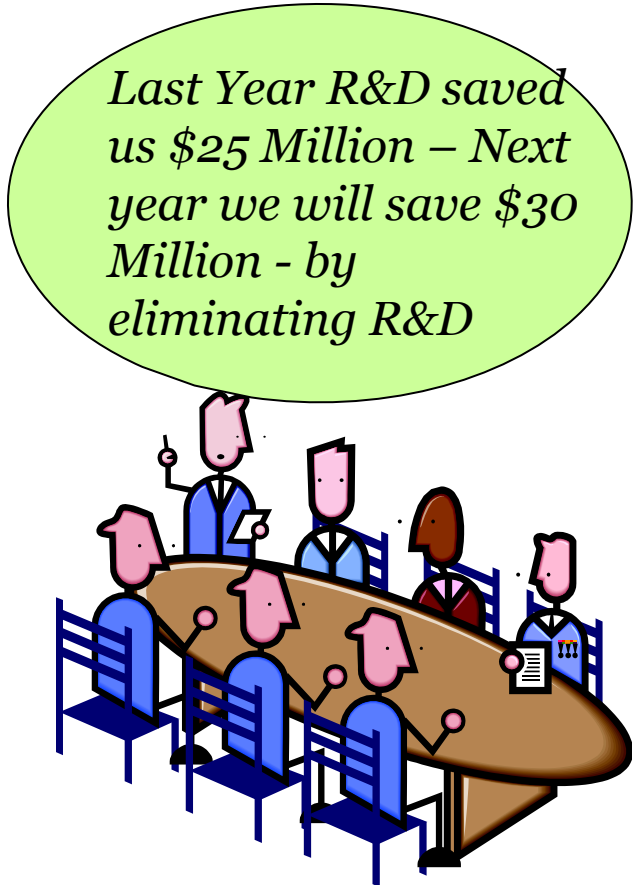
People

Prerequisites

- Purpose of R&D
- Organization - PM
- You may just as well do something significant
- Principles over tools
- Shadows
- Value Streams
- Collaboration
- The one with most knowledge wins

Purpose of R&D

Why should we do Research, Development (or Engineering)?

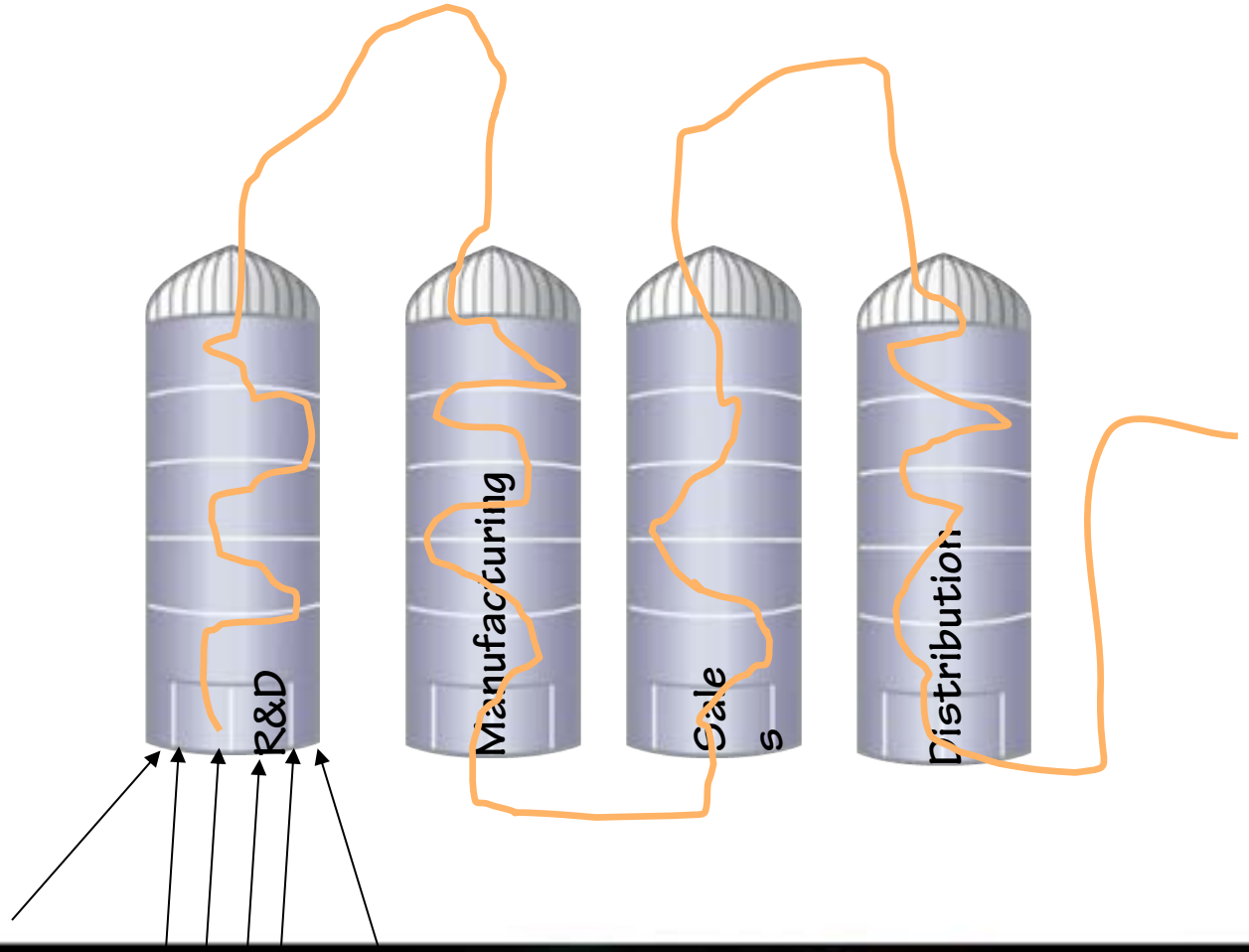


What is the Purpose of R&D?

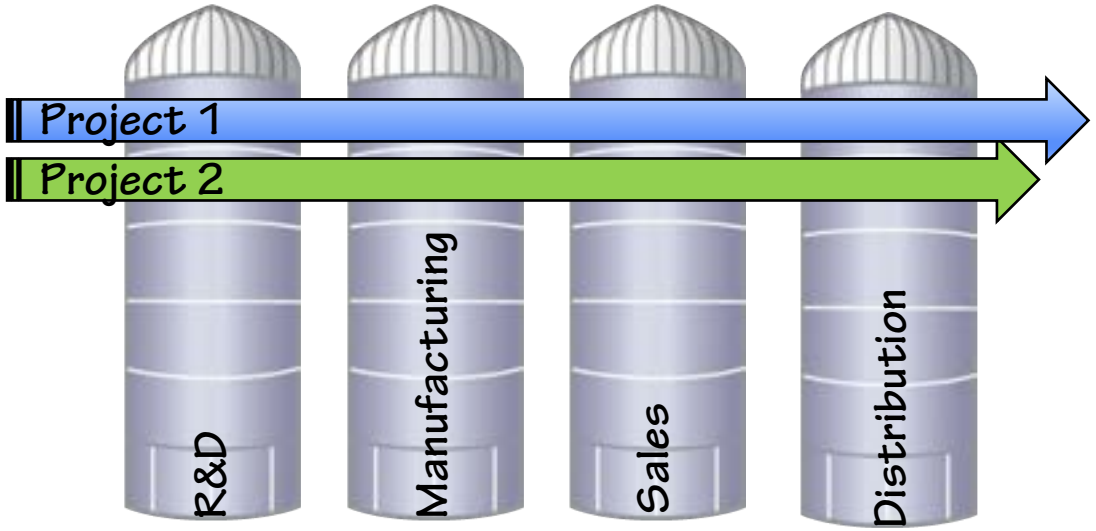
„ to help company generate revenue „

R&D is an INVESTMENT, not a cost

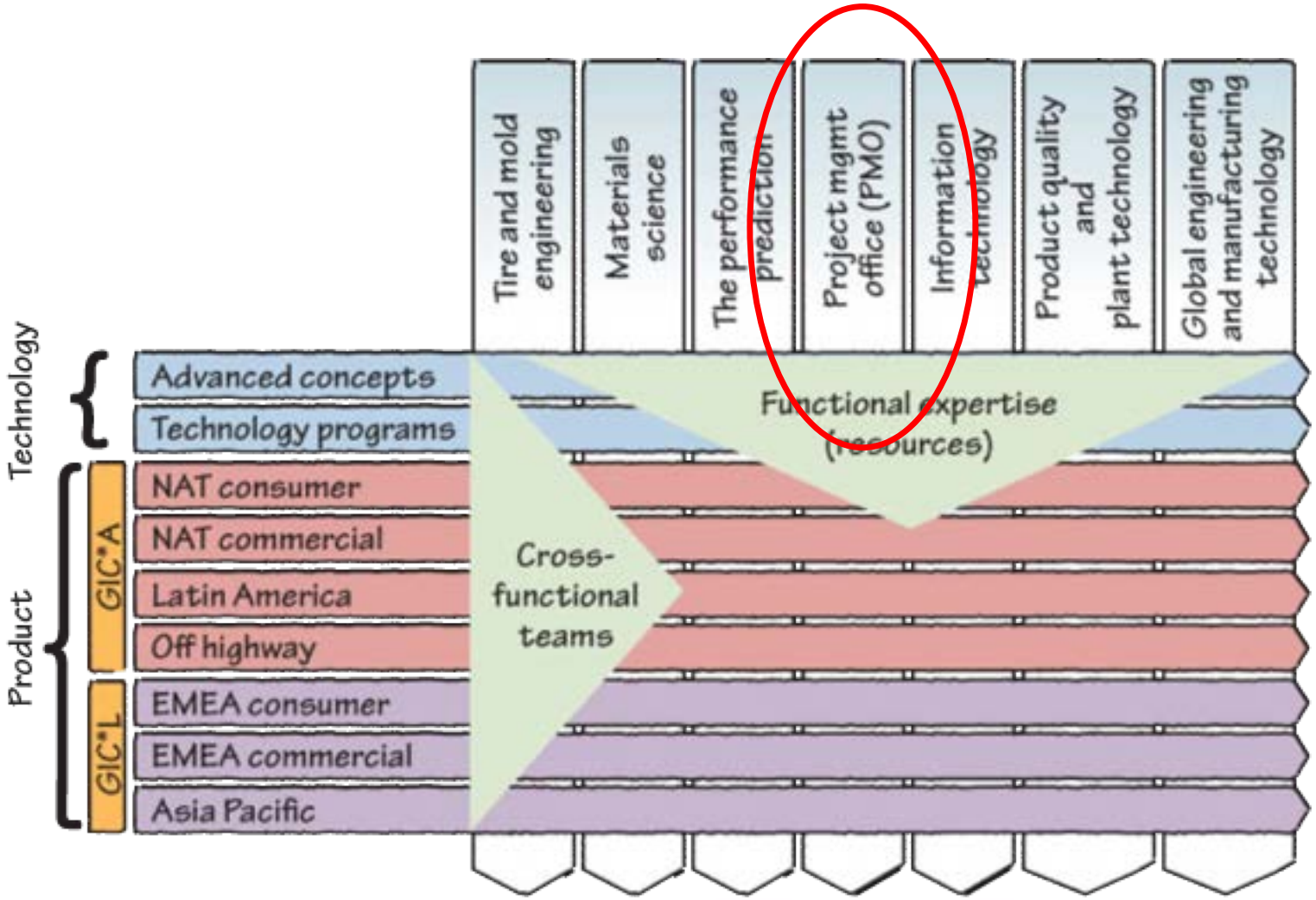
Typical Organization



Desired Organization



Matrix Organization



Basis of Agile

More than an org chart (Toyota HR)

Organization Necessary – Not Sufficient

Moving people where the work is - requires flexibility and standard work

Project managers (Chief Engineers) are needed - PMO (FUNCTION)

Leadership Support Critical

Get Organizational Issues Out of the Way

Chief Engineer @Goodyear

Doing the right thing AND doing things right - customer advocate then company advocate

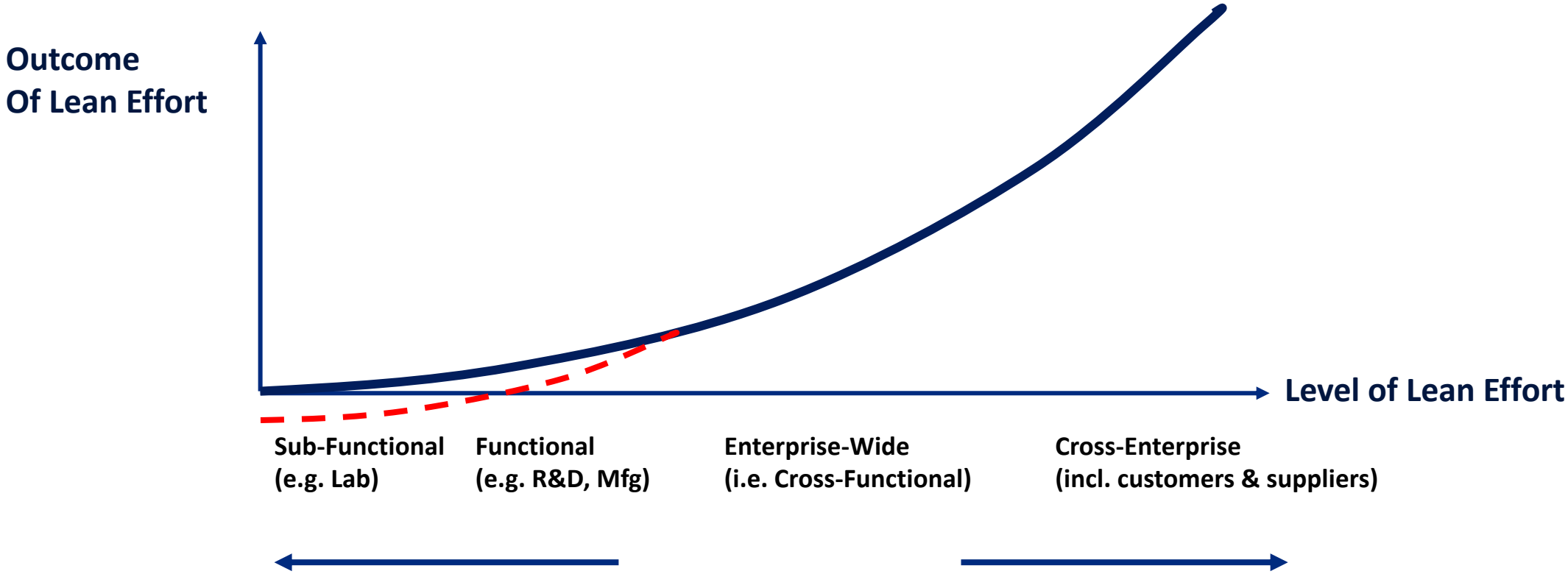
PM with technical expertise, value-stream knowledge

Must drive COLLABORATION and alignment

Manage PEOPLE (without authority)

Goodyear Project Success

You may just as well do something that shows REAL results



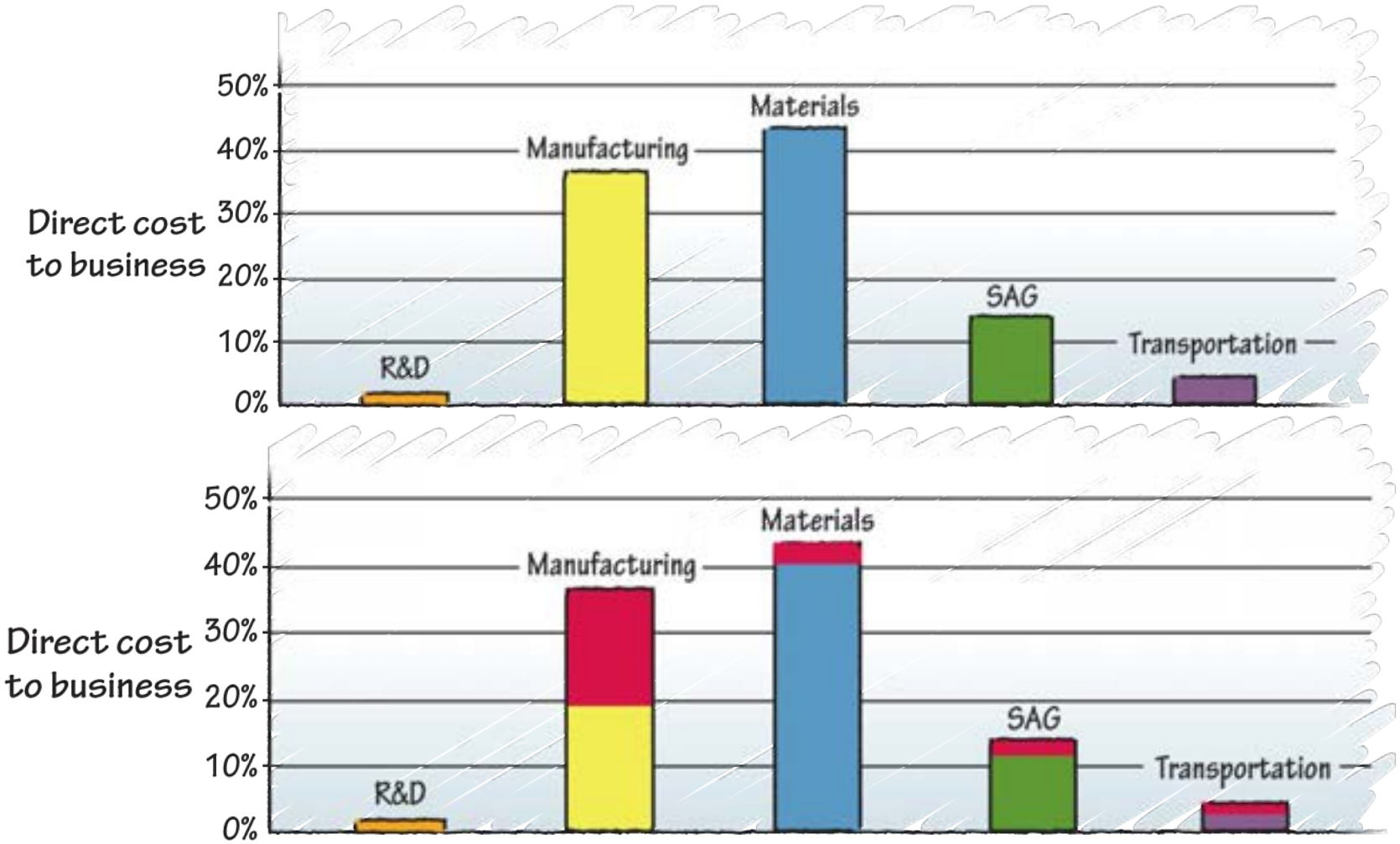
Chances for visible results are better if lean is applied on the highest level of the process

The One With The Most Tools Wins….

