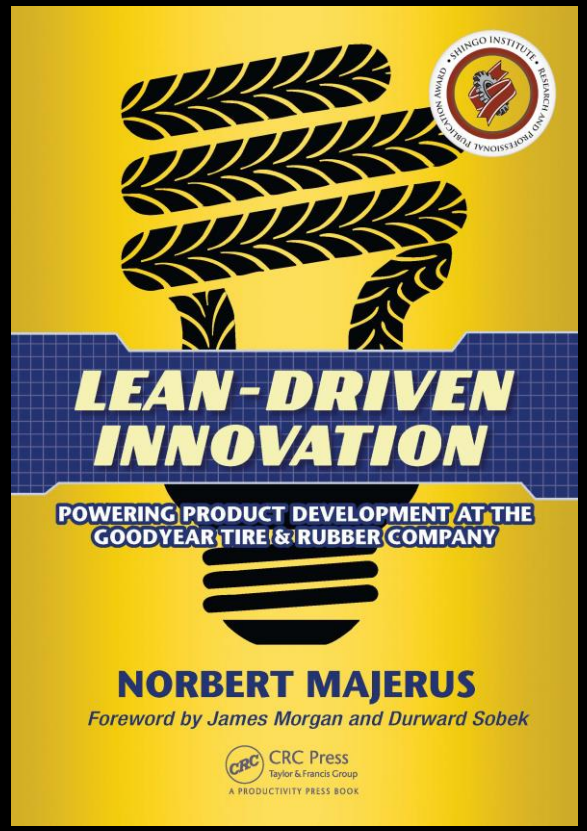


A Leader's Guide to Lean Innovation

Norbert Majerus
norbert majerus consulting llc

Why Lean?

GOODYEAR

2005

- Safety/quality were good (must continue trend)
- Late on almost all launches
- Less than 50% of the new products were profitable
- Low engagement scores and people quit for lack of work
- “We could help you improve your process if you had one”

Goodyear Lean Innovation

- Safety, quality – all time high
- 1,500, 95%, 100%
- 75%
- 3x
- Better engagement

2016 Recipient of the AME OpEx Award

My Experience With Lean Innovation

- Not as popular as lean manufacturing – 50%
- Low success rate in R&D/innovation 15% ???
- Benefits can be higher in R&D than manufacturing/services (if done right)

Innovation Facts

- Innovation surveys consistently show that 95% of company leaders want more innovation
- But few put the cultural enablers in place for innovation to happen
- Product and service innovation are (still) among the best strategies to leverage know-how for revenue
- Very few companies venture into the high risk/high benefit space

Most Common (cited) Issues with Lean Innovation

- Leadership Support
- Too much work
- Late on everything
- Too much firefighting/panics

Most Common *REAL* Problems with Innovation

- No time to do the right things
- Poor processes
- Lack of education (leadership)
- False starts – early stops – no patience
- Poor people engagement
- Missed opportunities (for revenue)
- It is not that easy

Agenda

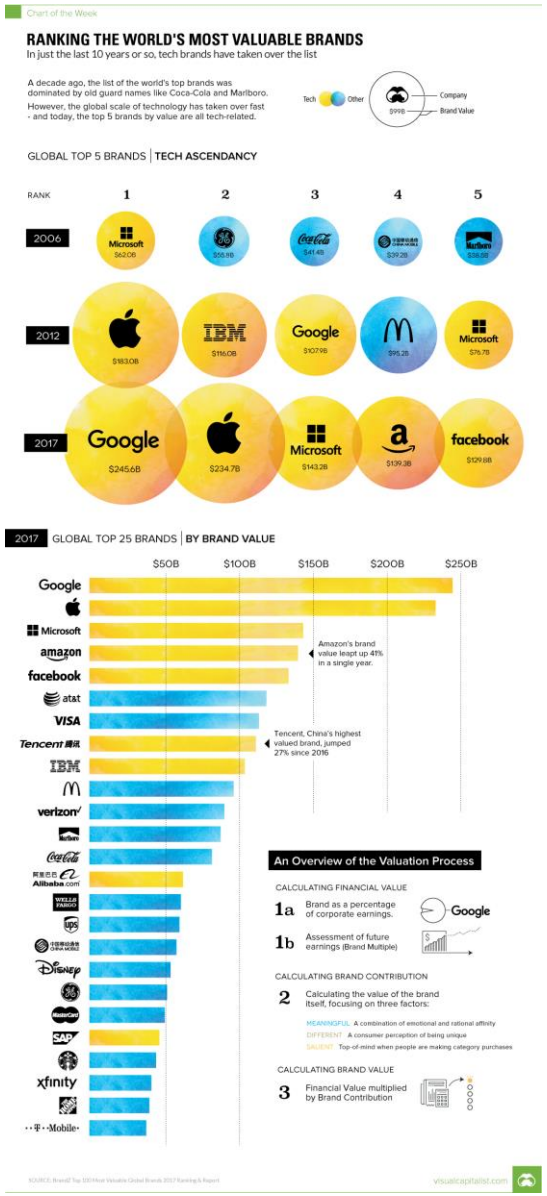
- Understanding lean innovation
- Preparing the organization
- The Process
- The People in the lean innovation organization
- The leader’s role in the transformation

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….

Average Company Age:

- In the 60ies – 70years
- Today?

Learning from the BEST

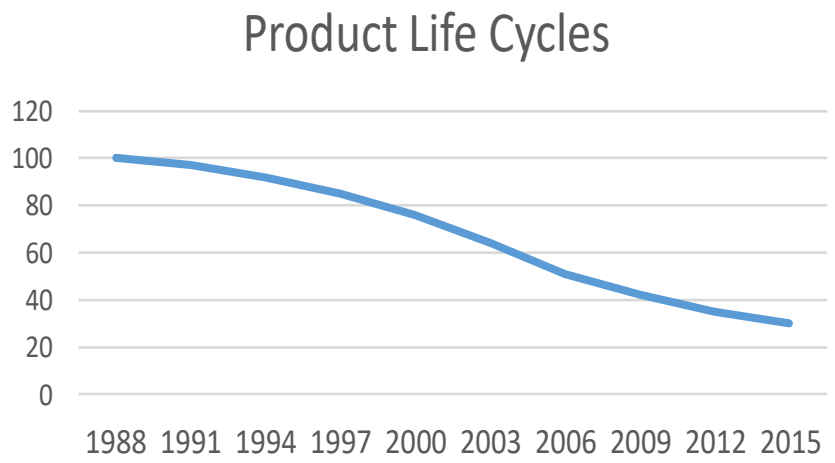
Innovation Grid

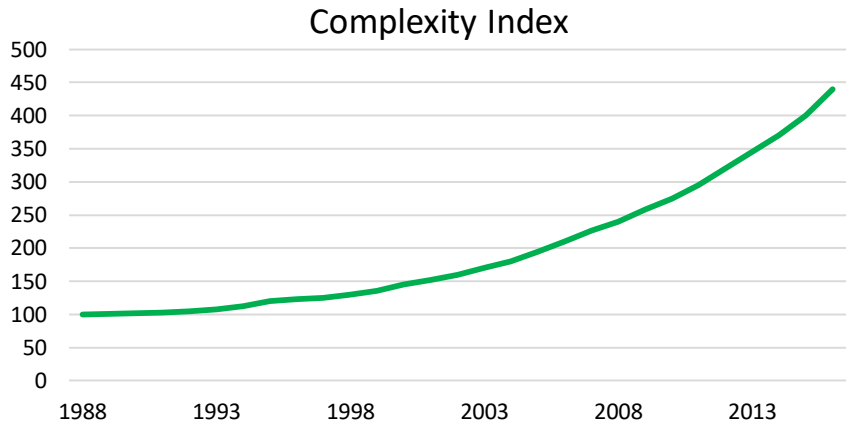
Project Uncertainty

Lean and Innovation Today

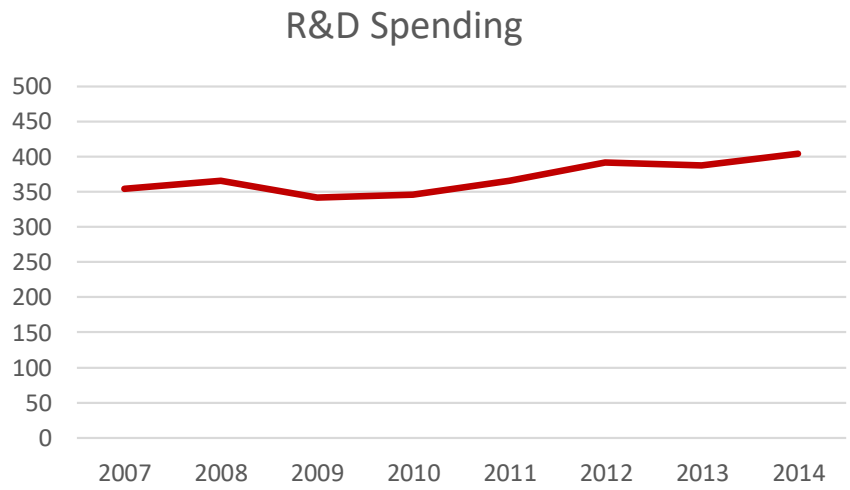
- GLOBAL Economy
- Economic growth is largely a function of:
  - Population Growth
  - Market Growth
    - **Productivity/Efficiency >>> Lean Manufacturing**
    - **Innovation >>> Lean Innovation**

2017 Global R&D





Learn to do More with Less



Goodyear data and estimates

What can be accomplished?