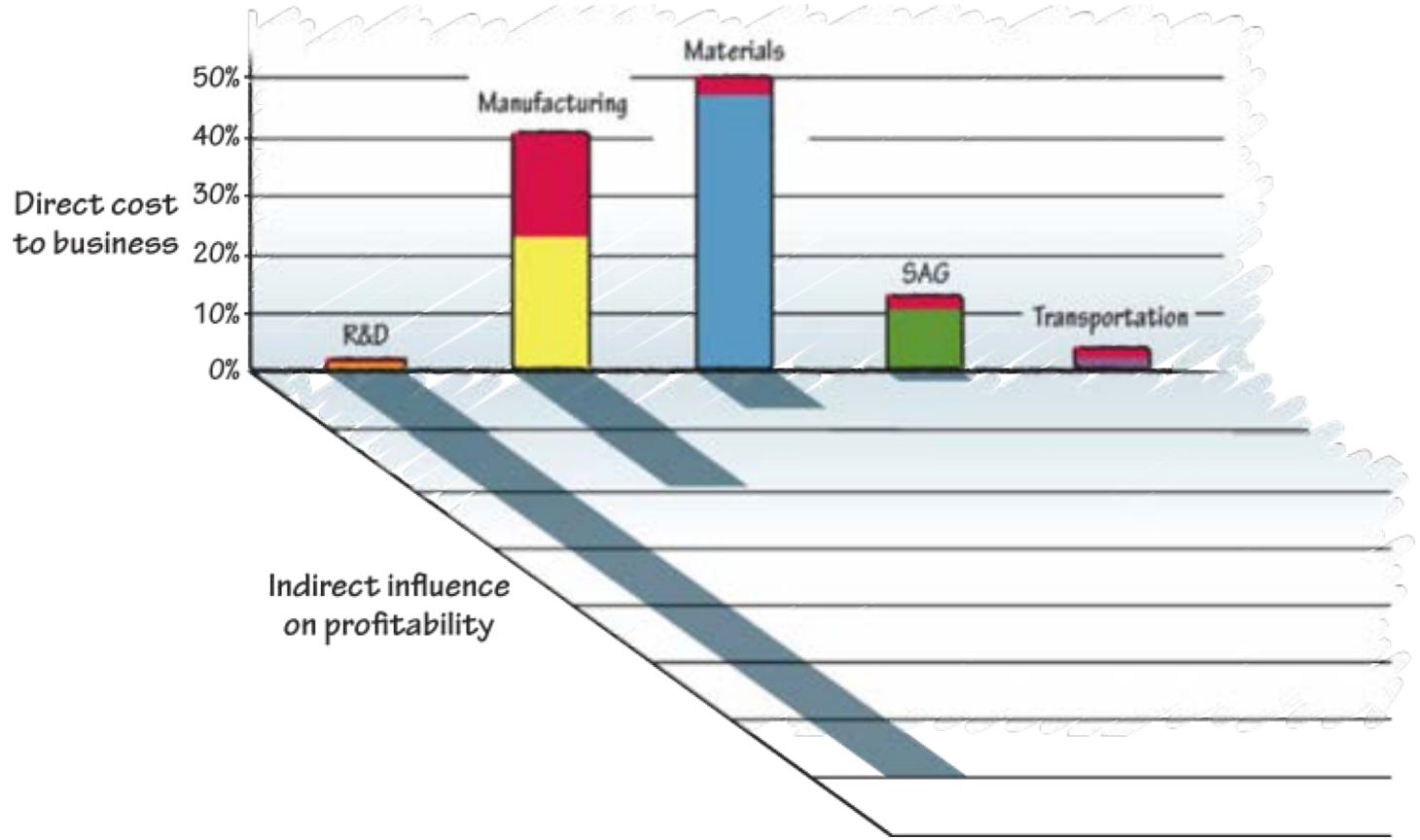
Mindset,
Skillset,
Toolset

Agile ….

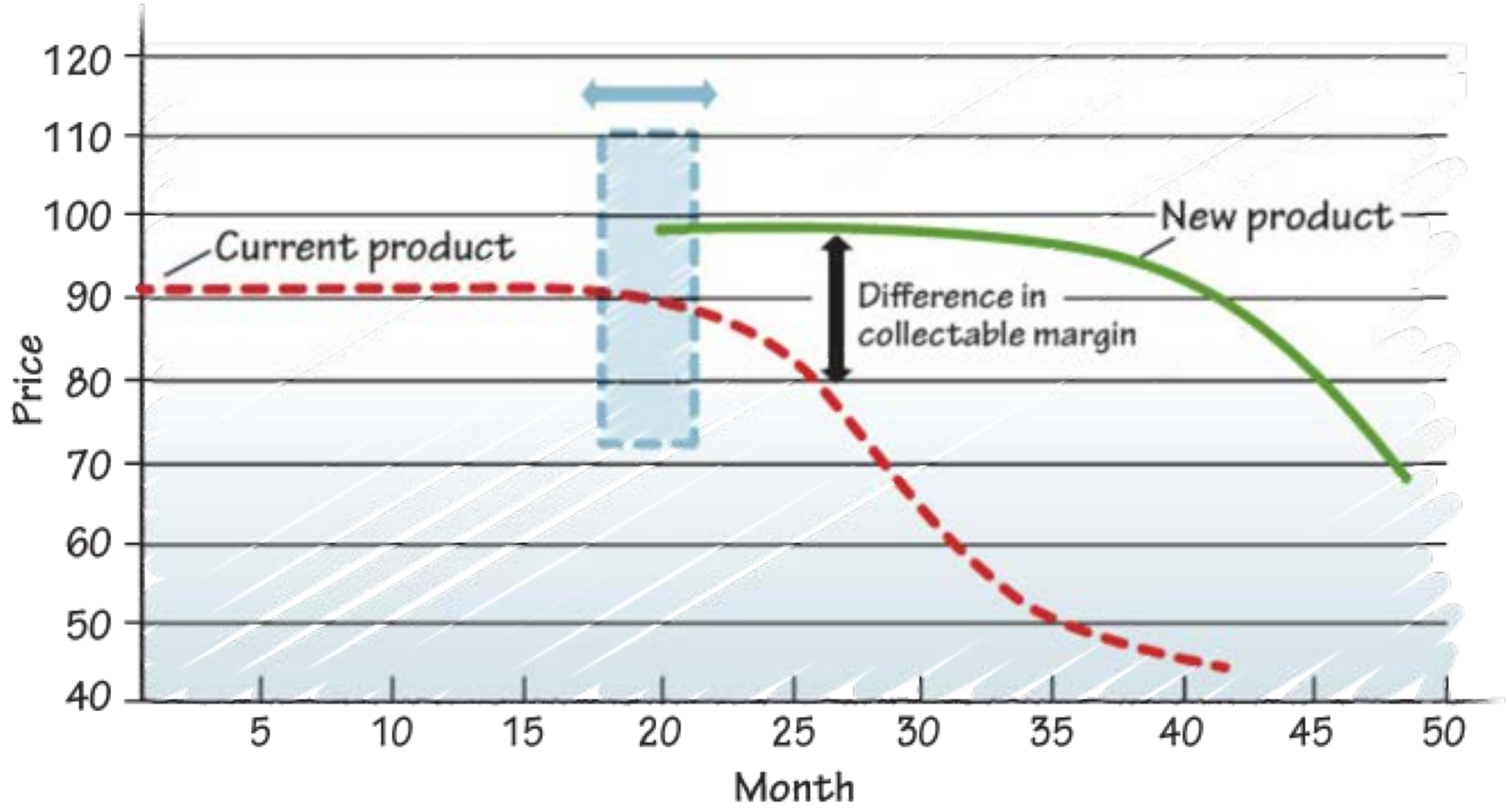
Focus on Customer VALUE, not cost



Create Value in the Shadows

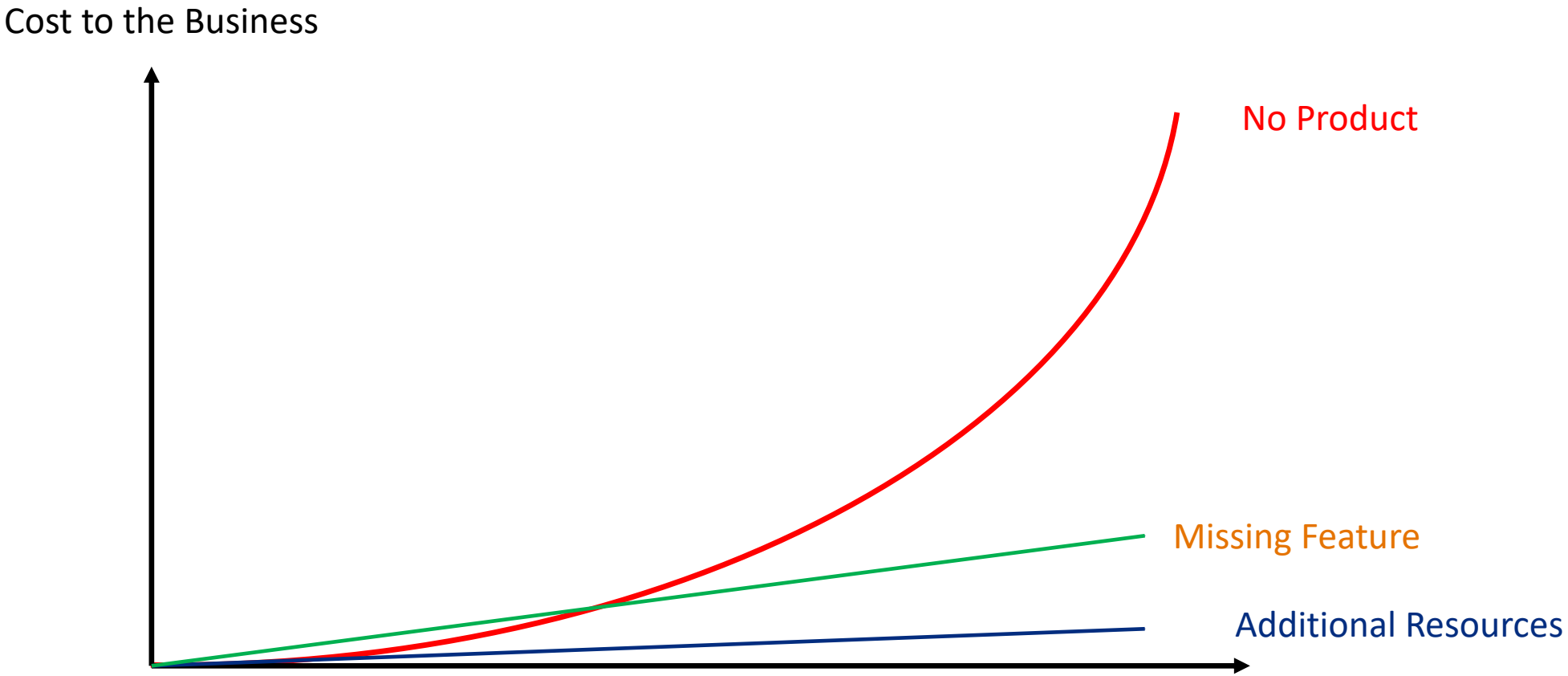


Winning in Innovation



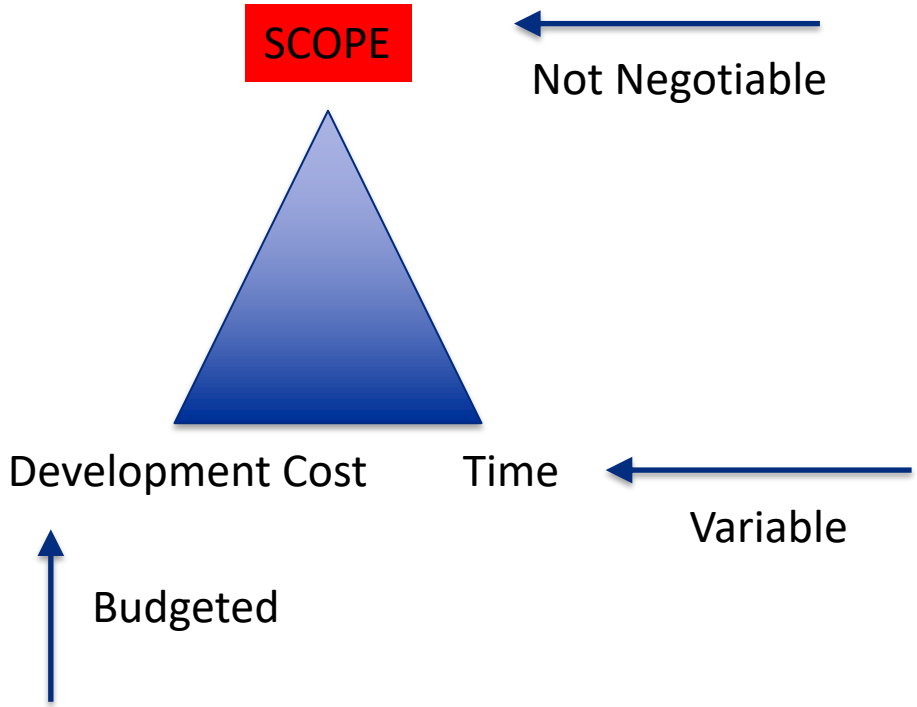
Goodyear Fuelmax

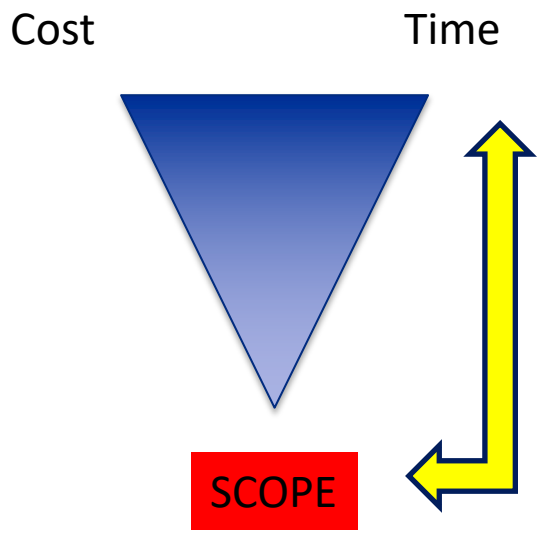
The Cost of Time/Delay



R&D Department vs Company

The Upside Down Triangle





Understand the Cost Of Time

New Product Launch

Winning at the Intersections

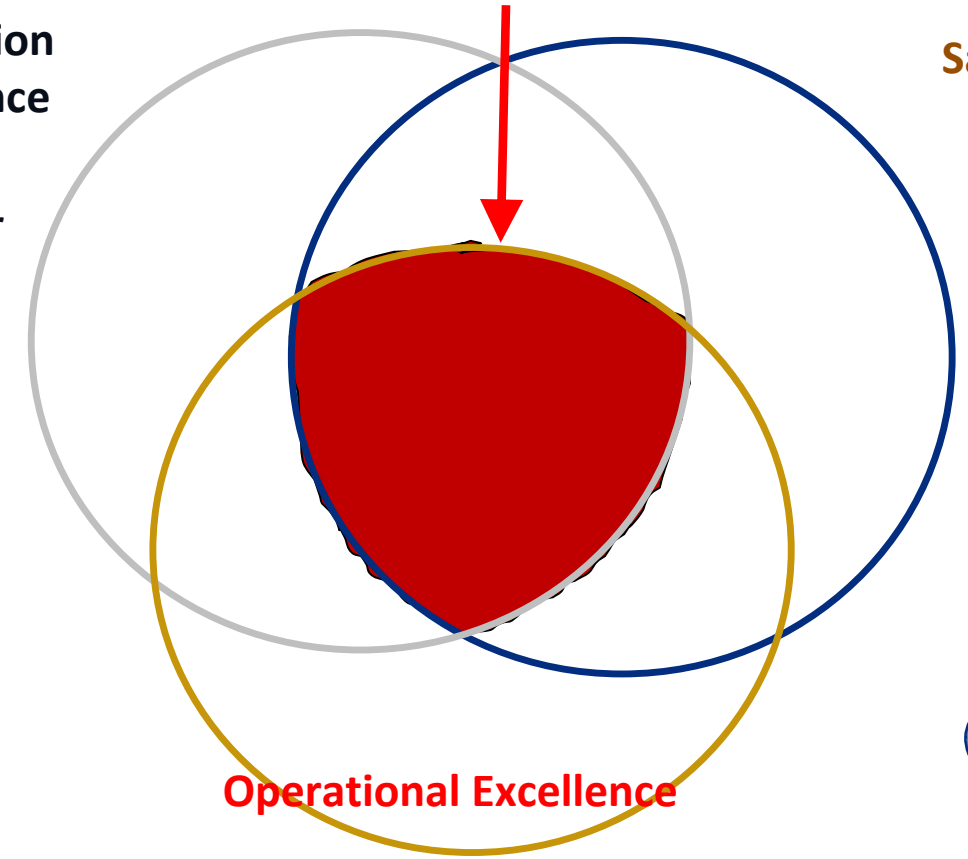
R&D critical to success at intersection

Innovation Excellence

"Great products meeting consumer needs"

Sales & Mktg Excellence

"Consumer-centric driven pull"



Operational Excellence

"Right tires, right place, right cost"

Design for Manufacturing

Compromise = easy way out

Collaborate and align to win at the intersection

Understanding Value Streams

Concurrent Engineering

Concurrent Design of a New Hospital

Knowledge Management

What have you invested in KNOWLEDGE?

Where is the knowledge today?

How is it being used?

Competitiveness is defined by “who can learn the fastest”

Develop Knowledge Faster Than Competition

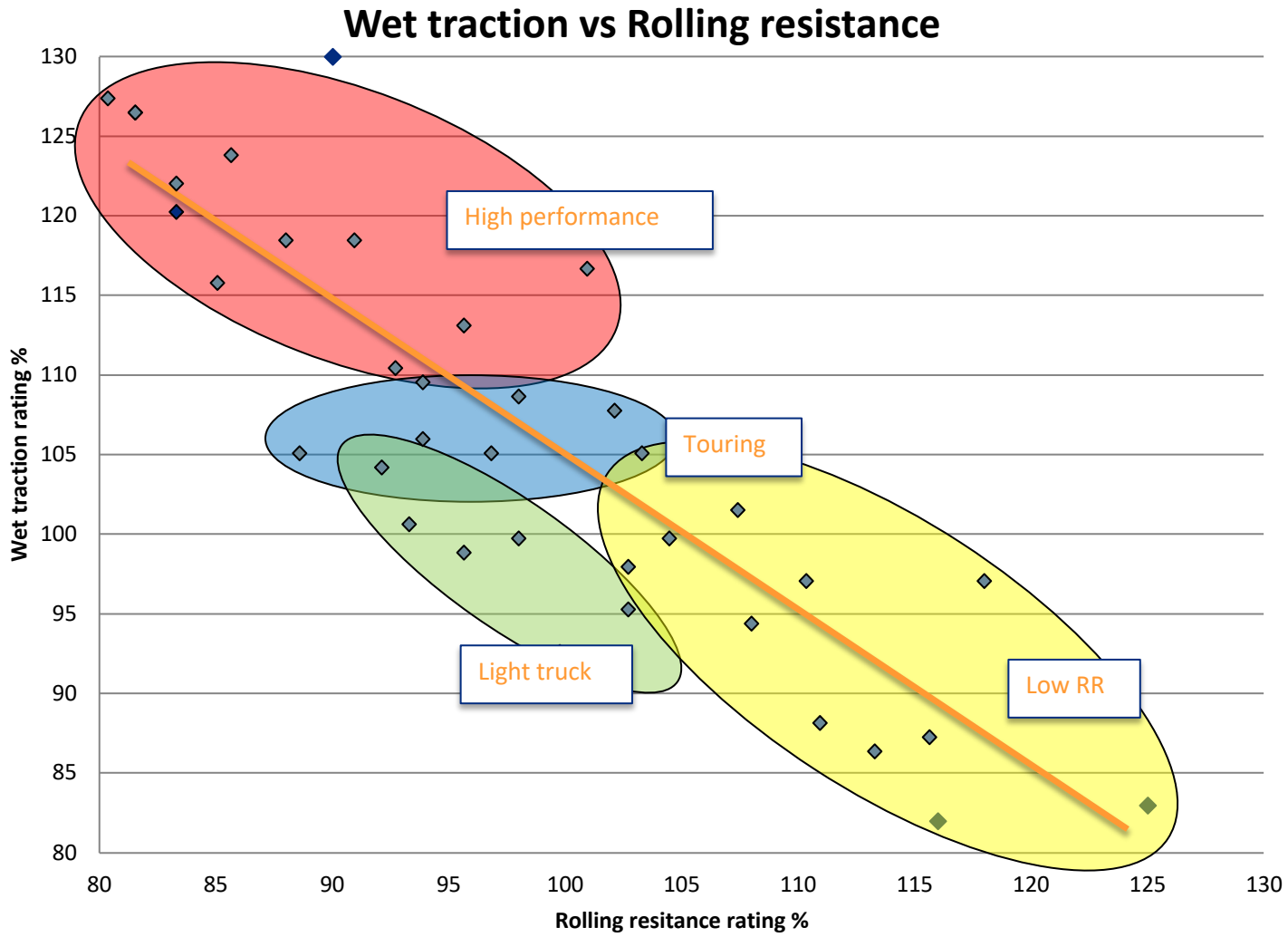
What knowledge is available?

Quickly/efficiently develop knowledge needed

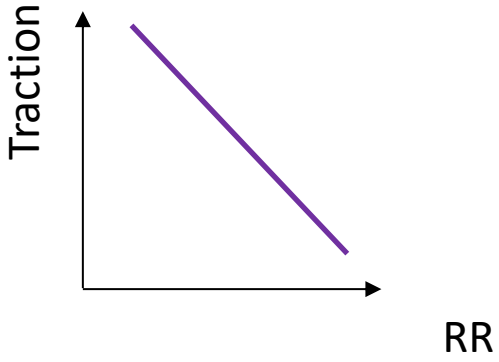
Capture and integrate new knowledge in knowledge management system

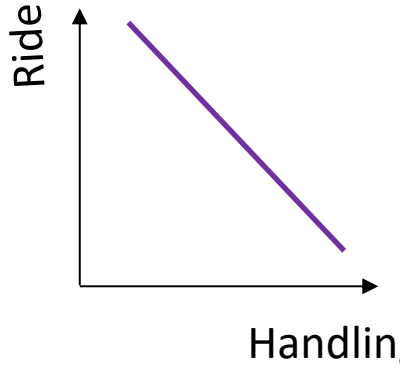
Update standards, tools, models …

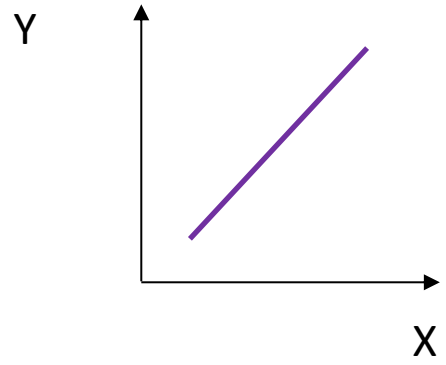
A REAL Trade Off Curve

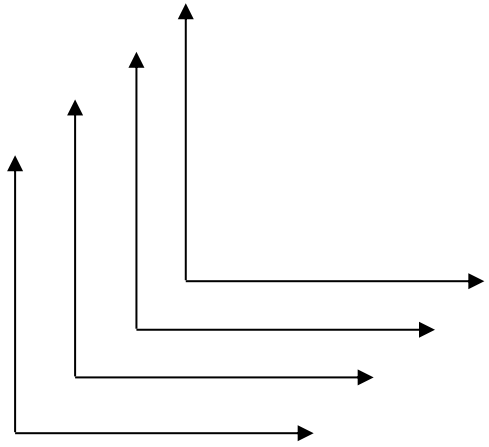


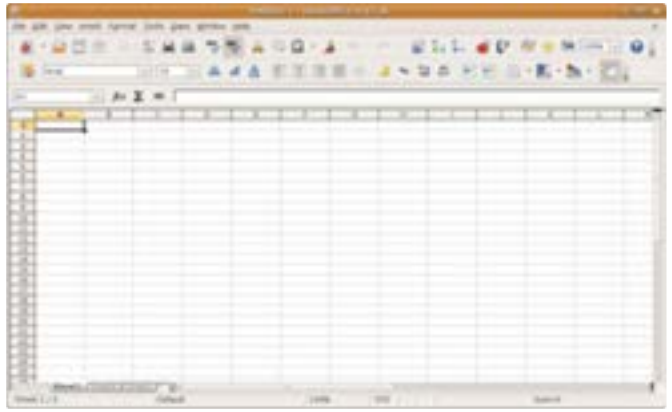
Appropriate Use of Trade Off Curves

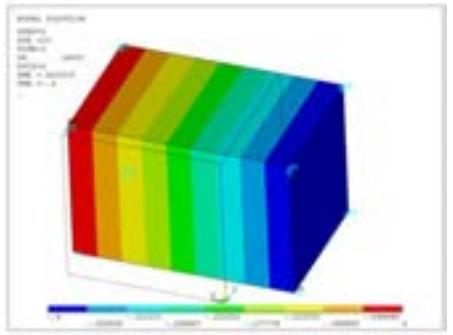












DOE
Set Based
Tagushi
…..

Set based OR OTHER experimental set
– focused on knowledge gaps

Places For Knowledge

TOOLS

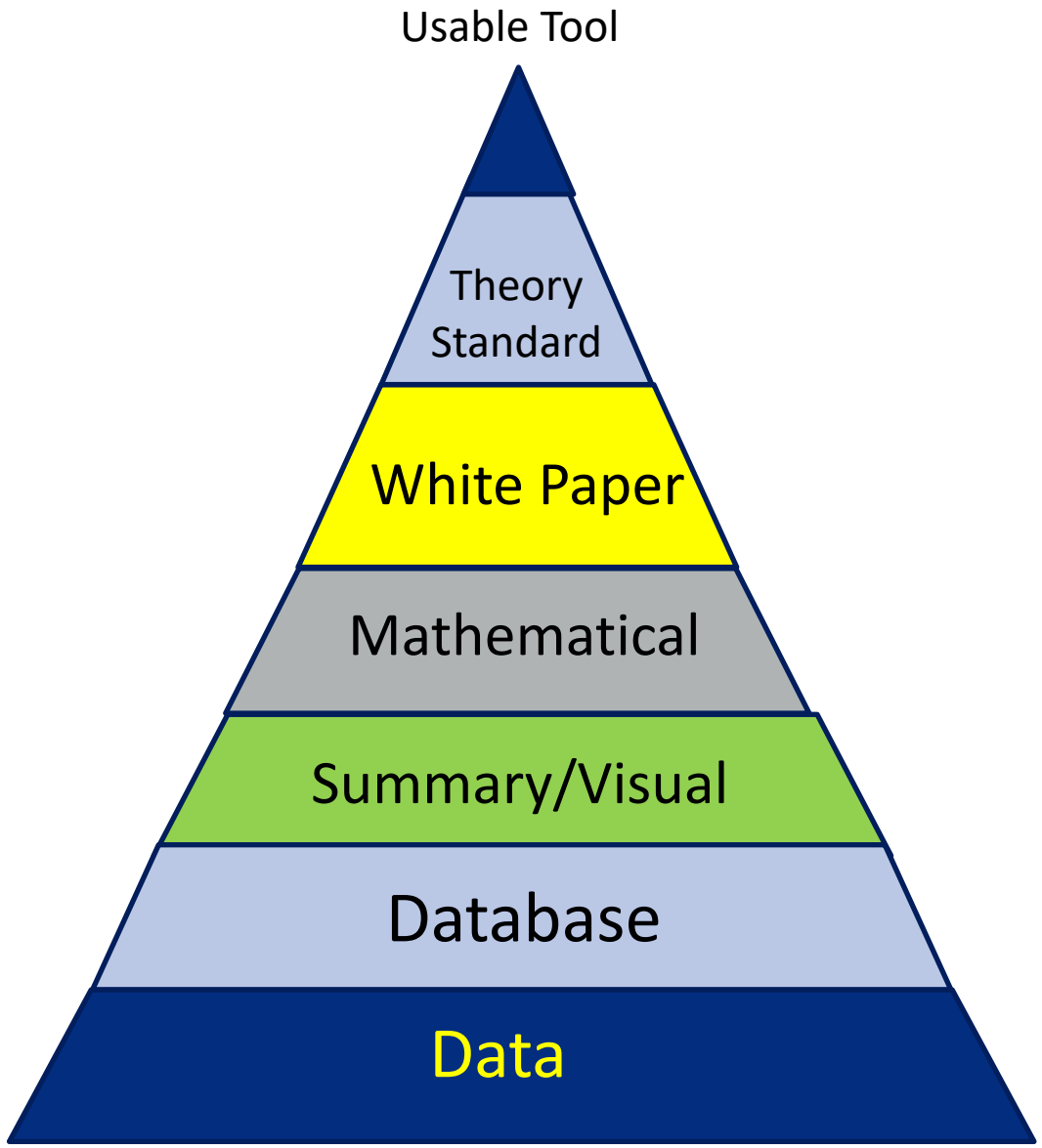
Products

Tools – Modeling

The CULTURE

The head of an engineer

Books



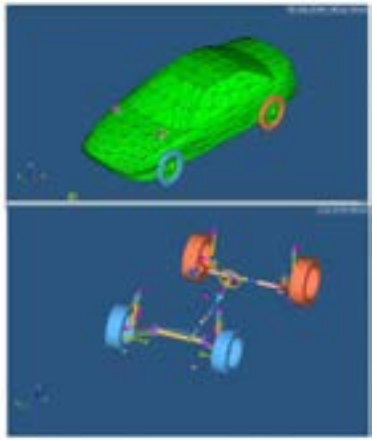
Modeling and Knowledge Reuse

Use knowledge to build good computer modeling or "predictive" tools

Test to validate/improve the models

Interpolations and extrapolations

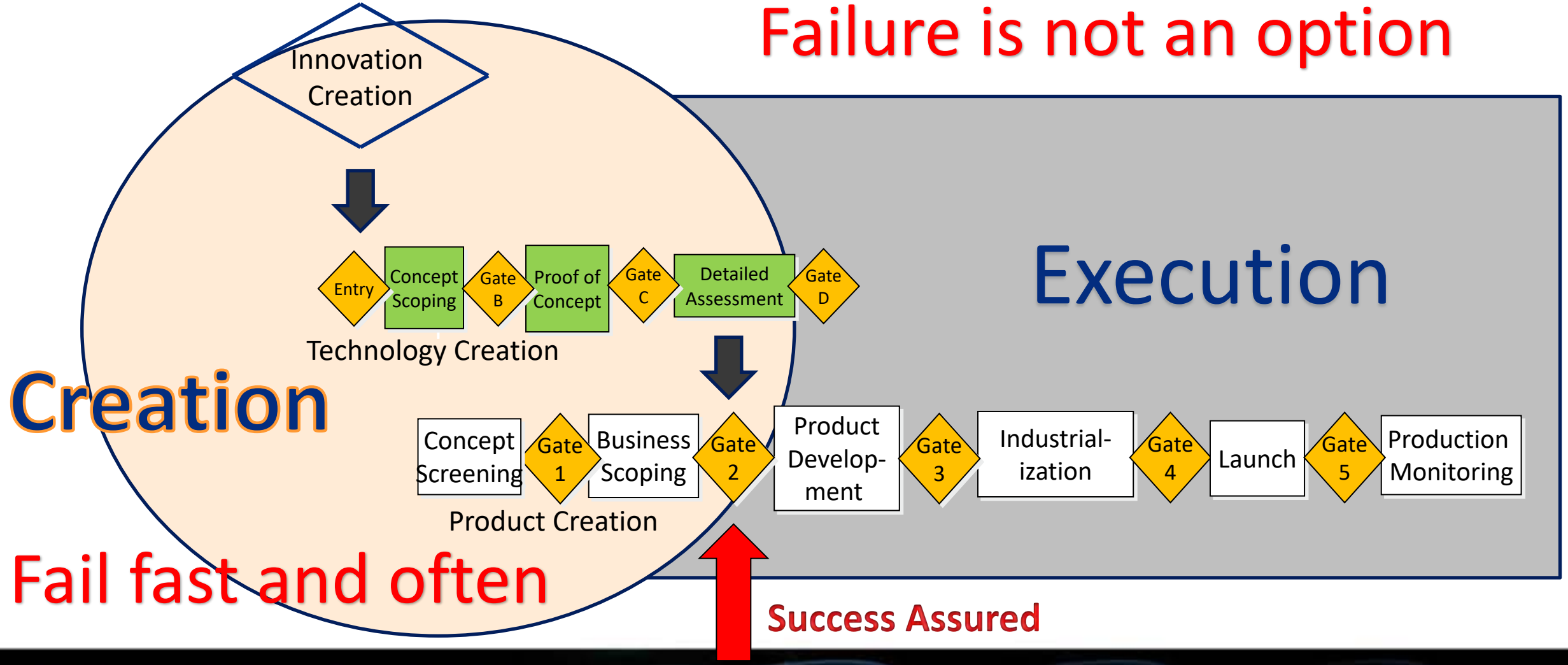
Allows quick set based and DOE's



Tires for Chevy "VOLT" were developed **virtually** with a vehicle model supplied by *GM* – no tire/car built before "approval"

Tires and vehicle were developed concurrently

Can Innovation Have a Process?