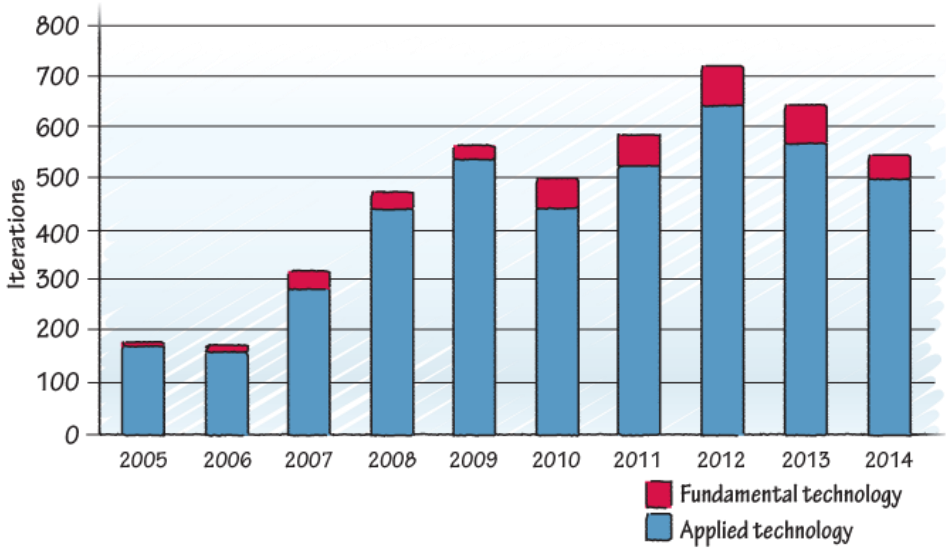
- Efficient front end process allowing more ideas to be considered
- Much better technology creation process
- Efficient product creation process
- Improved quality by design
- Much more engaged workforce

Agenda

- Understanding lean innovation
- **Preparing the organization**
- The Creation Process
- People – managing the lean innovator
- The leader's role in the transformation

Creating Capacity for Innovation

- Hard for companies – Innovation always first to go
- Government/Europe
- Best times for innovation in the US?
- How
  - Google, 3M, Lockheed Martin Skunkworks, Goodyear …
- Funding necessary but not sufficient



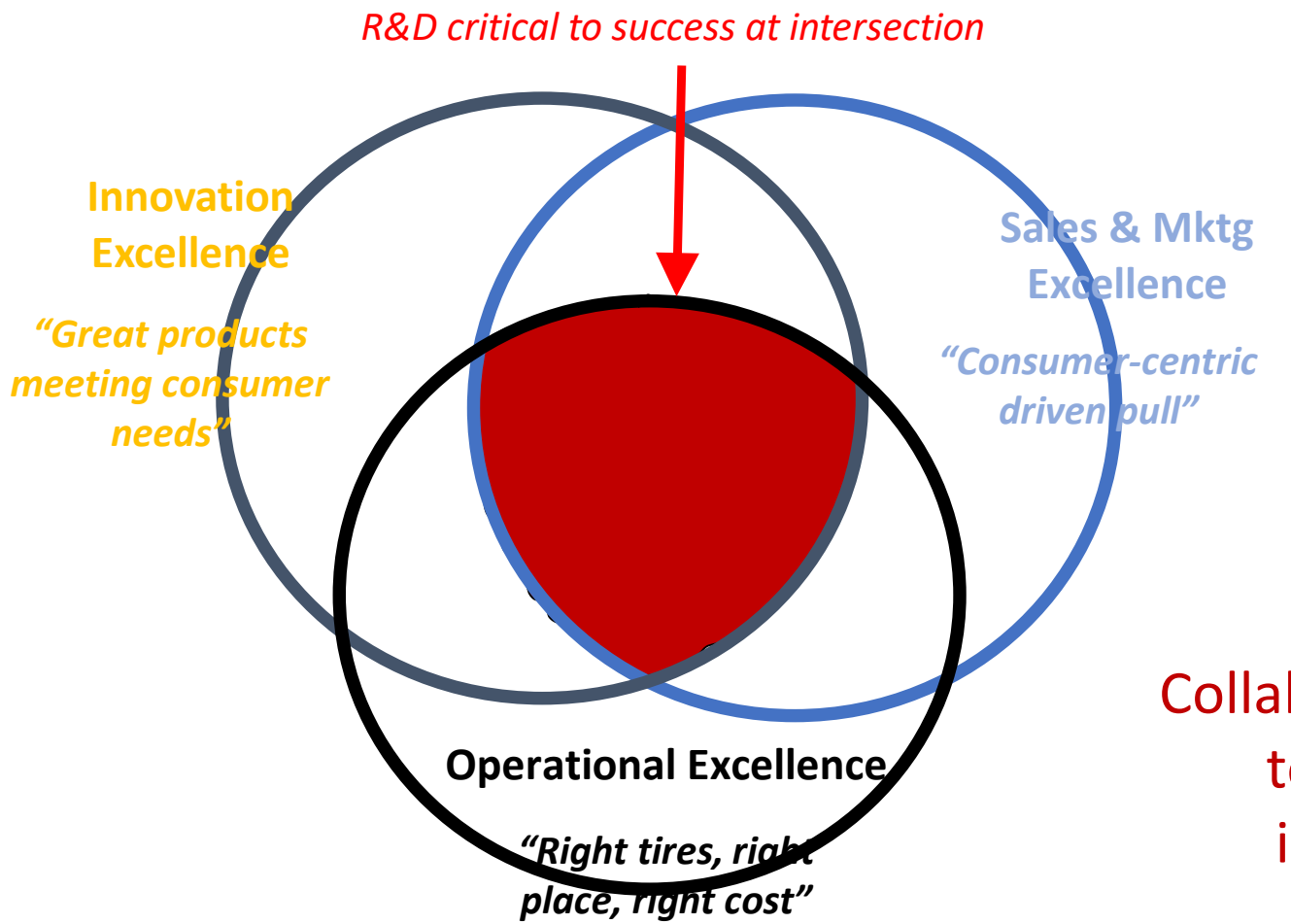
Best Innovation Primers

- Google – get it all from the outside
- Discretionary Funding (past @ Goodyear)
- 15-20% (3M) - the money will be spent???
- Give people the opportunity to experiment a little without approval - red box credit card
- The right metrics (30% sales from new products)
- The right process

3M

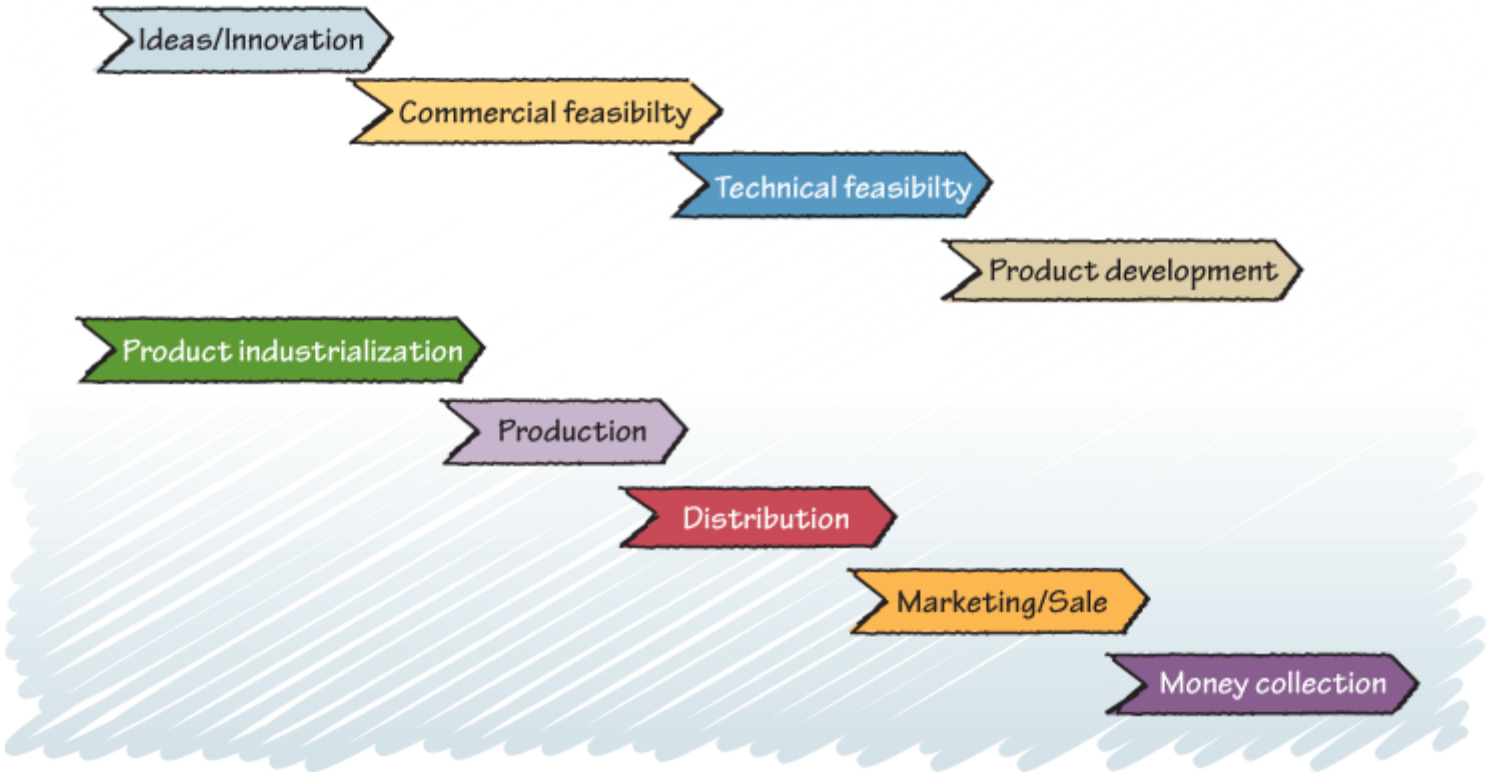
Complete freedom is not the best setting for creativity
Different individuals have different needs for structure in order to be creative