Execution Phase

Generates company income – and platform for launching innovation

Inspired by lean manufacturing

Goodyear 2016 AME Excellence Award - Innovation Center

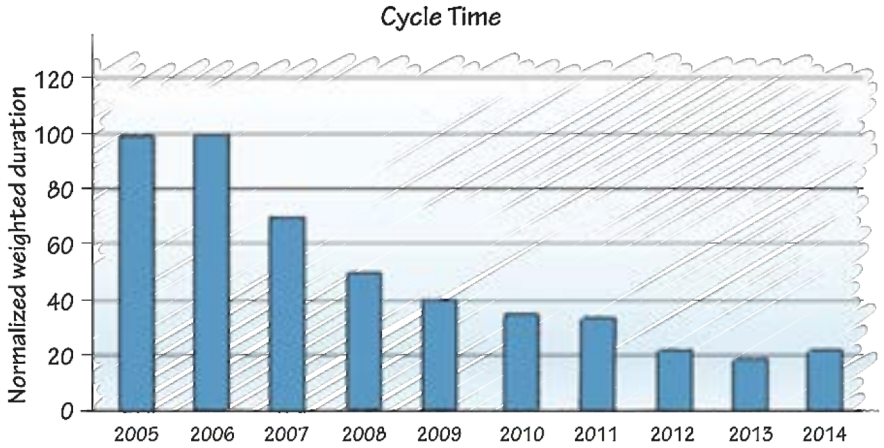
100% delivered on time

Fast is better than slow

Innovation Speed

If I had only one thing to focus on, it would be SPEED

- Competitive advantage
- Faster learning, better risk management
- Better cash flow
- **Collaterals of efficiency**

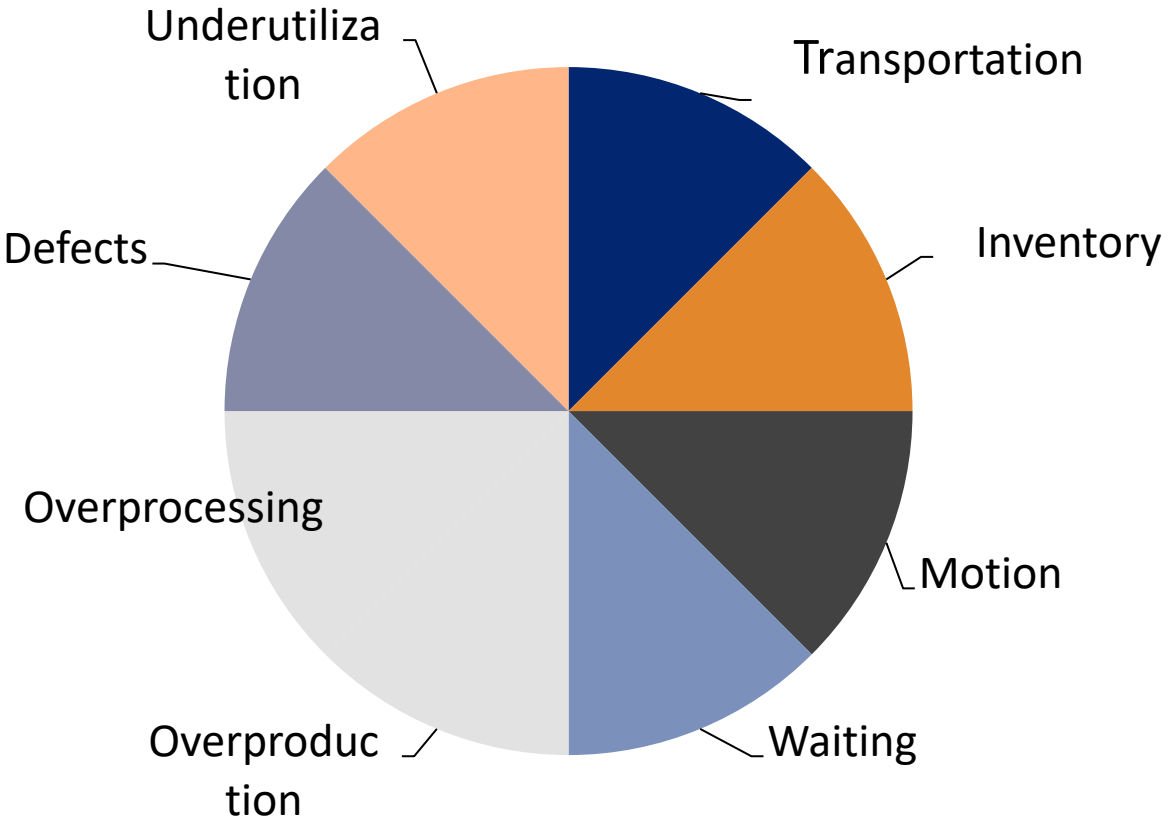


Some Goodyear iterations require more time than others. In order to track cycle time across all iterations, regardless of the varying time, Goodyear established a measure of normalized weighted duration, establishing a base of 100 in 2005.

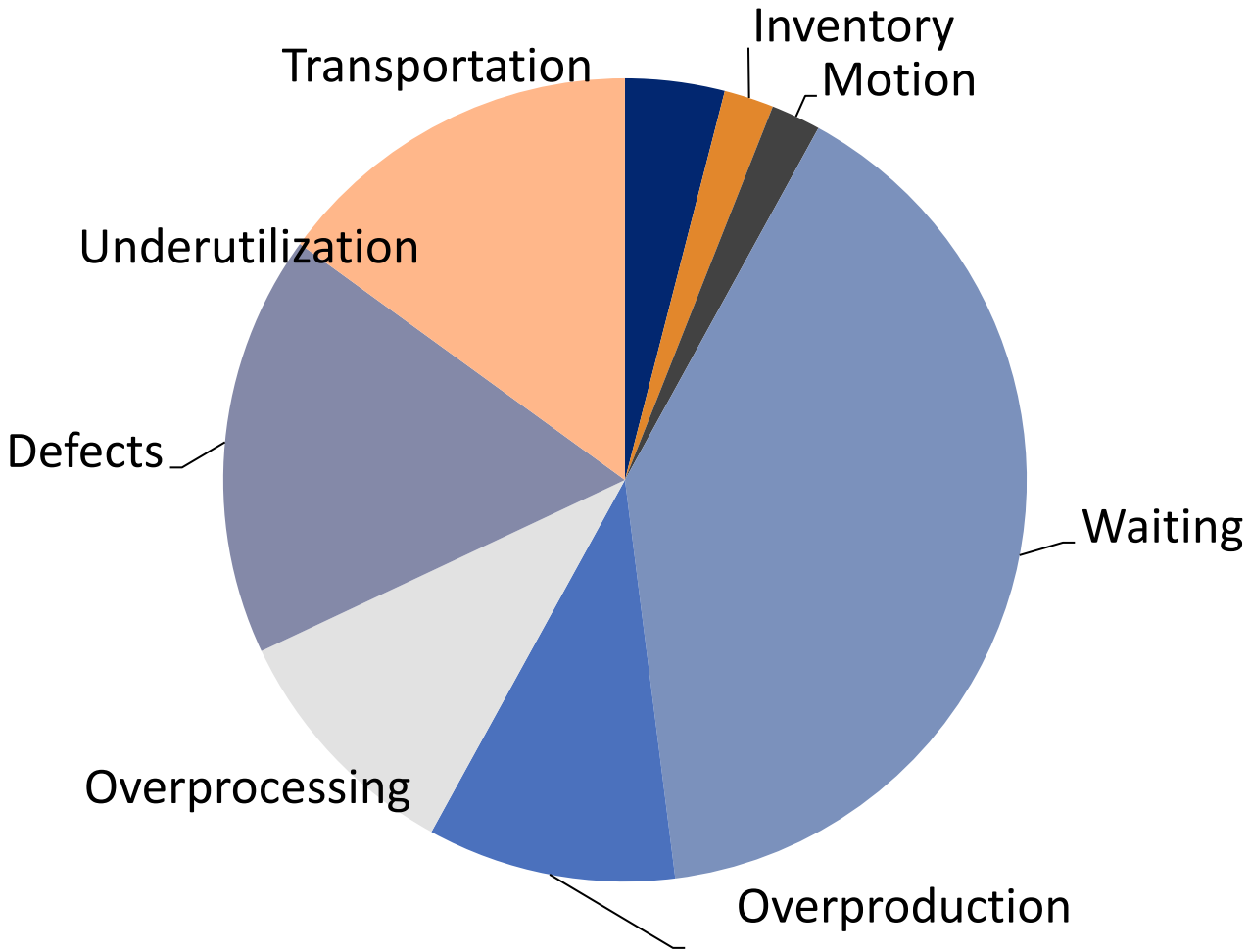
Fast is Better Than Slow

- Eliminate Waste
- Flow and Pull
- Visual management
- Late Start

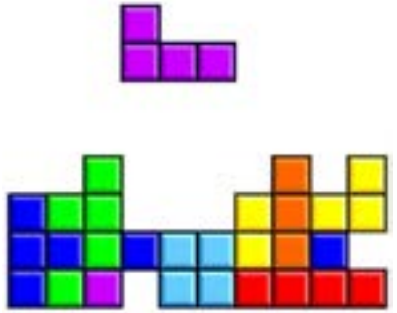
Waste

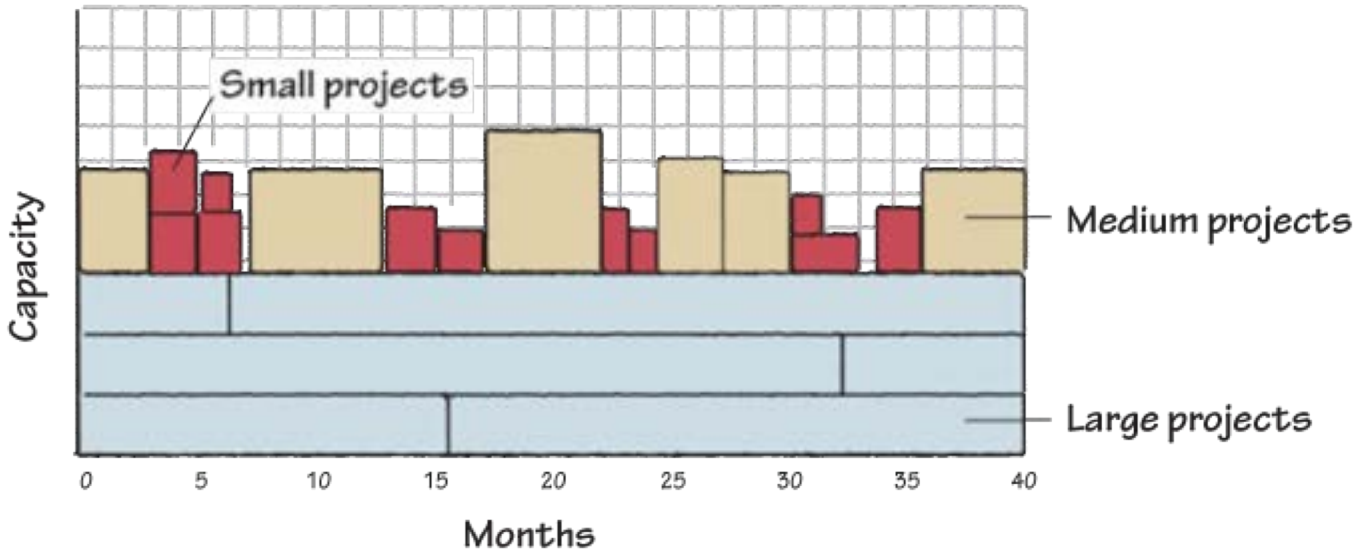

Underutiliza tion
Transportation
Defects
Inventory
Overprocessing
Motion
Overproduc tion
Waiting

Waste

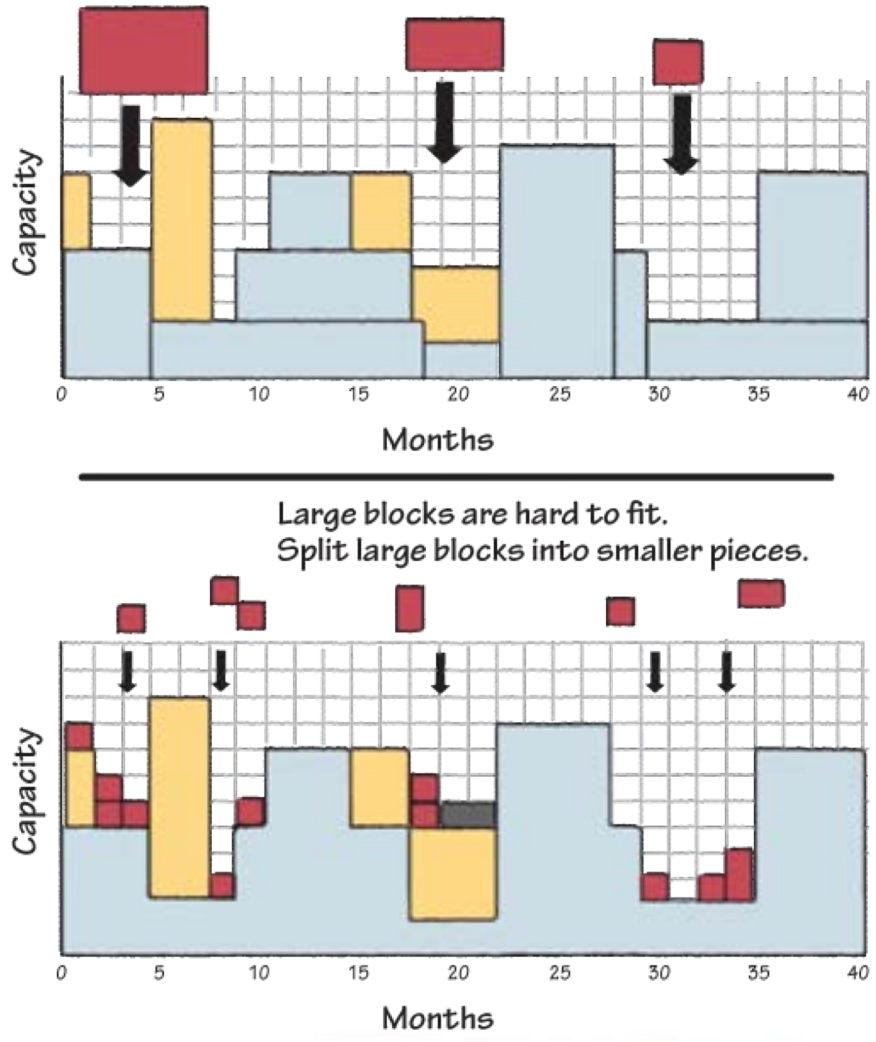

Transportation
Inventory
Motion
Underutilization
Defects
Waiting
Overprocessing
Overproduction

Tetris Principle

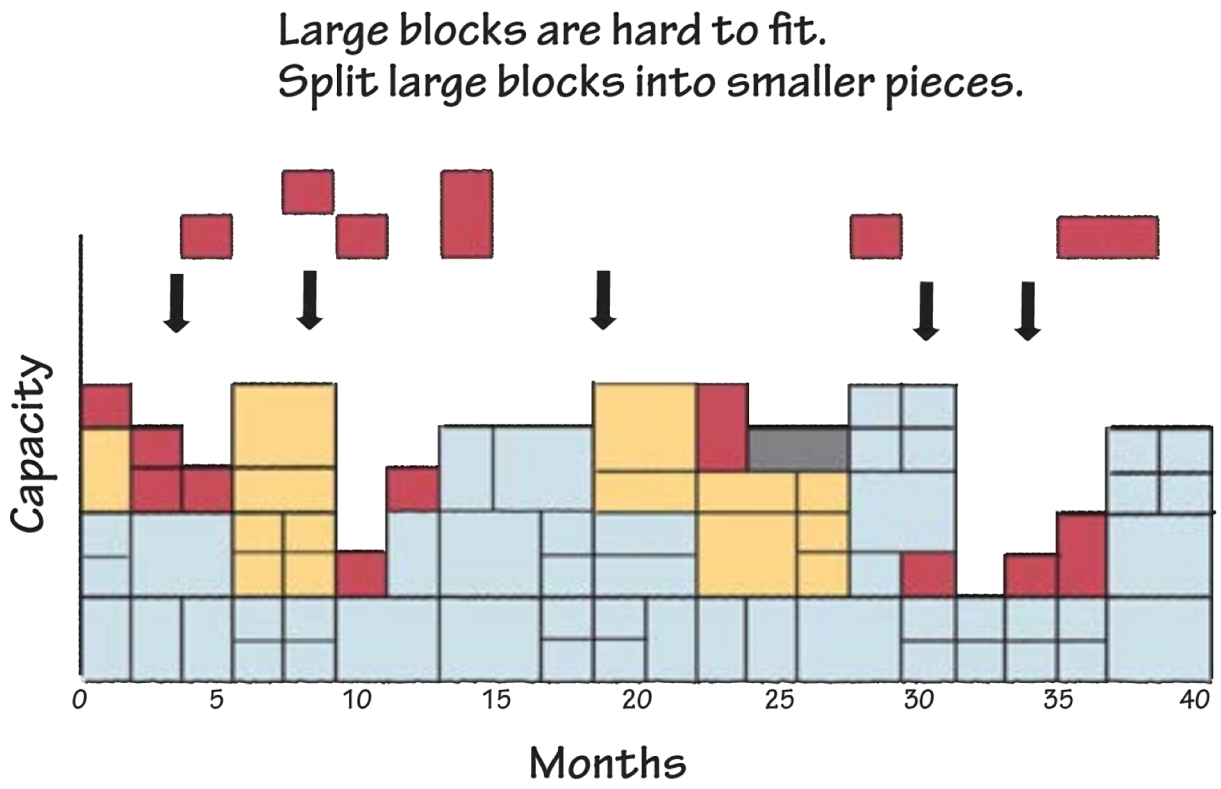




Tetris Principle



Tetris Principle



Short Cycles

- **Are easier to schedule**
- **Allow better risk management**
- **Create knowledge faster**
- **Create agility**

Managing Projects in Small Pieces

Much easier to schedule

Manage risk in small pieces – allocate money in small chunks

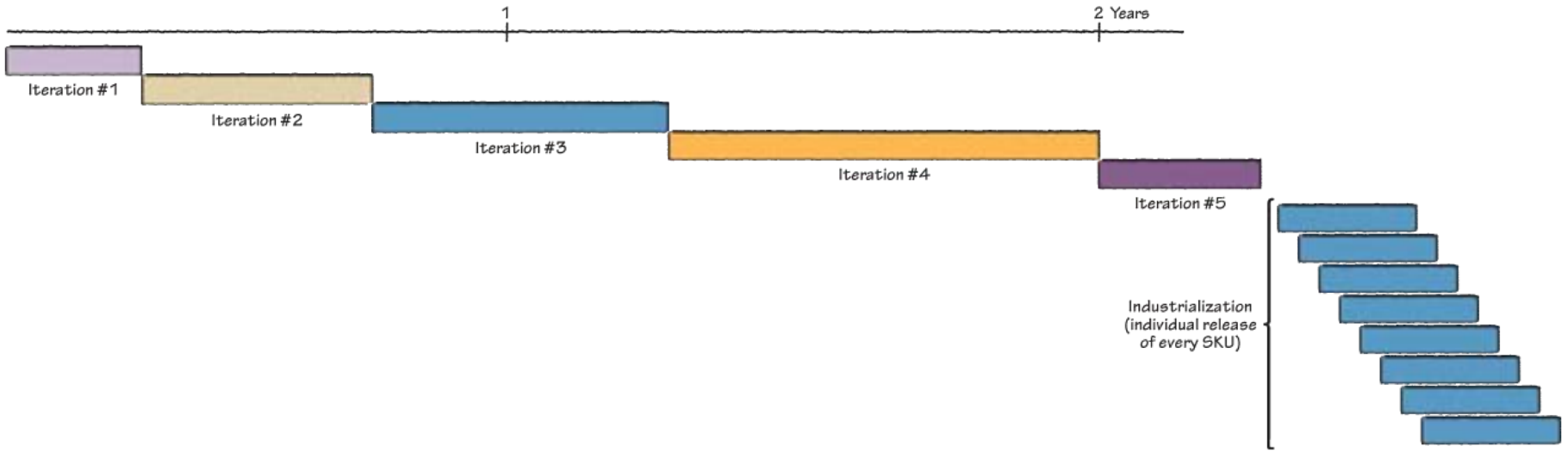
Creates agility – decision after every small step

Addresses problems faster

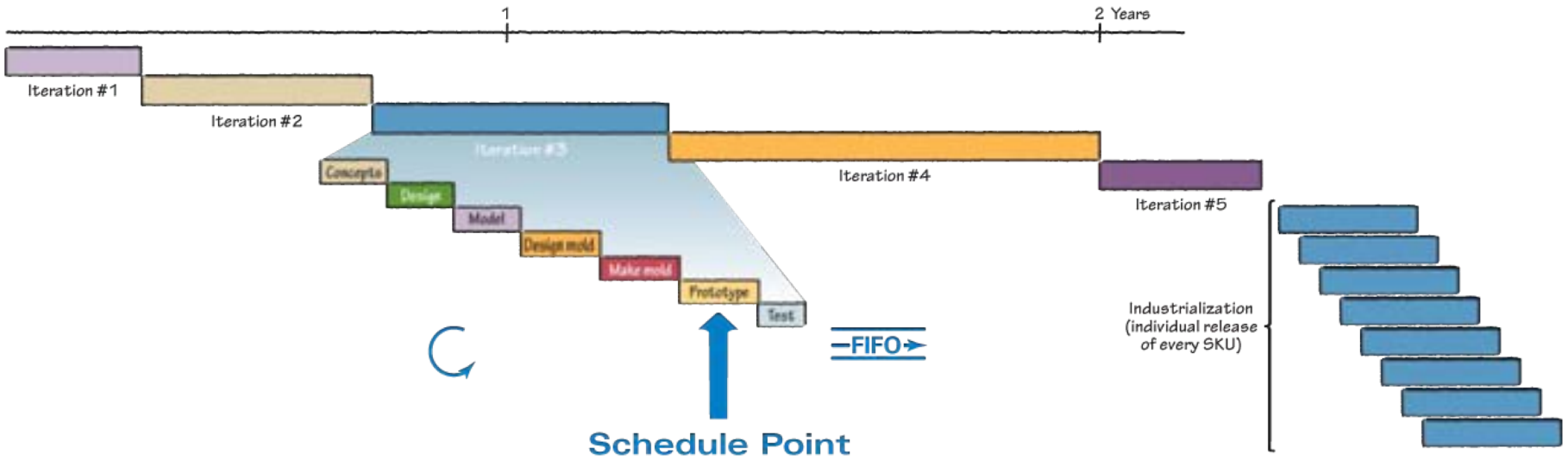
Faster learning

BUT must maintain focus – hoshin kanri helps

Goodyear Iterations



Goodyear Iterations



Visual Planning

10 Second Rule

Visual Management

Show deviation from standard – 10 sec rule

QUICKLY activate **standard problem-solving process**

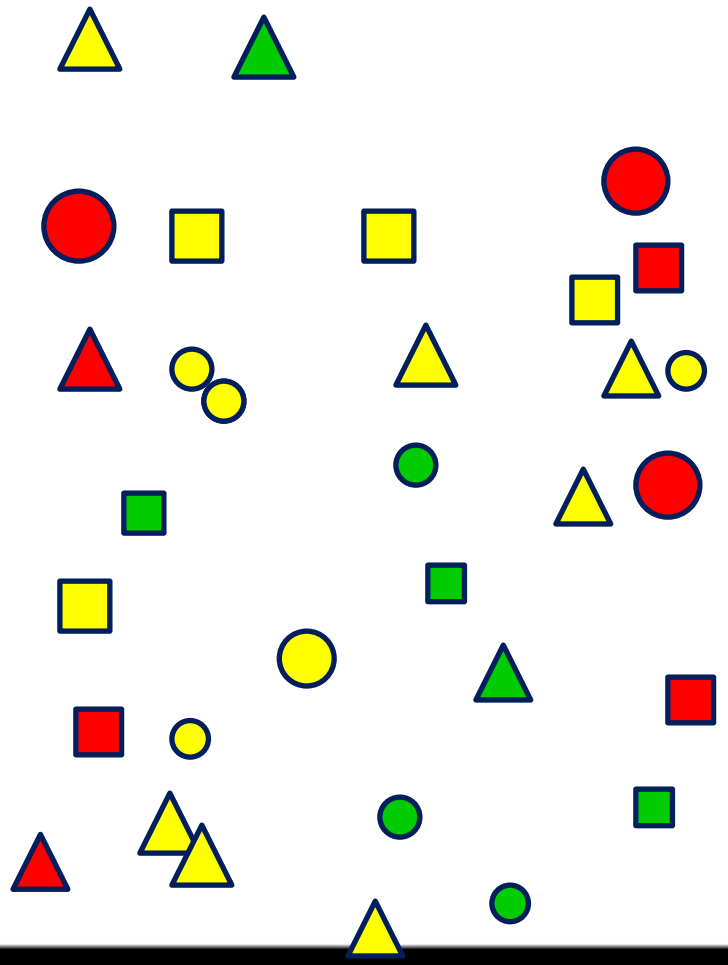
- One time deviation
- Systemic problem

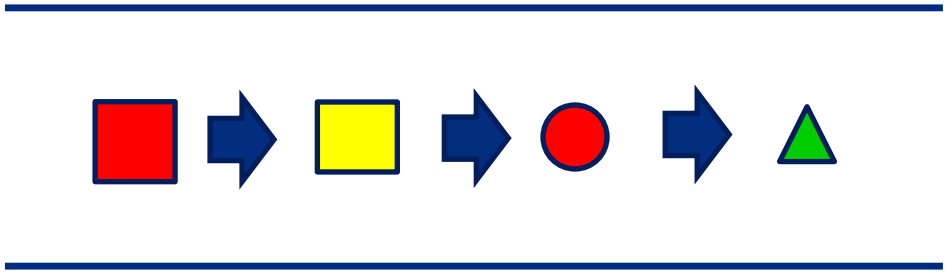
Verify solution

Make new standard

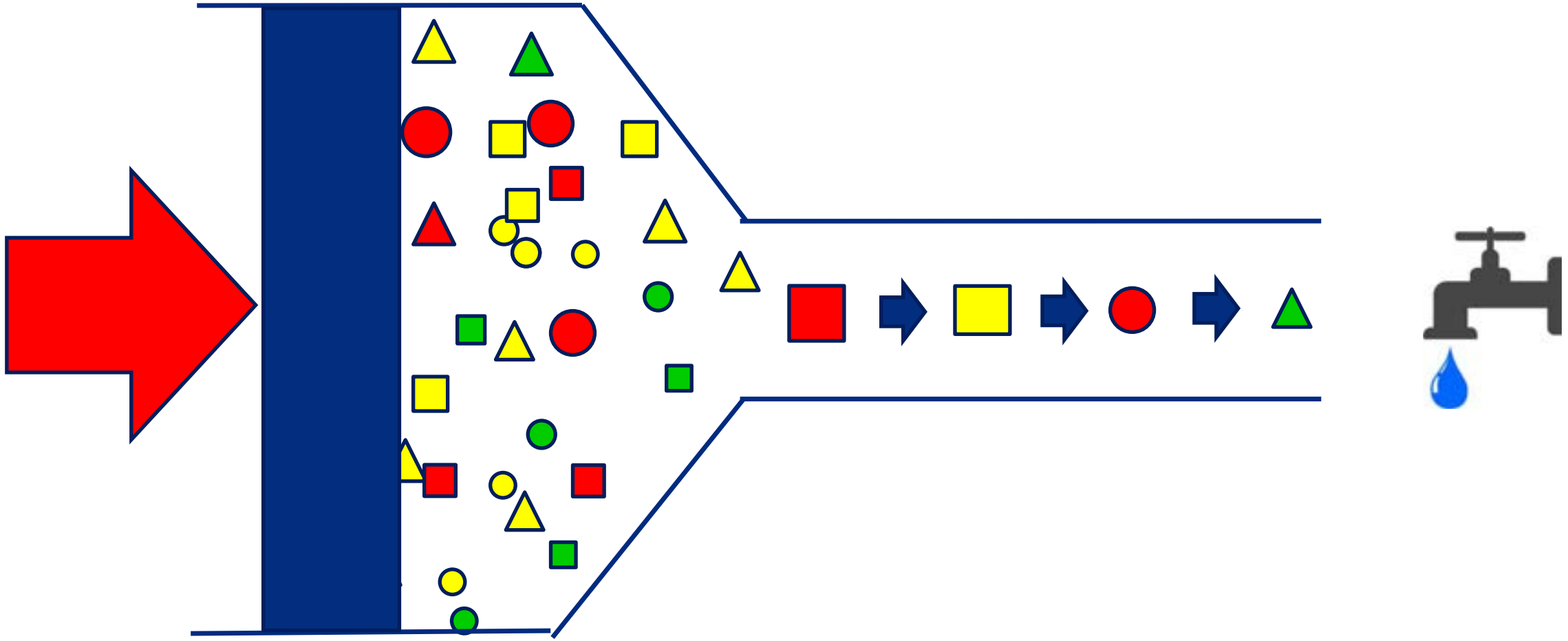
"The primary role of managers must shift from firefighting to designing, aligning and improving systems."