Winning at the Intersections

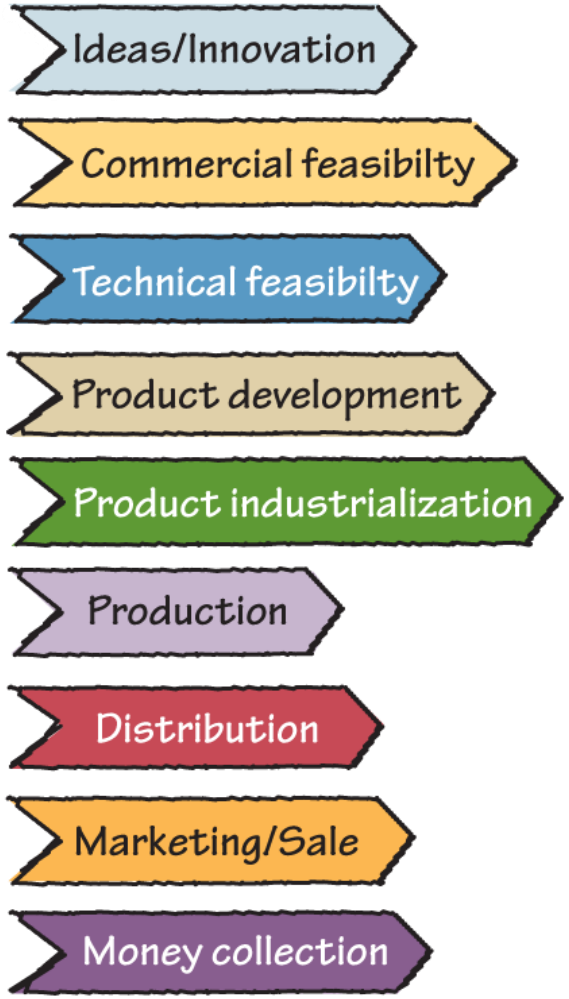


Collaborate and align to win at the intersection

Understanding Value Streams



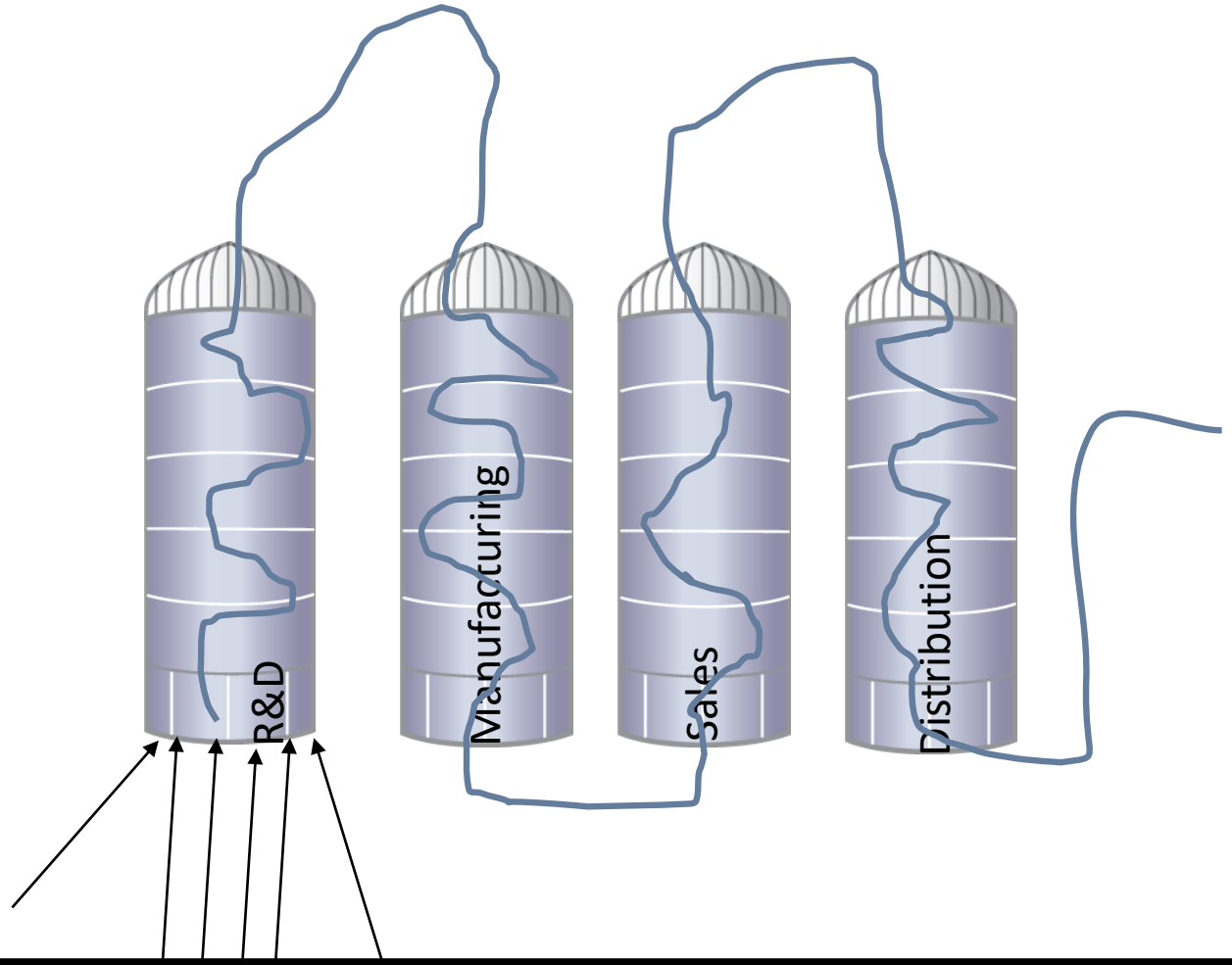
Value Stream Collaboration



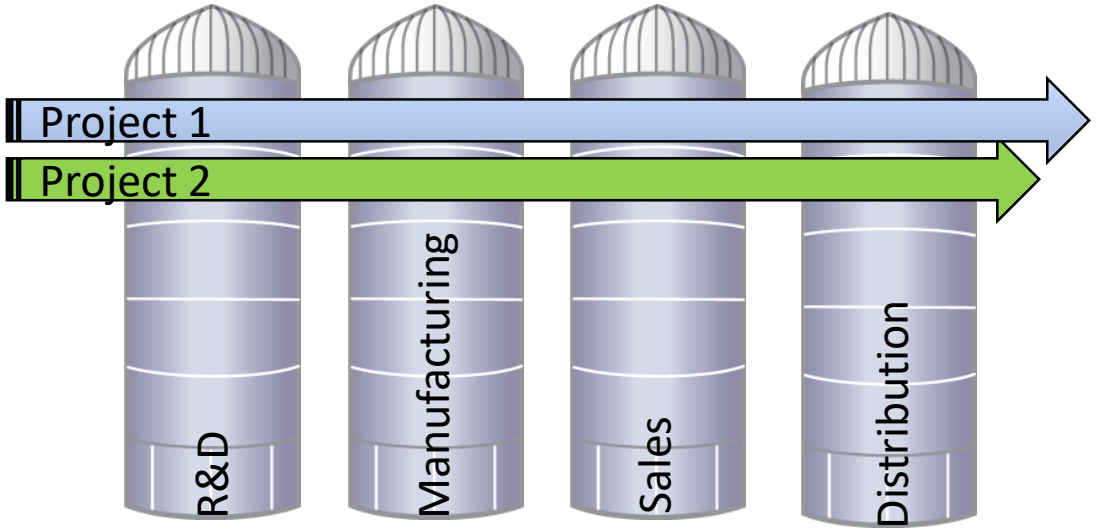
- Targets set JOINTLY – but they evolve
- Targets reflect value for customer and company growth
- CONCURRENT development
- Functional and personal agenda take a back seat to the value for the customer and the growth of the company