Schedule For Flow





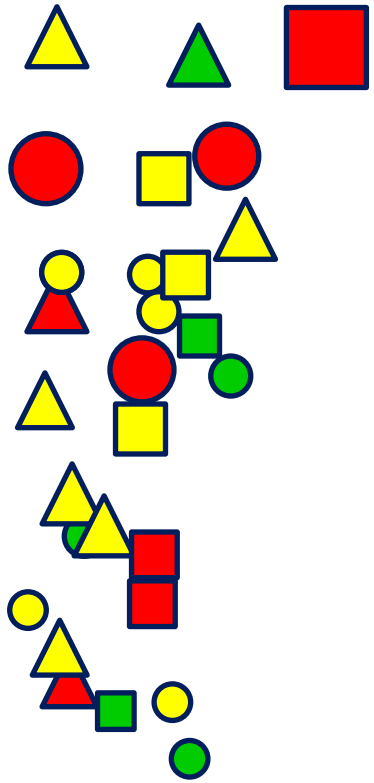
Hydraulic Principle

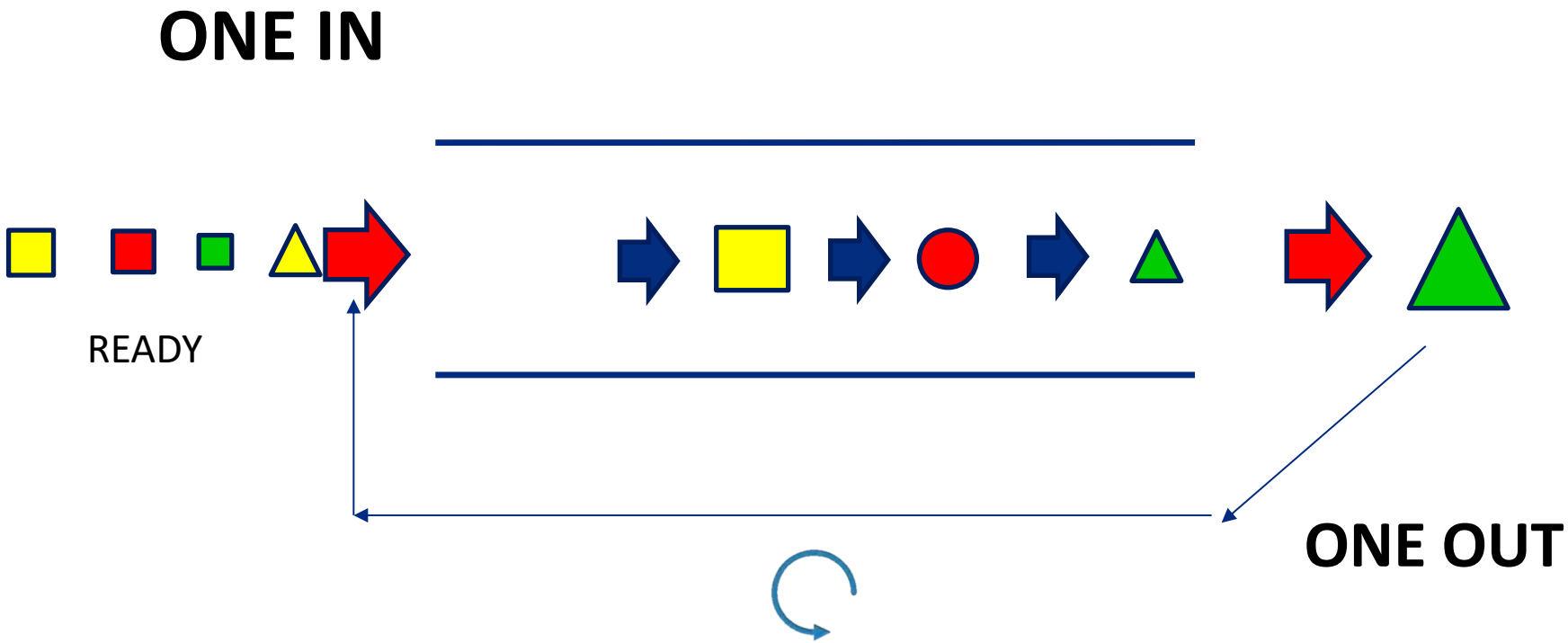


One In – One Out

Pull

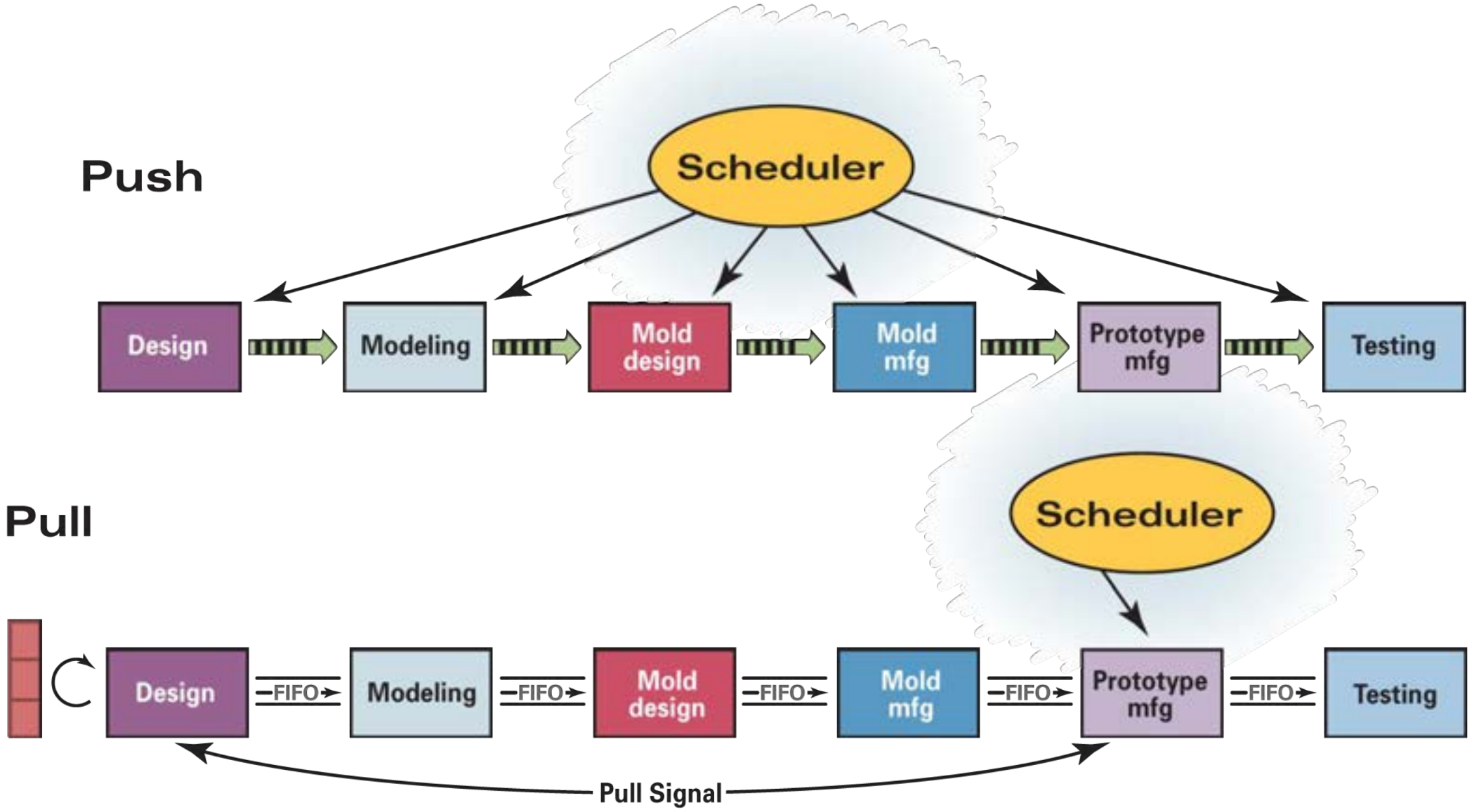
Virtual
Queue

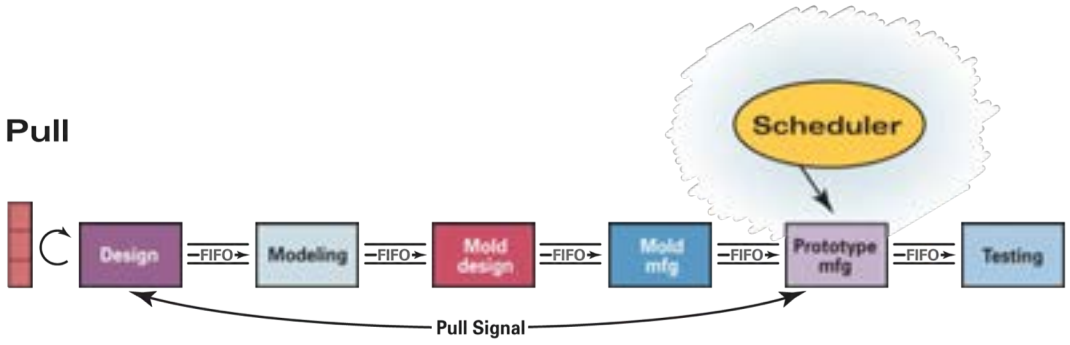


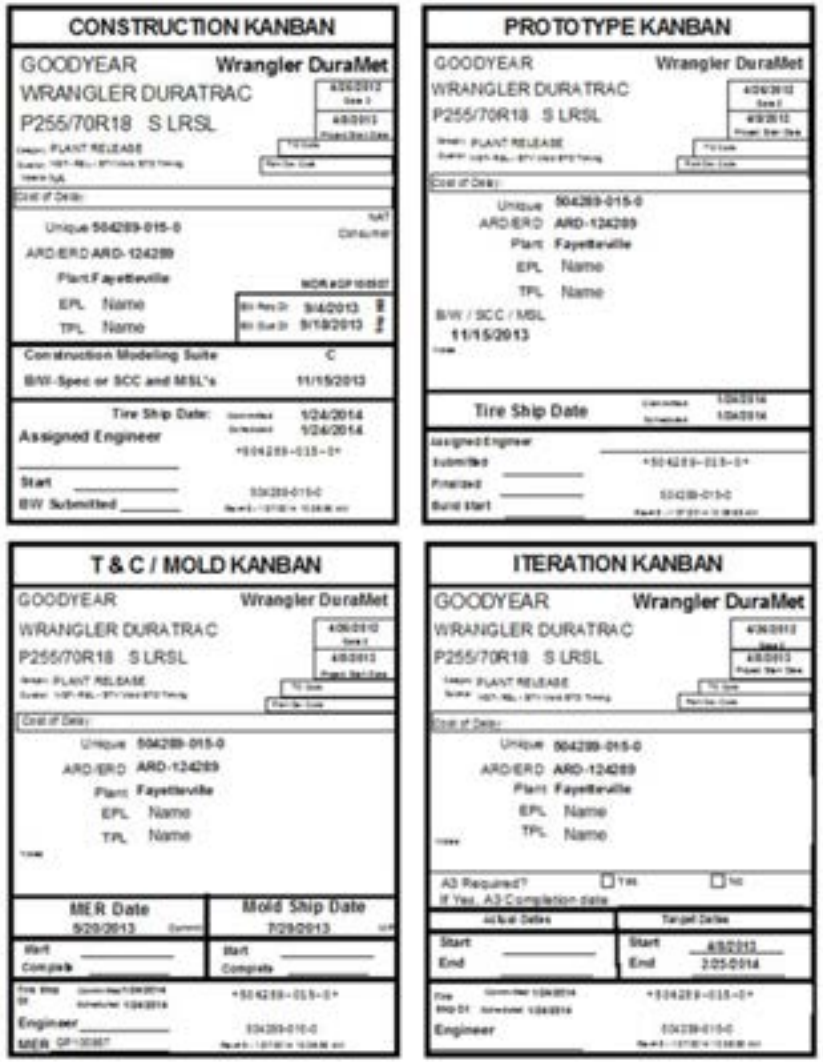


Visual Planning

They can have ANYTHING but not EVERYTHING


Push
Scheduler
Design
Modeling
Mold design
Mold mfg
Prototype mfg
Testing
Pull
Scheduler
Design
FIFO
Modeling
FIFO
Mold design
FIFO
Mold mfg
FIFO
Prototype mfg
FIFO
Testing
Pull Signal





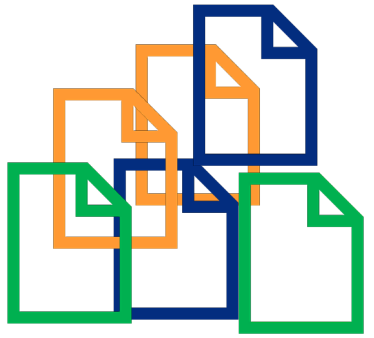
Self adjusting/aligning

Limits inventory / work in progress

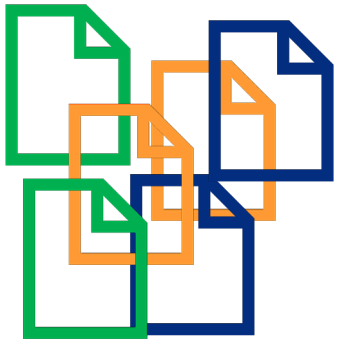
Tom's Hijunka Box

Engineer	Project 1	Project 2	Project 3
Amanda			
Jim			
Karl			
Susan			

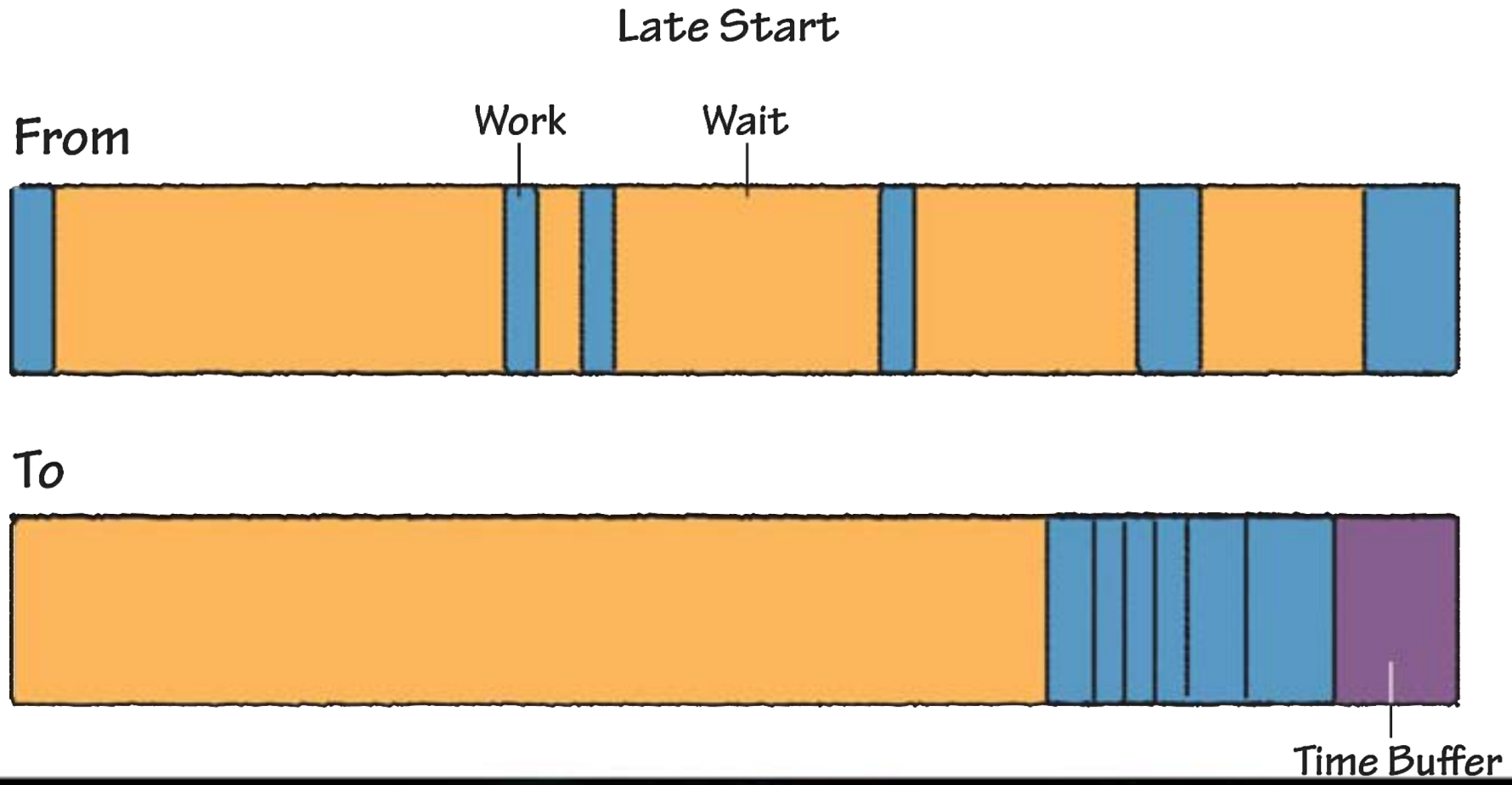
WAITING



PARKED



Late Start



Late Start

Every iteration is started as late as possible but with enough time to finish, including a small buffer to account for variability

Dealing with perishable information

Manage changes

Lock in designs as late

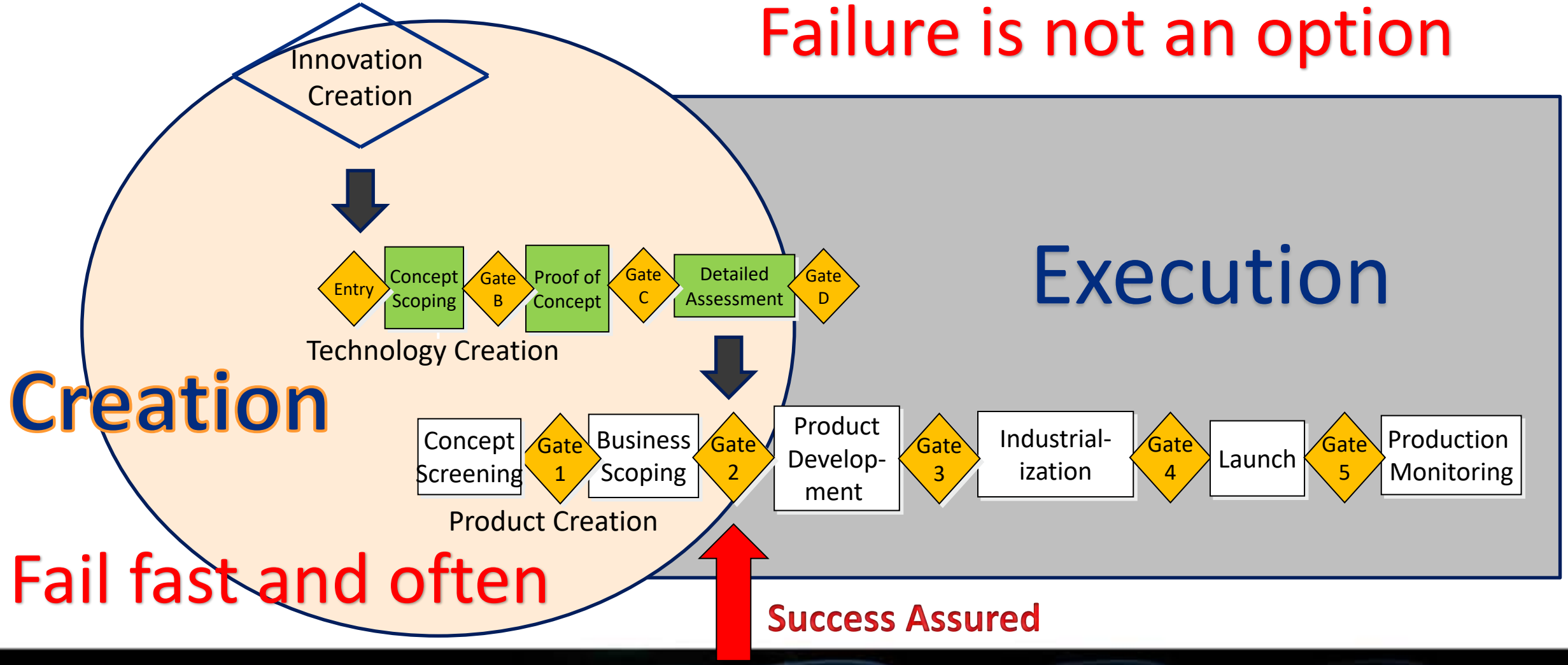
Dealin

V

La technology and opportunities

A few years ago a major customer changed the tire size of on important new vehicle!
Goodyear had not started the program
The Goodyear account manager noted that we saved $1/4 MM over our traditional development process, which was based on ordering hardware and building prototypes the day we found out about the program

Can Innovation Have a Process?

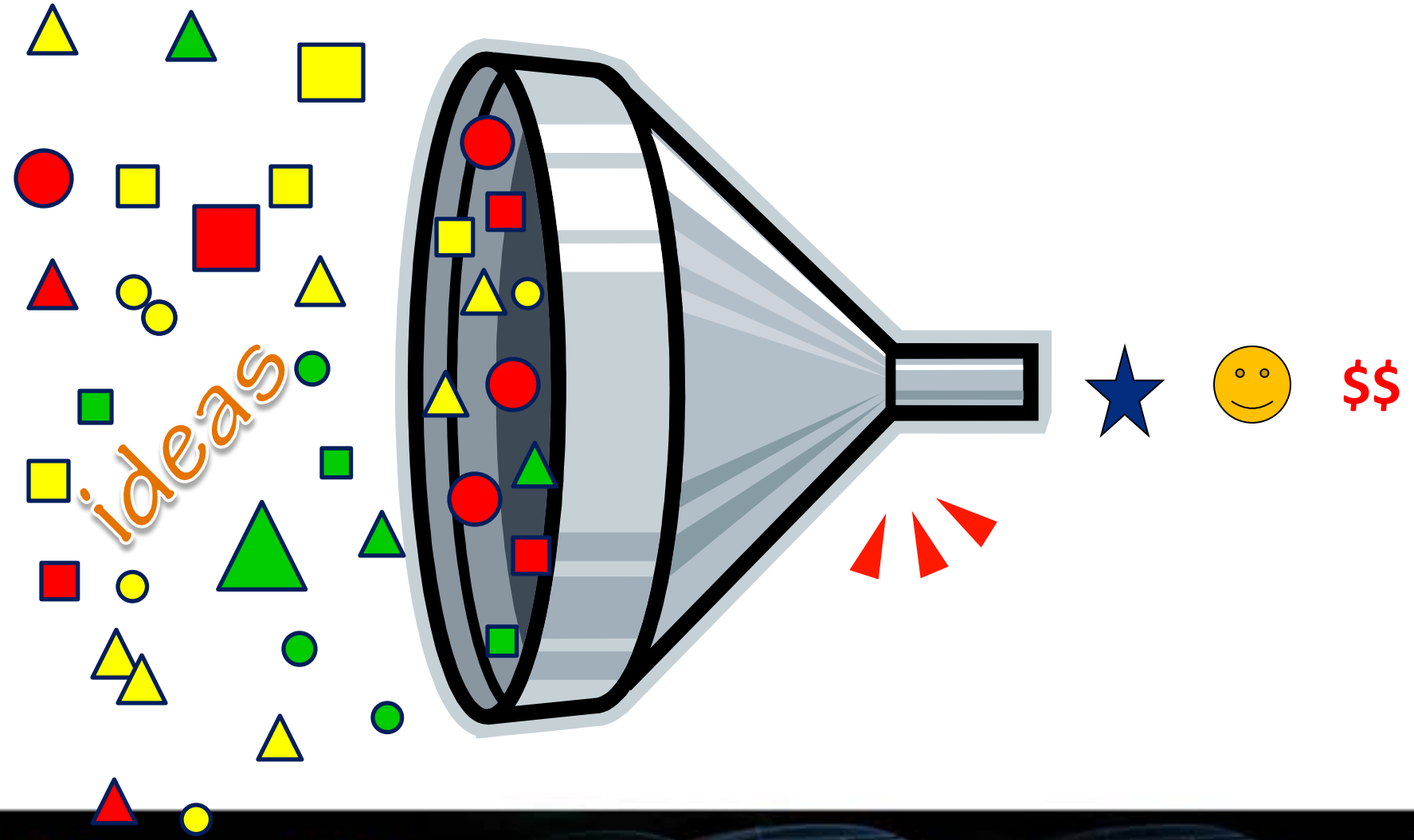


My Dream Process

H&M

The more you try,
the luckier you get

Generating Ideas



“Reality”

Goodyear Innovation Department – 80’s:

The Reversed Funnel

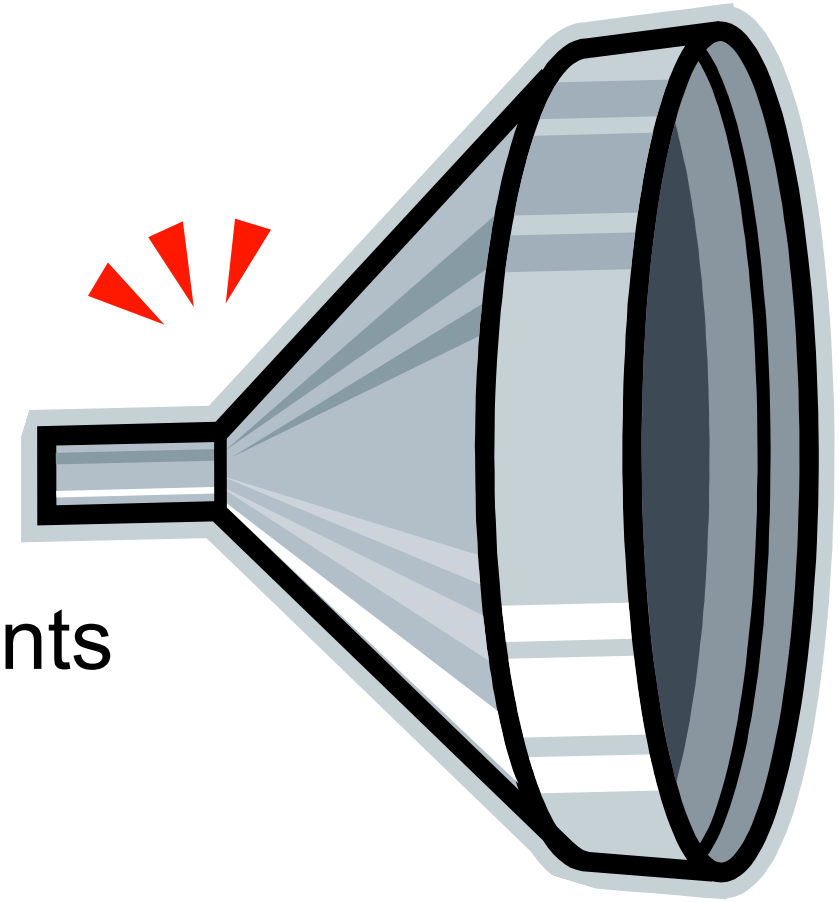
CUSTOMER

Market Back

Observe

Listen

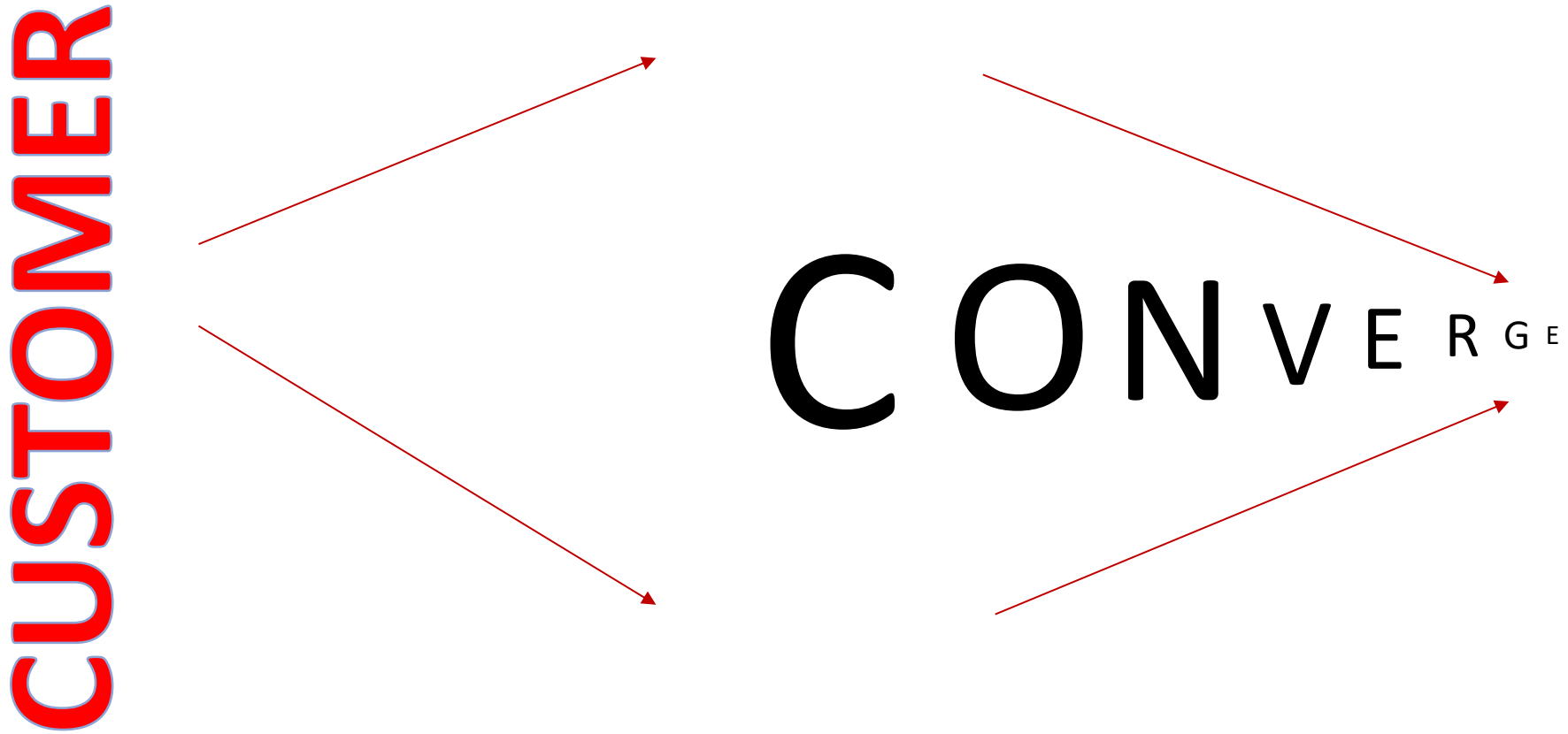
FIND pain points



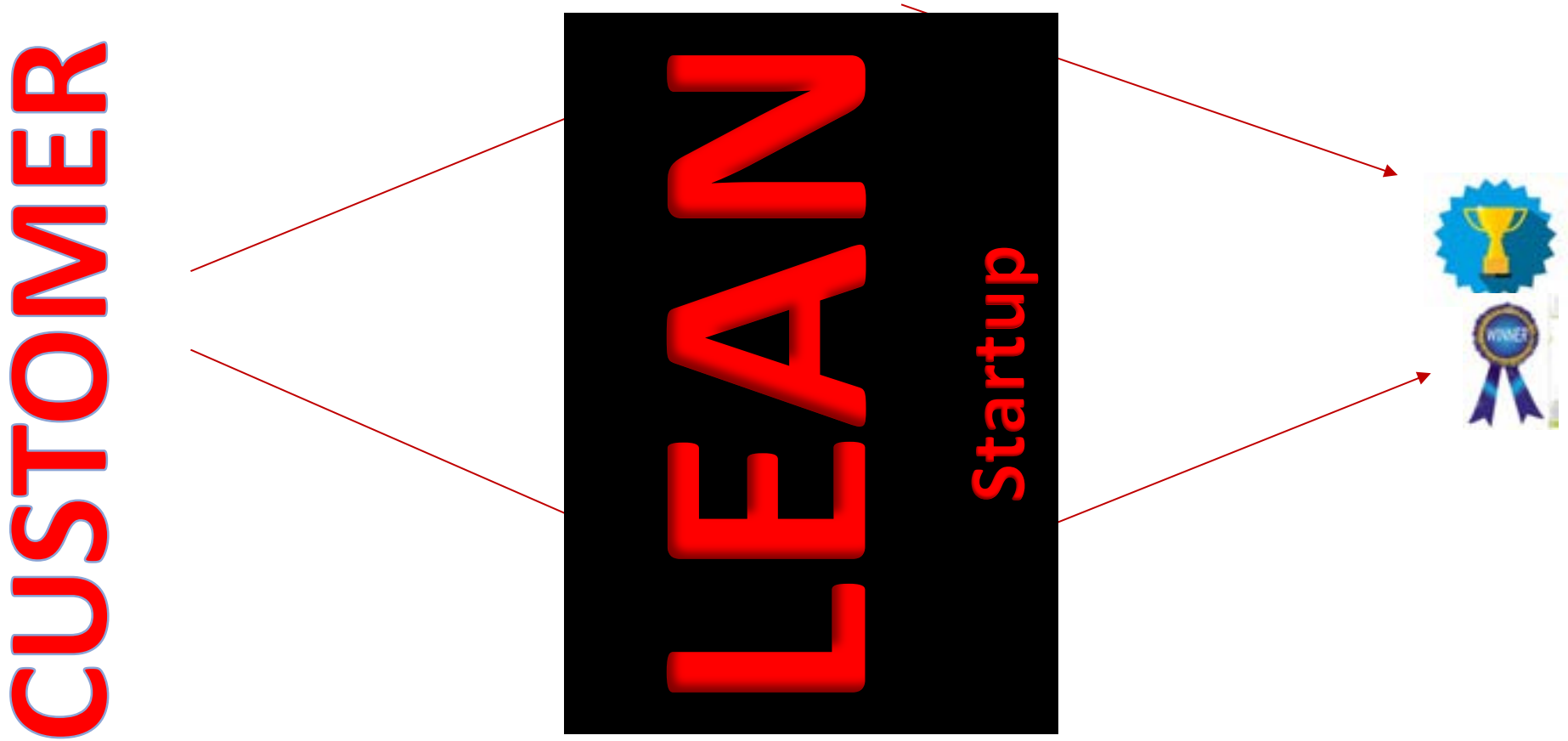
CUSTOMER

DIVERGE

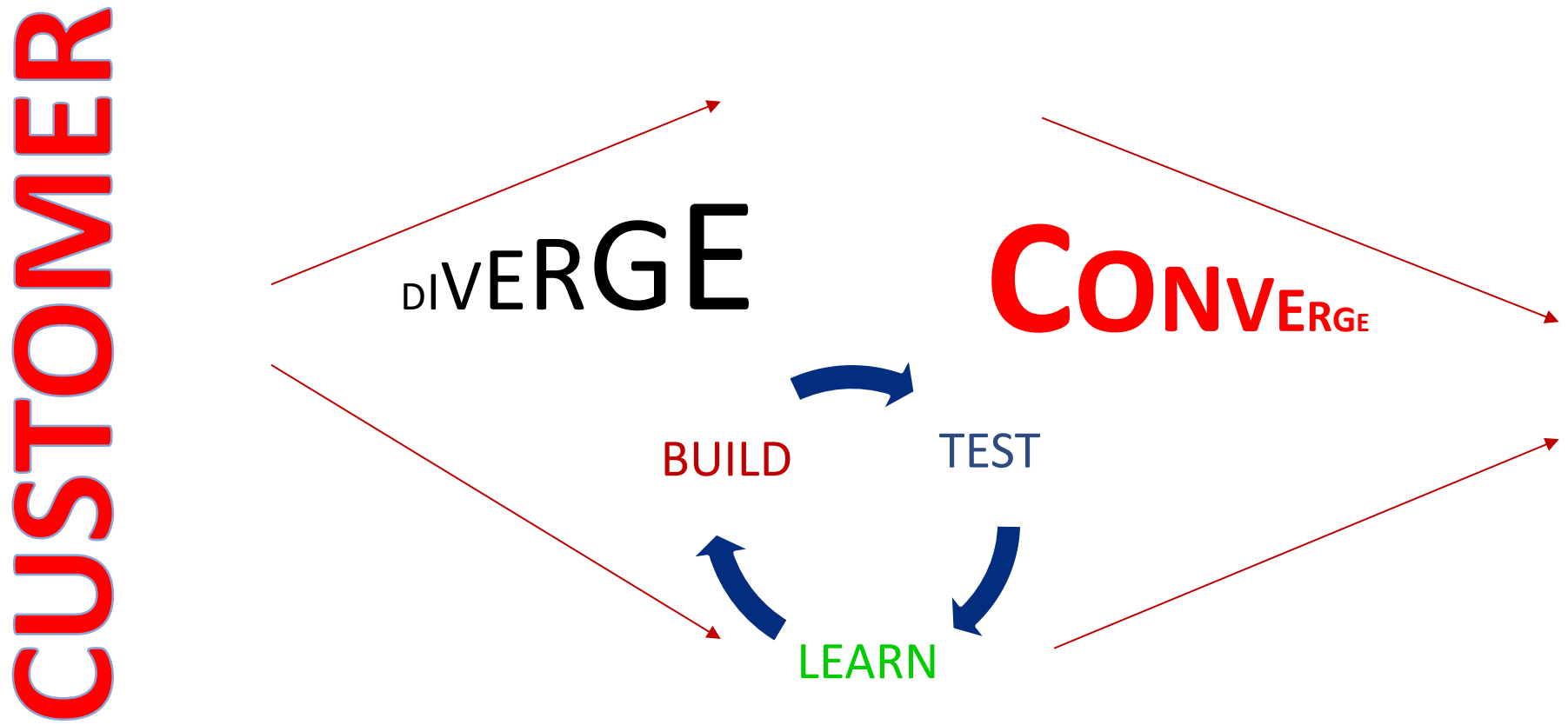
Sorting Out Ideas



Lean Innovation



Innovation Cycle

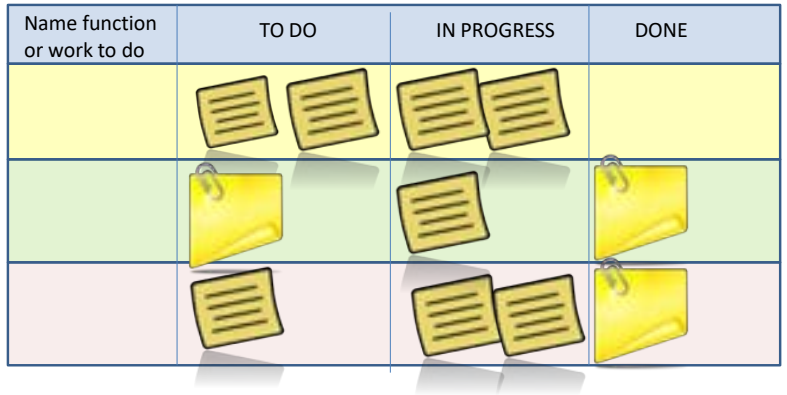


Fail Fast and Often

Quick Learning Cycles – SCRUM, sprints, agile …

Time Period

Goal, deliverable ….



Work in very small steps, FAST – often time limited steps

Cross functionally from the beginning

Retain flexibility through the process – launch or pivot at any time

Use technology/world as our lab

And

- In the right order
- With the minimum effort

What are the knowledge gaps?

CRITICAL QUESTIONS

Can we sell it?

Can we make it?

Is new technology needed?

Will we get approval?