Lego over Ego

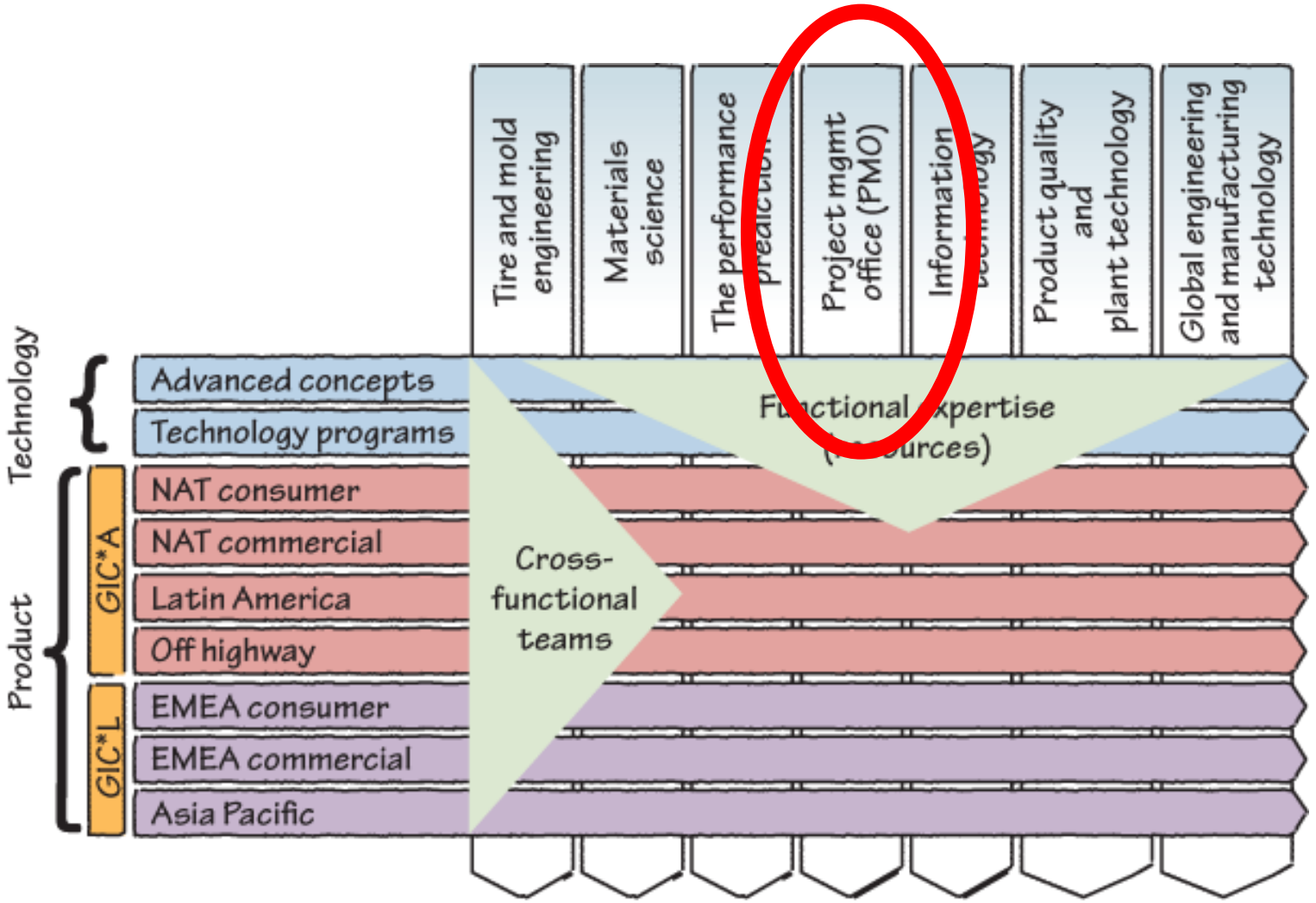
Typical Organization



Desired Organization



Matrix Organization



Basis of Agile

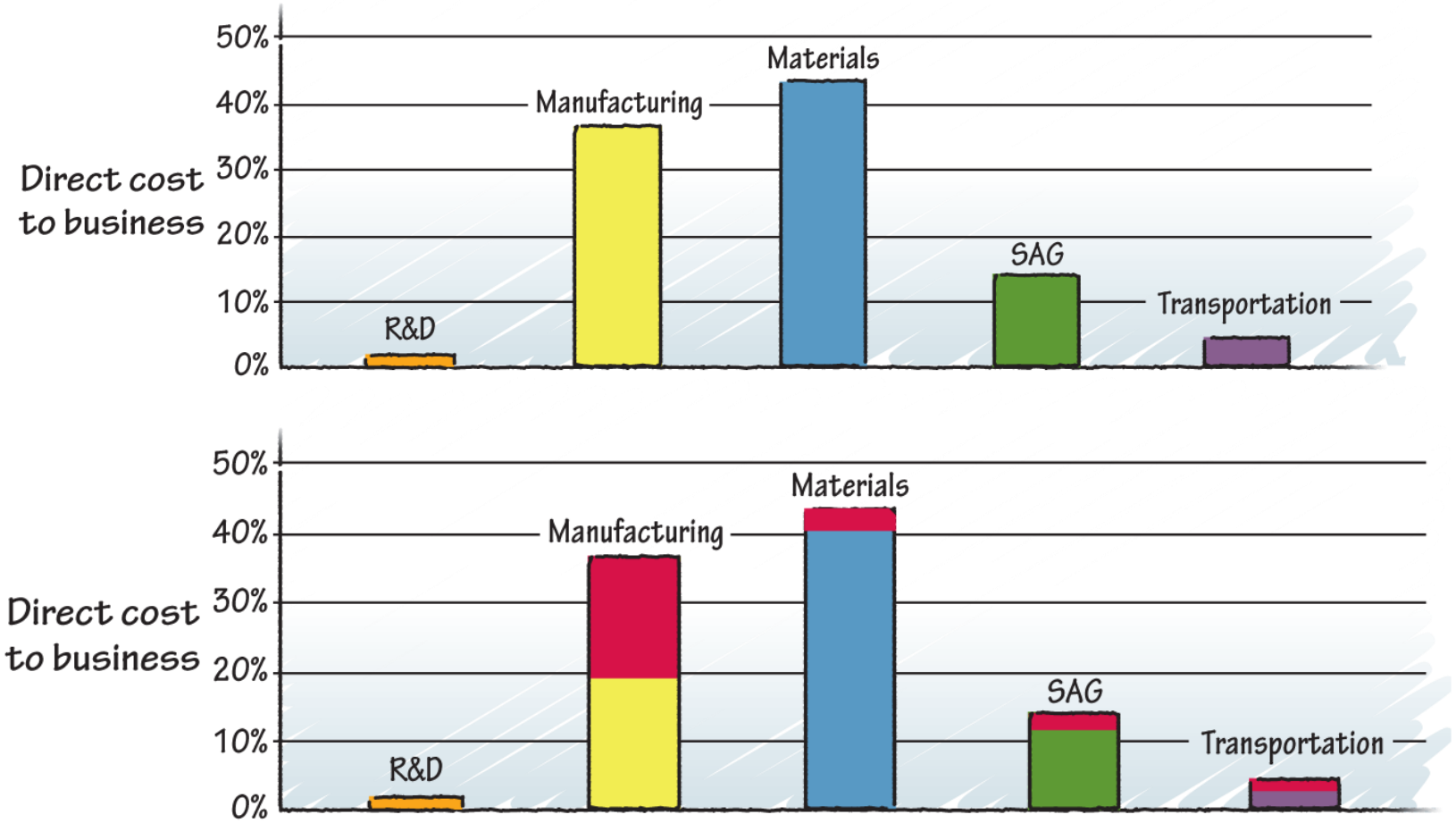
More than an org chart (Toyota HR)

Organization Necessary – Not Sufficient

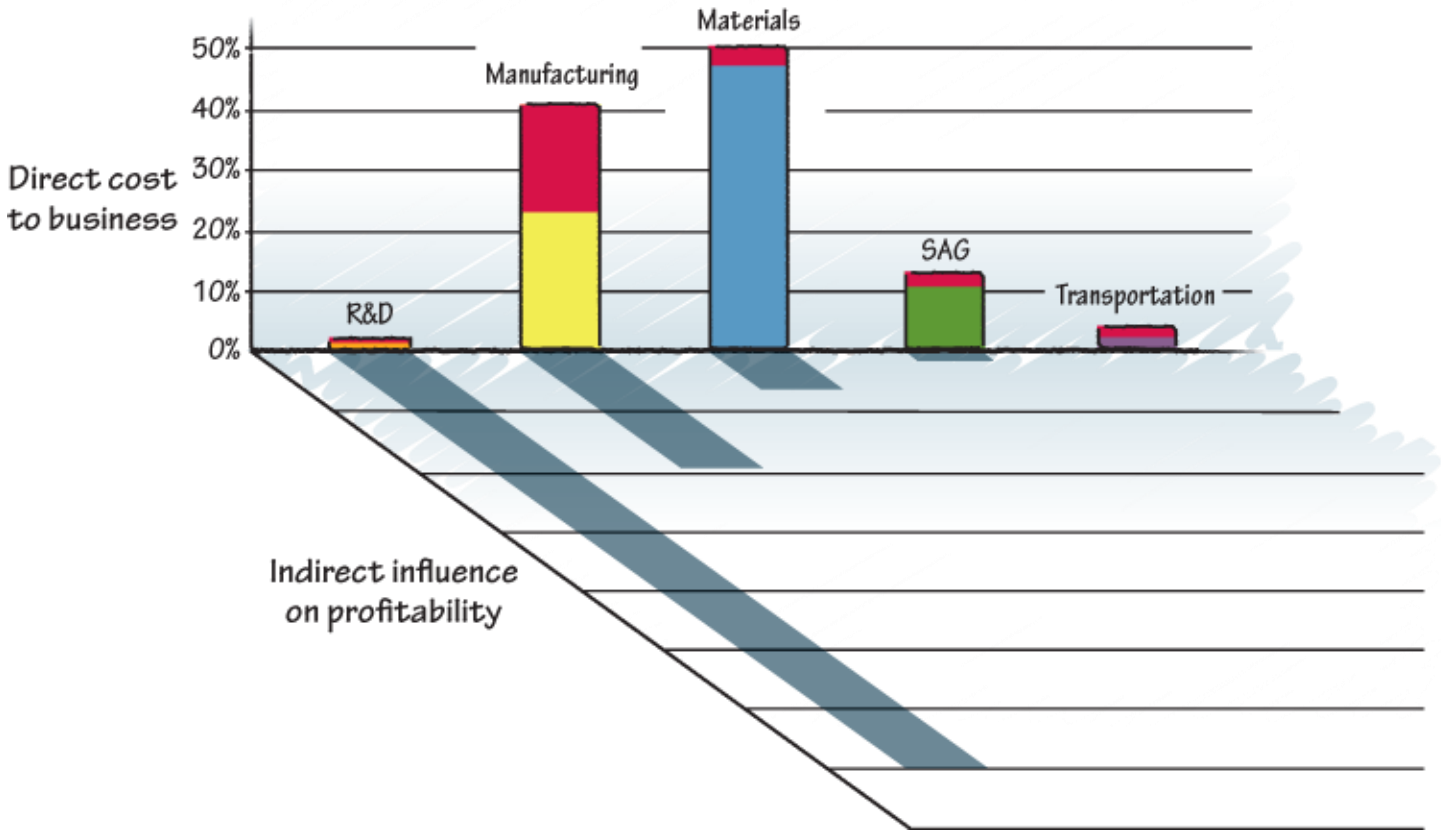
- Moving people where the work is - requires flexibility and standard work
- Project managers (Chief Engineers) are needed - PMO (FUNCTION)
- Leadership Support Critical

Get Organizational Issues Out of the Way

Focus on Customer VALUE, not cost



Create Value in the Shadows



Goodyear Fuelmax

Which is the Best Lean (Innovation) Tool

- ❑ Hackathon
- ❑ Lean Startup
- ❑ Design Thinking
- ❑ Agile
- ❑ TRIZ
- ❑ SCRUM
- ❑ Quick Learning Cycles
- ❑ Others

Chasing after tools is like

….a dog chasing a car – he would not know what to do with it even if he caught it

What is the right tool?

Mindset,
Skillset,
Toolset

Agile ?

Understand your Process

Learn the Principles

Pick the Right Tools

Agenda

- Understanding lean innovation
- Preparing the organization
- The Process
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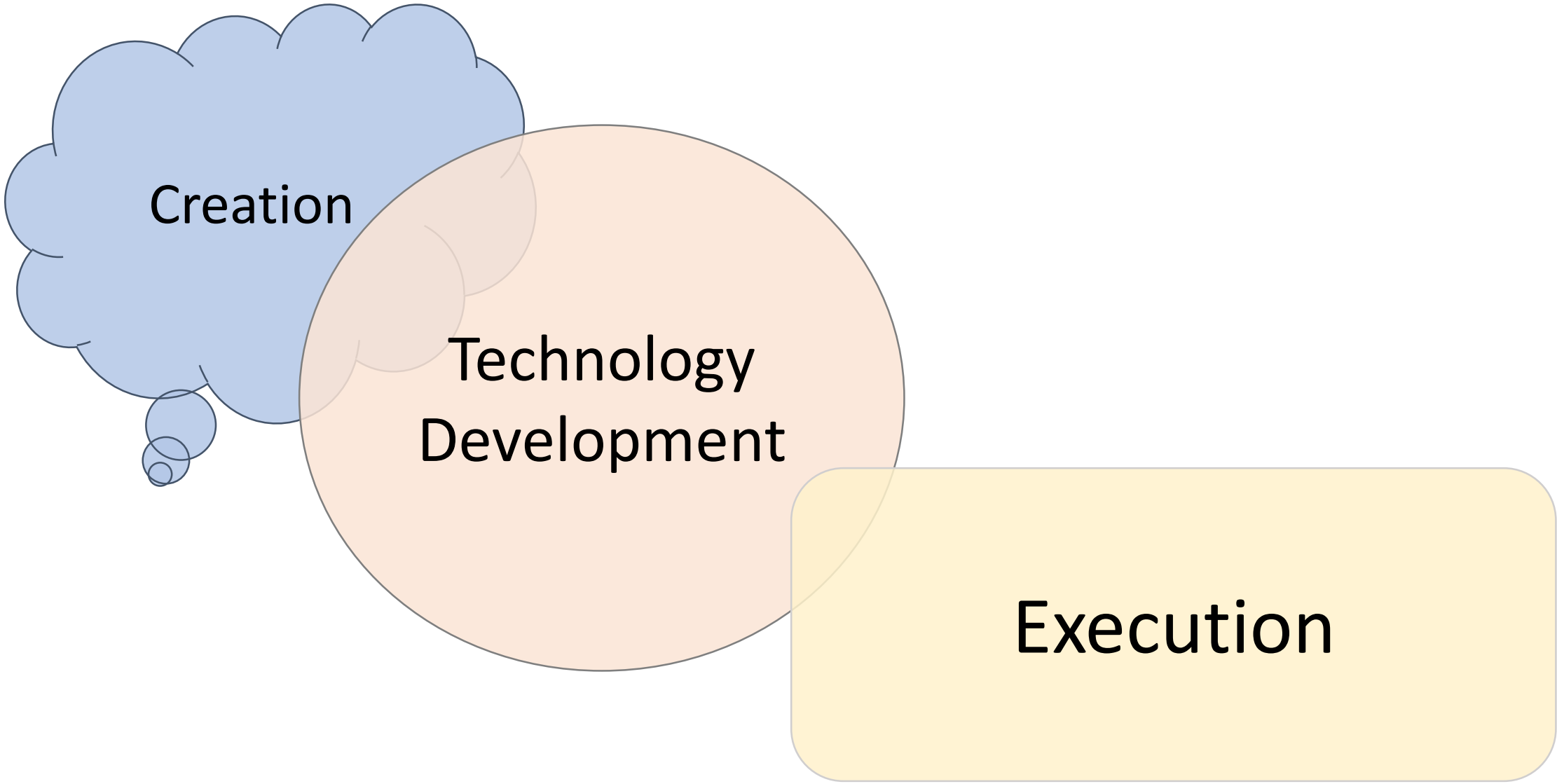
Innovation Trivia

Which statement is TRUE?

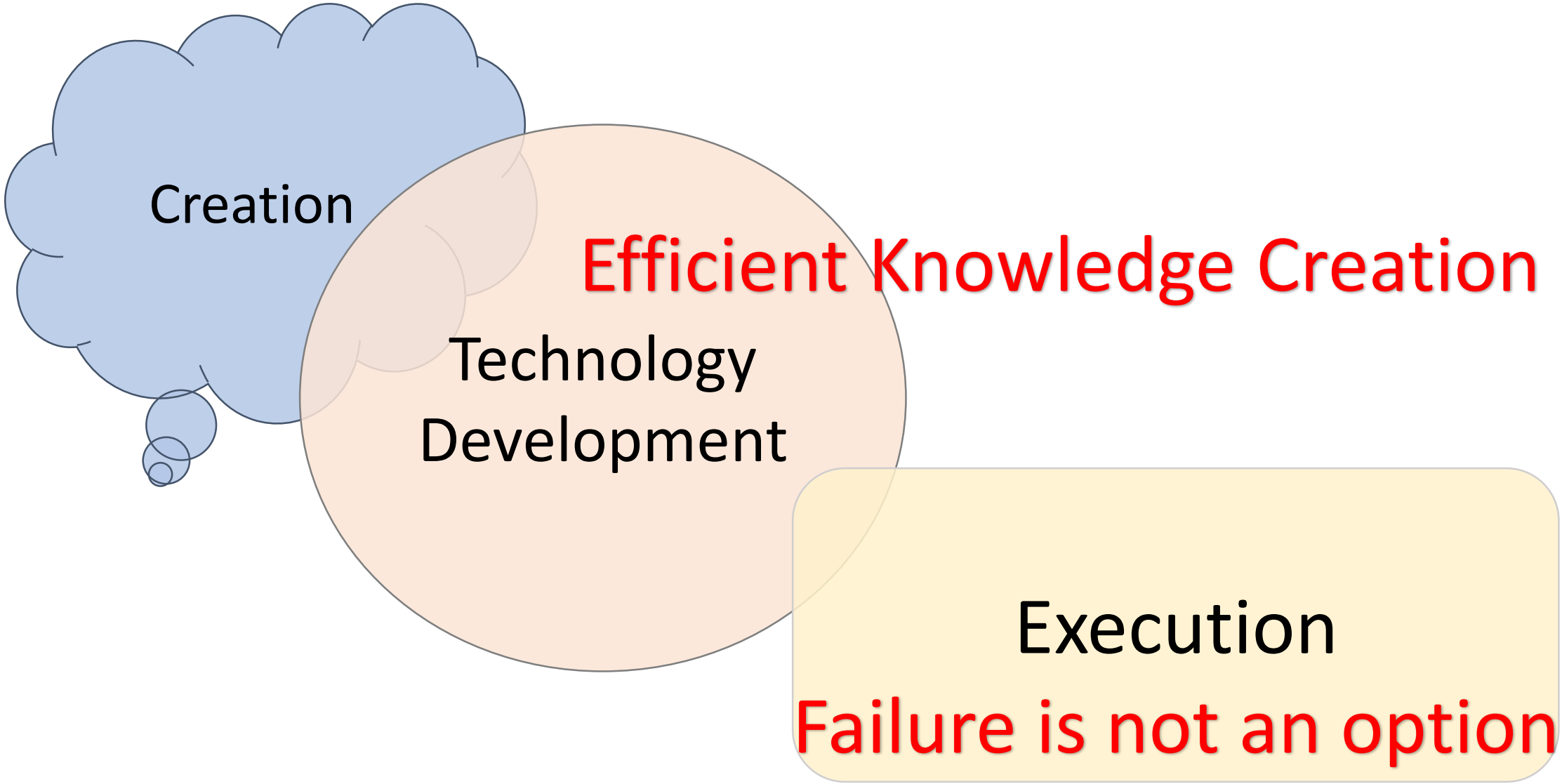
- 60% of new product development projects succeed
- 99.7% of new product ideas fail (not always for technical reasons)