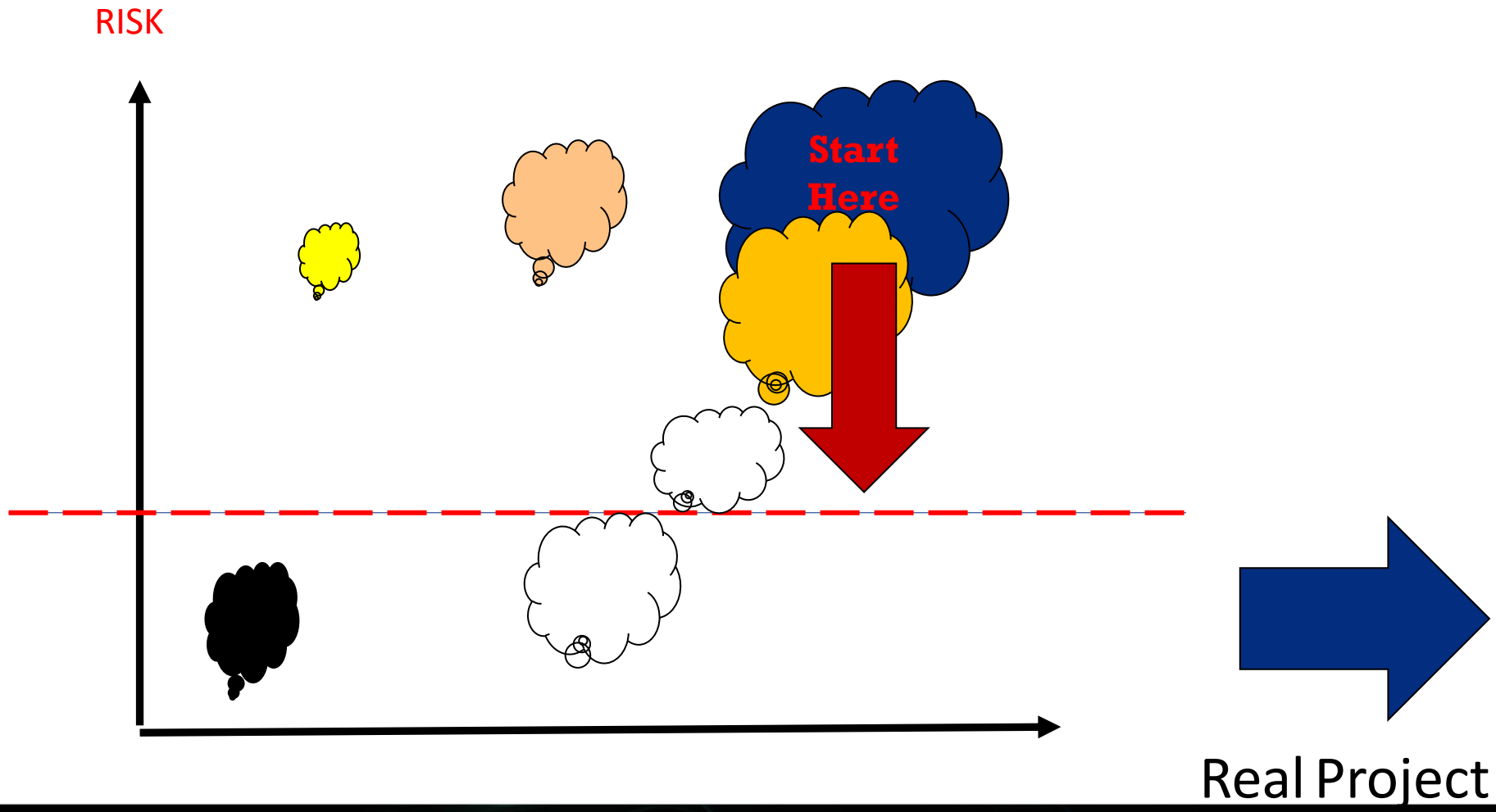
Is it legal?

Do we have the talent?

Can we buy the technology?

Etc ……

De-Risking an Idea



Lean Experimentation

Maximum Learning
With Minimum Effort

MVP - Hospital

Goodyear Example : Willingness to pay for a recycled tire

Assumption: Consumers will pay a premium for a green tire (New Earth tire)

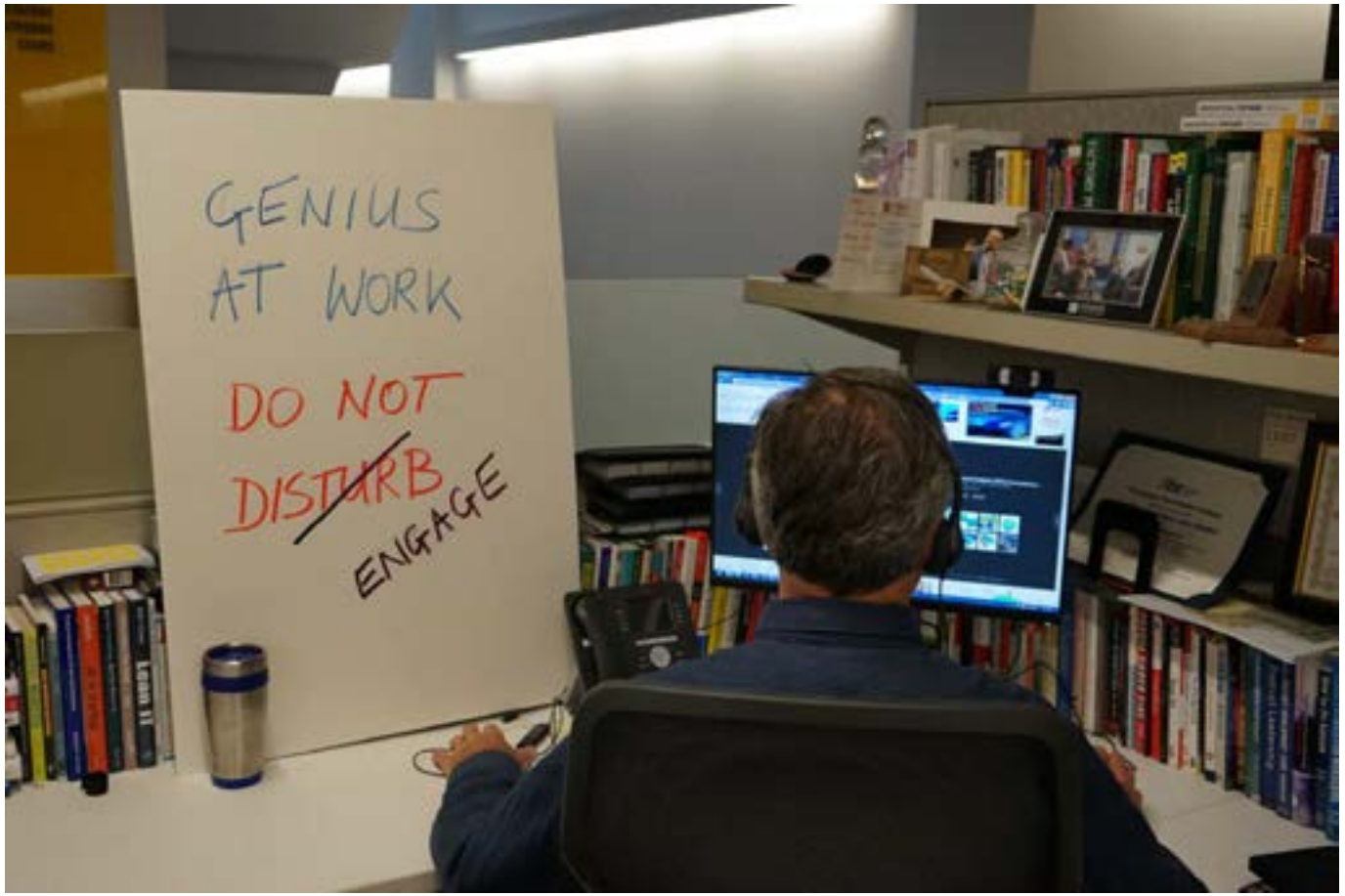
Design: Project team dressed/trained as in-store sales associates, pitching consumers the new concept (Wizard of Oz)

Results:

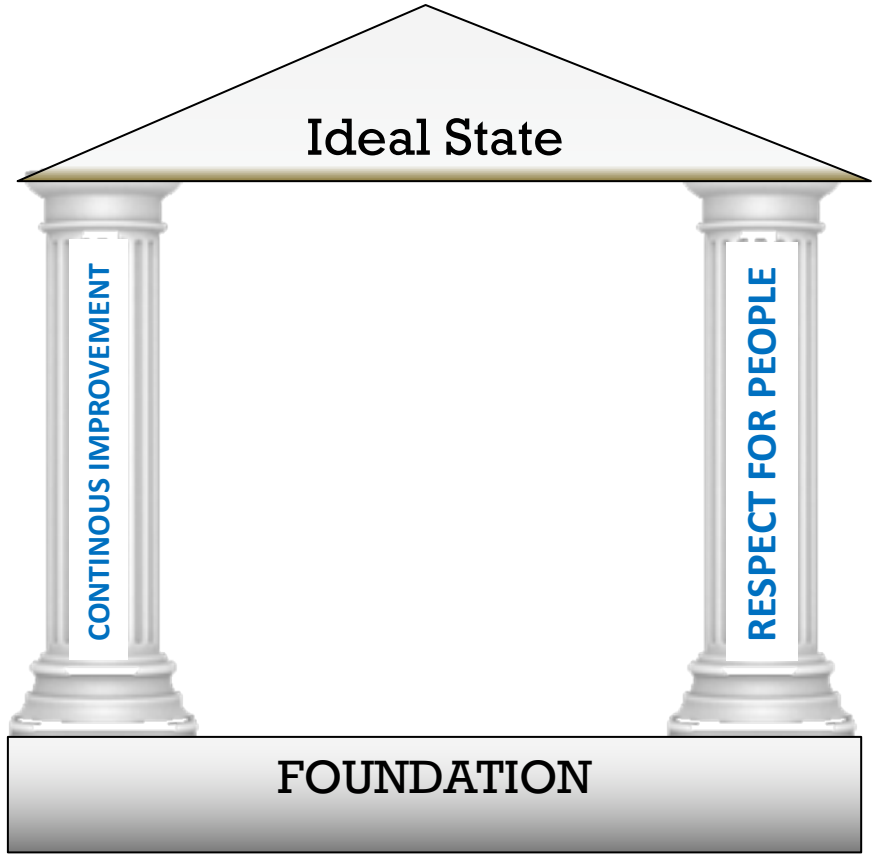
- Consumers expected a discount (they saw recycling as a savings opportunity for Goodyear)
- Consumers would not compromise on any traditional performance attributes to get recycling as an additional feature

Conclusion: Project cancelled

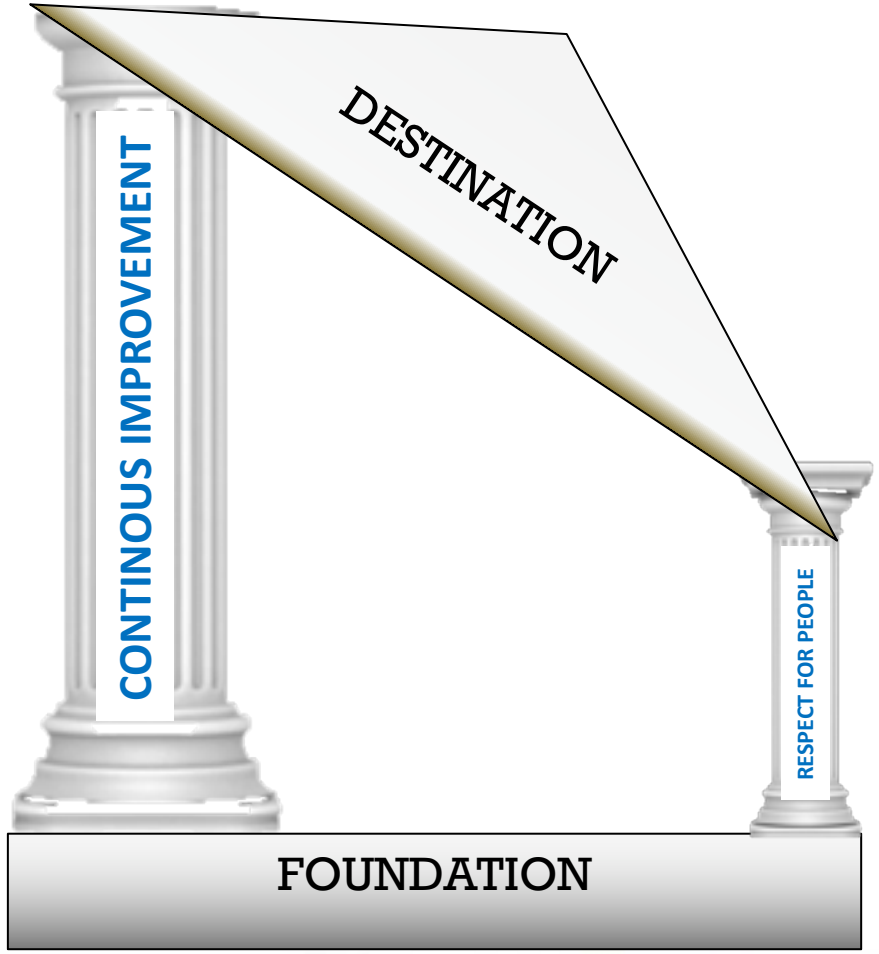
Managing People in a Lean Innovation Process



(my) Desired State



Current State



Average of 70% of people are not engaged*

*Jerry Solomon - Lean Frontiers

Managing People

Engagement

Empowerment – Andon Cord

Respect for people

Upside Down Leadership

Who is the best positioned to make recommendations about changing the work people do?

It is easier to teach the process experts the lean principles than it is to teach an outsider the process and the culture

Empowerment

Who is the best positioned to make SUGGESTIONS (for decisions)

Who are the technical experts?

Leaders have the right to know – not to tell

Why escalate difficult technical decisions to the level of least competence?

Anita Friis Sommers – Lego – IRI 2018

Respect

People come to work to do a good job

If they cannot, look at process, training, qualification, equipment …

Help the people be successful (ALL)

People deserve a safe work environment

Remove waste from their work

Ask questions, do not give answers

Learn to manage the round peg in the square hole – (google)

Hard on the Process, Easy on the People

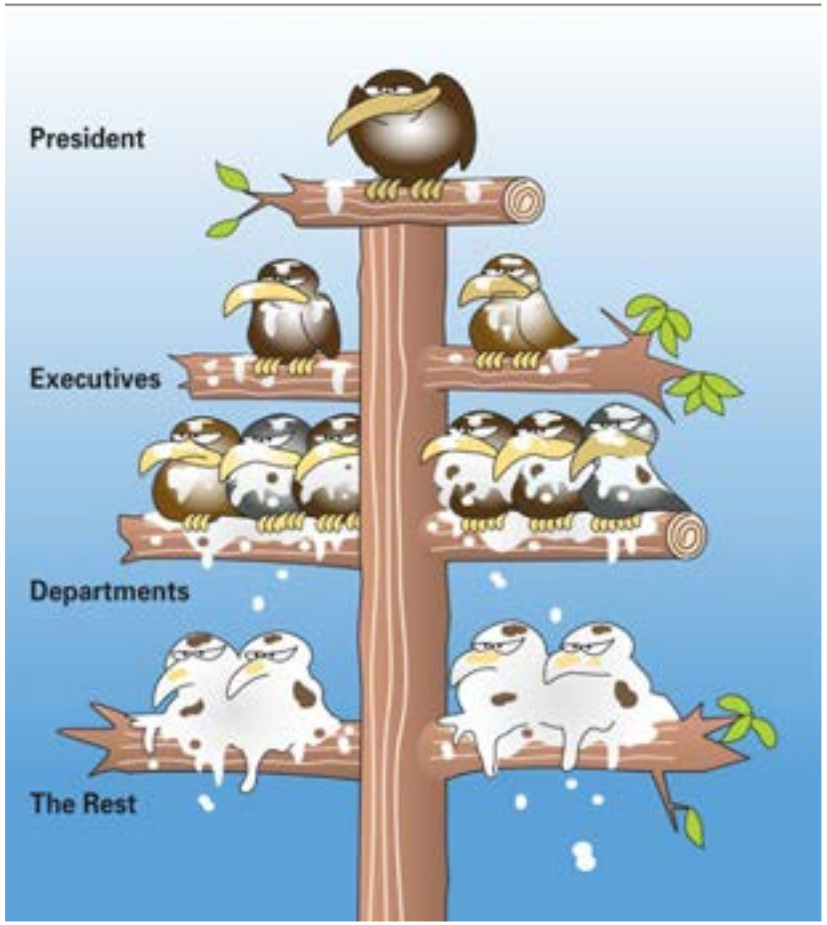
Upside Down Leadership

Billy Taylor, Director
NAT Manufacturing

Ellis Jones, Plant
Manager Akron

Best NASCAR tire builders in the world

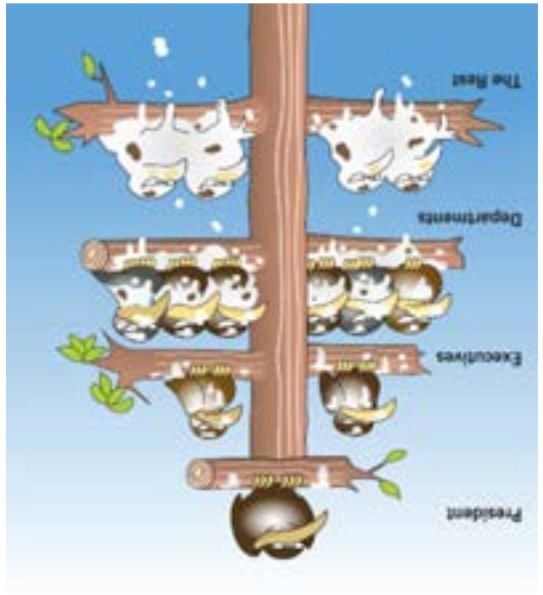
Leadership

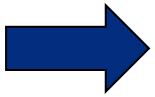


When bottom level guys [illegible]

*Inspired by unattributed graph

Lean Leadership





Role of the Leader/Sponsor

Leader has the right to know – not to tell

Go see (facts over data)

Engage associates, coach, sponsor ….

Insist on root cause, PDCA ..

Hold people accountable

Speak “native” language to help people be successful

Lead without using authority

Jean-Claude Kihn
Goodyear CTO and President

Summary

Lean works extremely well in an R&D/Innovation environment

Some of the basics:

- The right organization
- Focus on the shadows

There are 2 processes:

- Execution is like manufacturing
- Creative front end is like fashion industry

People must be respected and engaged

Thanks

If everything seems under control, you're just not going fast enough.

-- Mario Andretti

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