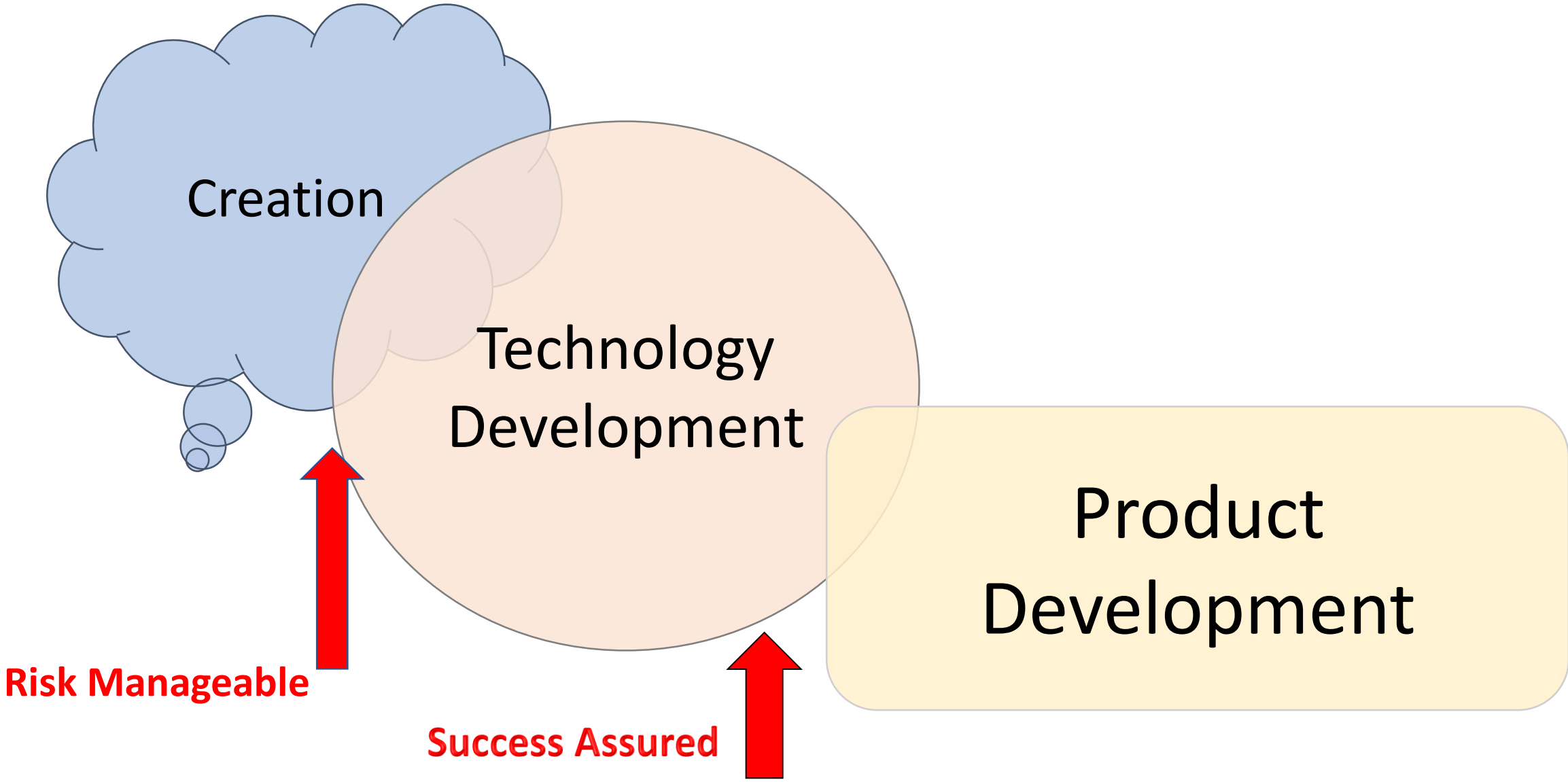
>>BOTH

Stevens, G; Burley, J; 3,000 raw ideas = 1 commercial success!; Research Technology Management; May/June97, Vol. 40 Issue 3, p16-27



Fail fast and often





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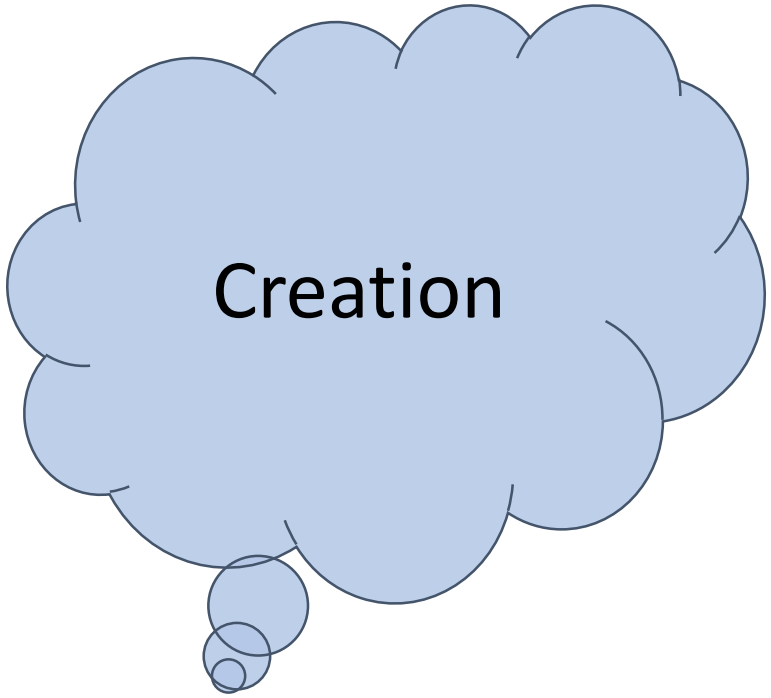
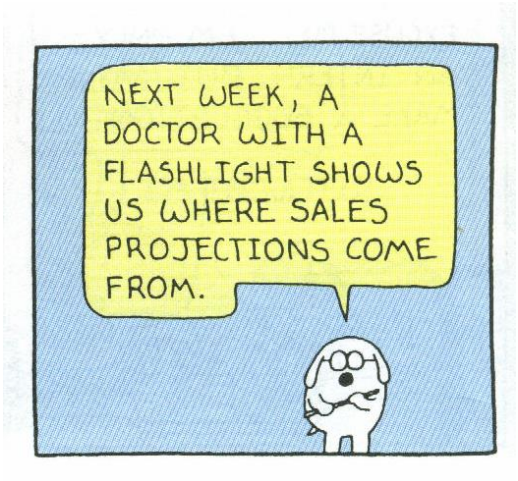


Create Value for the Customer



Most of the big discoveries in the last 20 years originated in R&D

- Necessity is the mother of invention
- Invention is the mother of necessity

Necessity

- Diapers
- Scotch Tape
- Uber
- Amazon
- Netflix

Invention is the Mother of Necessity

- Sticky notes
- Honey Nut Cheerios
- Energizer
- I-phone
- Tagaderm
- Synthetic detergents
- Steris - the guppy swallows the whale

My Dream Process

H&M

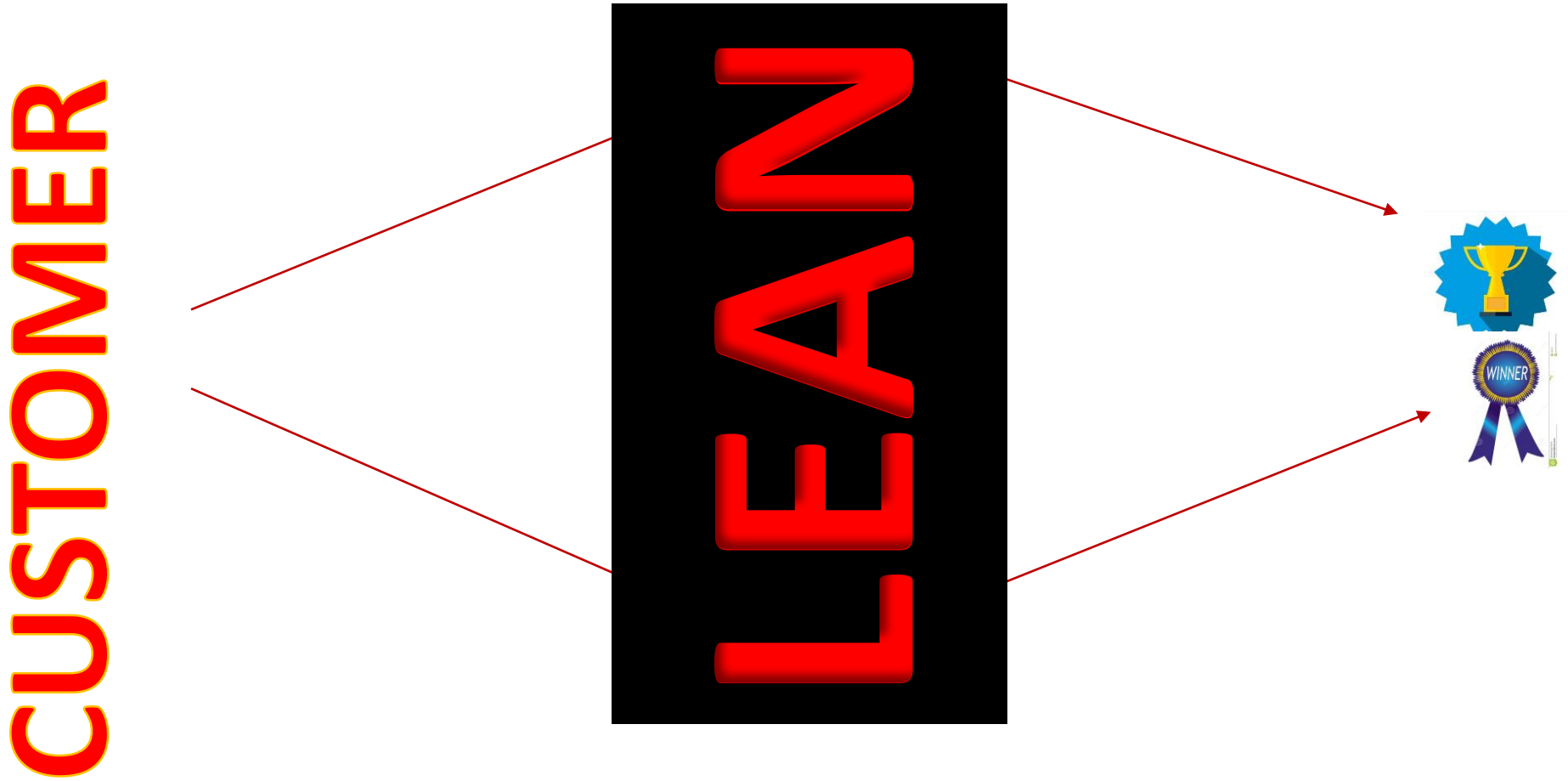
CUSTOMER

DIVERGE

Apple – no joke – from an ex employee

- Will Steve like it
- Will it demo well

Lean Innovation



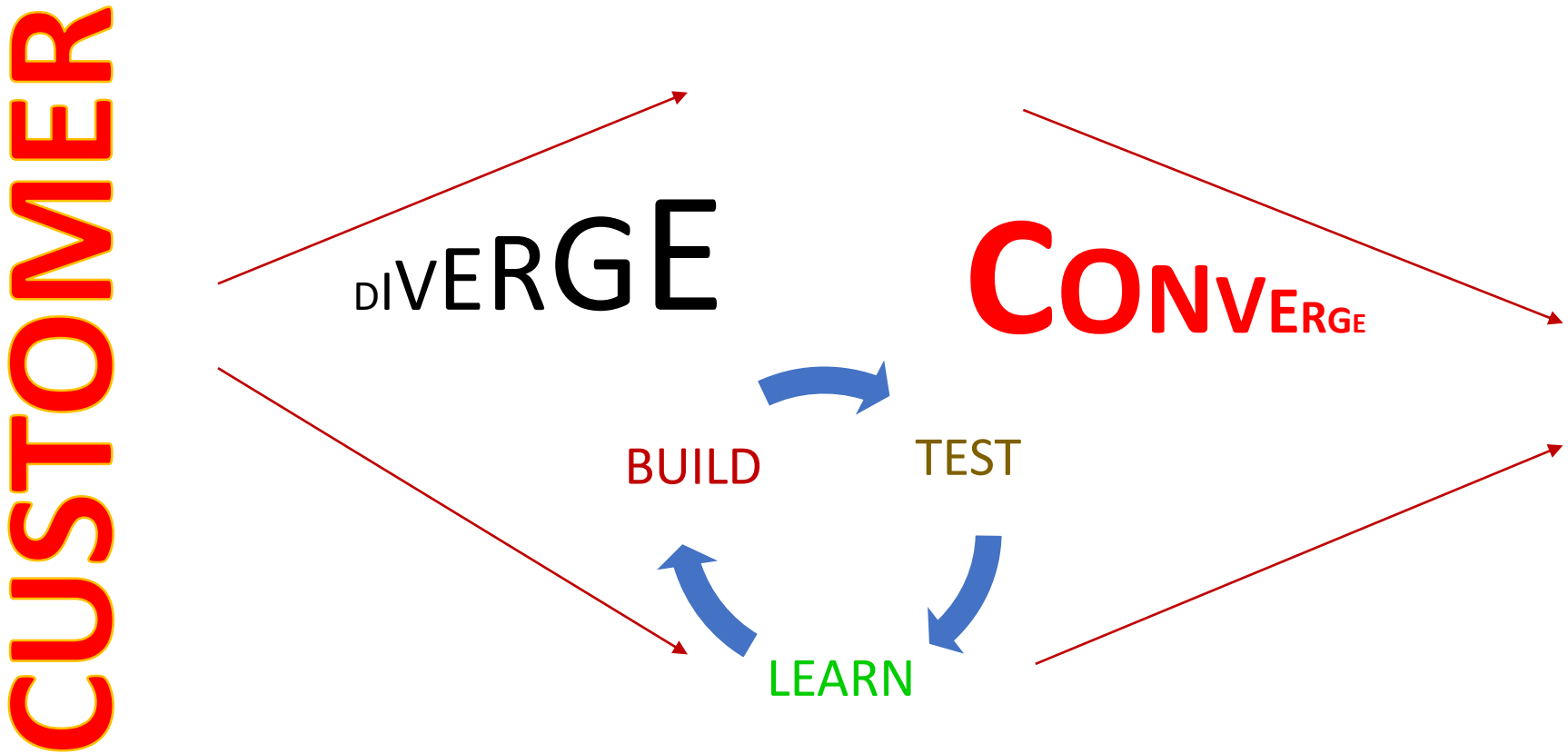
My agile, quick learning, scrum, rapid deployment, design thinking, … cycle

BUILD

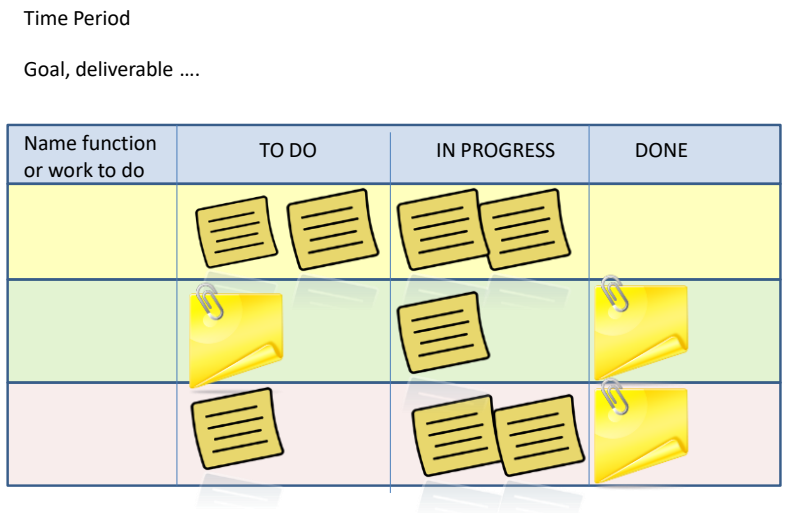
TEST

LEARN

MY Innovation Cycle



Quick Learning Cycles – SCRUM, sprints, agile …



Potentially Shippable Product after every cycle

- 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
- And
  - In the right order
  - With the minimum effort

Building a house

~~Start Digging~~

- Buy land
- Make a drawing
- Get a permit
- Start digging

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 ……..

Exercise – what would have been the most critical question

- Google search engine
- Uber
- Sticky notes
- Self driving cars
- Affordable 3D printing machines
- Vertical farming
- Tire with recycled material
- A wind turbine for the high school

Lean Experimentation

Maximum Learning With Minimum Effort

Experiment 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

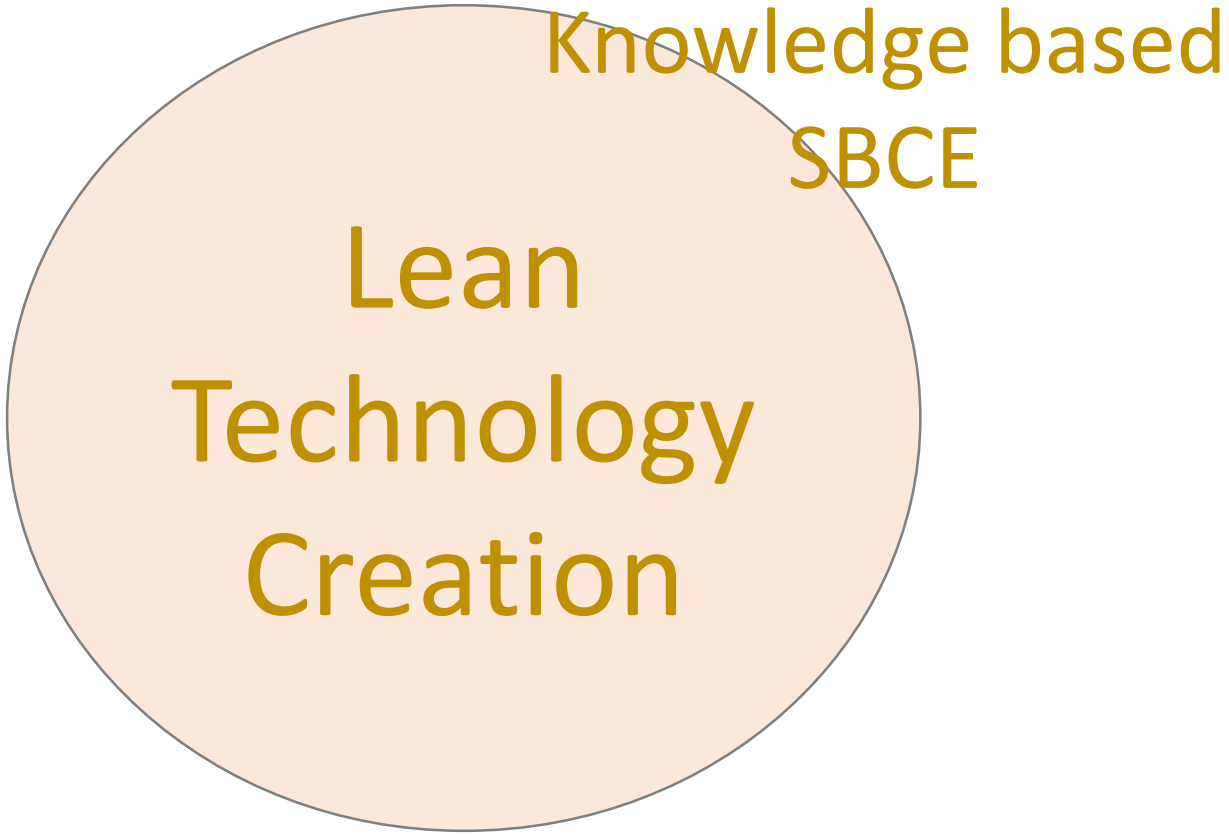
Start-up vs Corporation

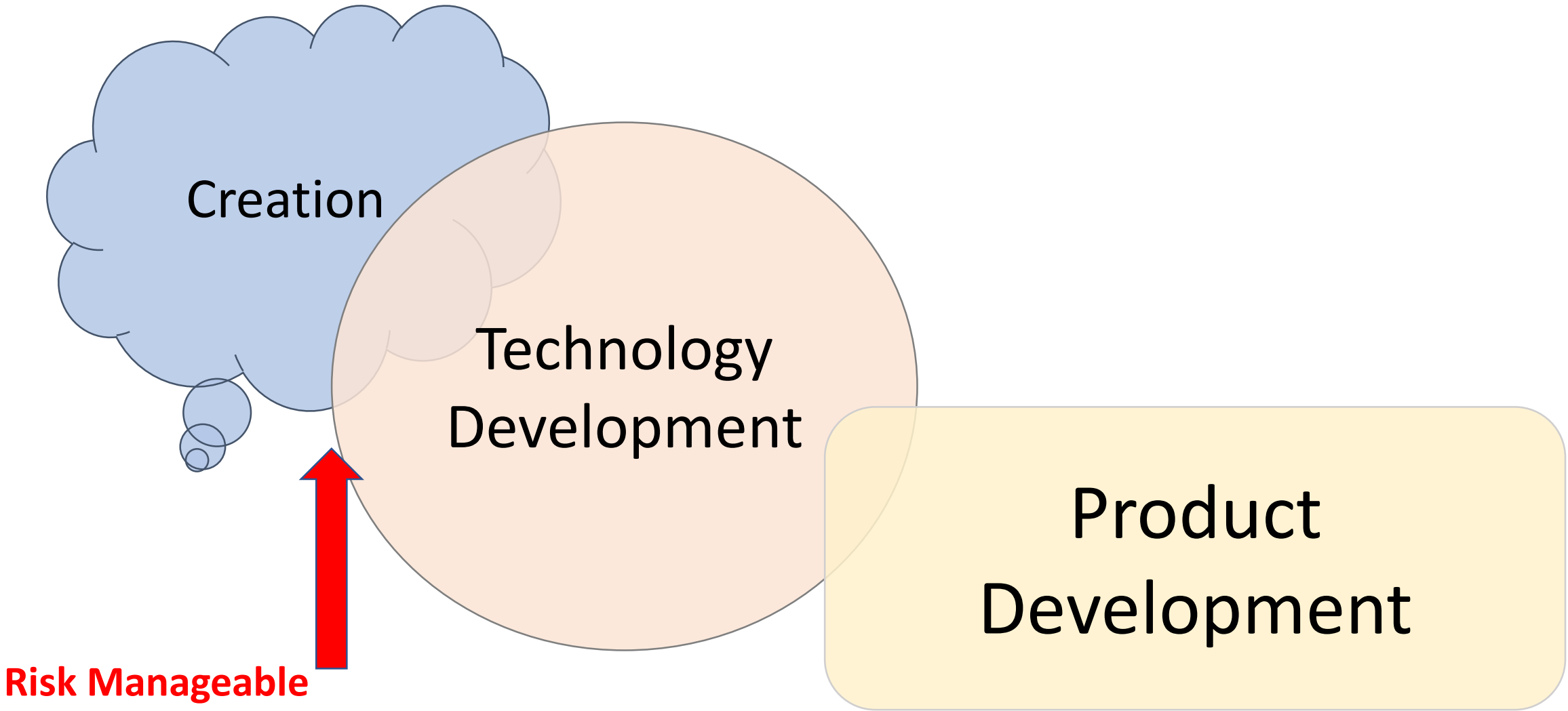
- Start-up – humble means – nothing to lose
  - Succeed or fail
- Corporation – sufficient means but a lot to lose
  - Effective risk reduction
  - No reason to spend any more than a start-up
  - Can afford to look at a multitude of ideas

Start 100 projects for the cost of 1

Essentials of Technology Development

- Concurrent
- Set-based
- Knowledge Driven





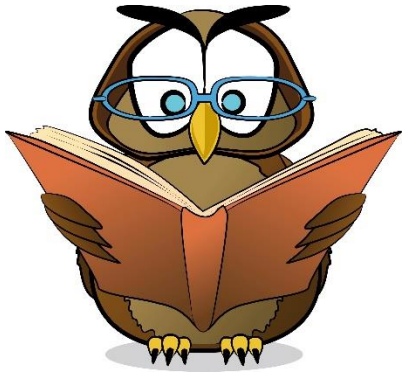
In this process we generate KNOWLEDGE – not a product (yet)

The Shell Story

At some point, Shell oil became distressed with how much money they were spending on drilling wells. The belief was you just have to try things and see what happens. But the executives in exploration decided on a different tack – drill ONLY where you know you will hit oil. Now, everyone thought this was ridiculous, but they soon found themselves learning to find ways to ensure wherever they drilled came up a win.

- Their hit rate went way up
- Their costs went way down
- Their proven reserves went way up

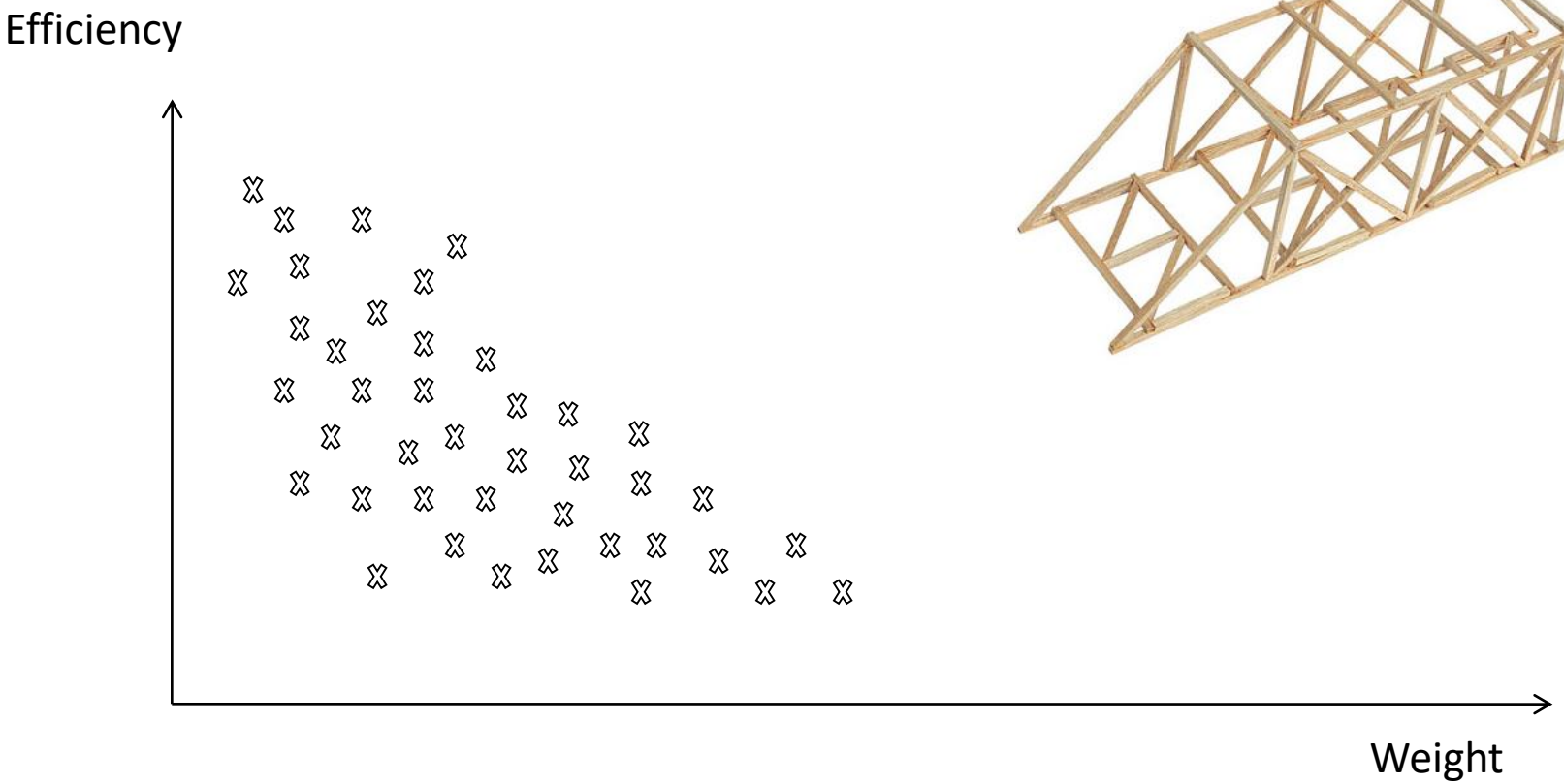
Learning about the product without building the product



Knowledge Management

Norbert Majerus

A Little Knowledge Goes a Long Way



Efficiency = Load at break / weight

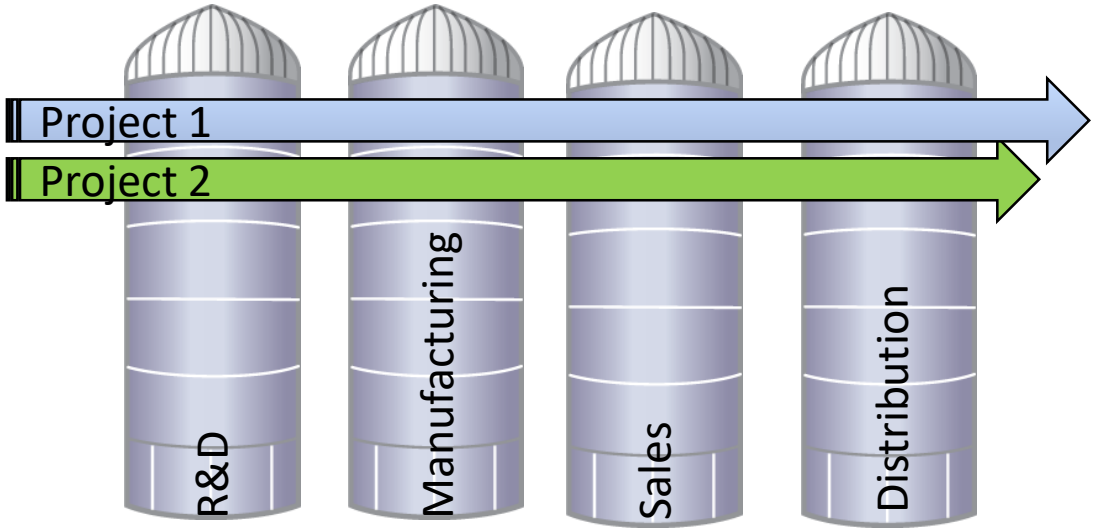
What did your company spend on knowledge?

$Billions over the history of the company

Traditional Knowledge Management

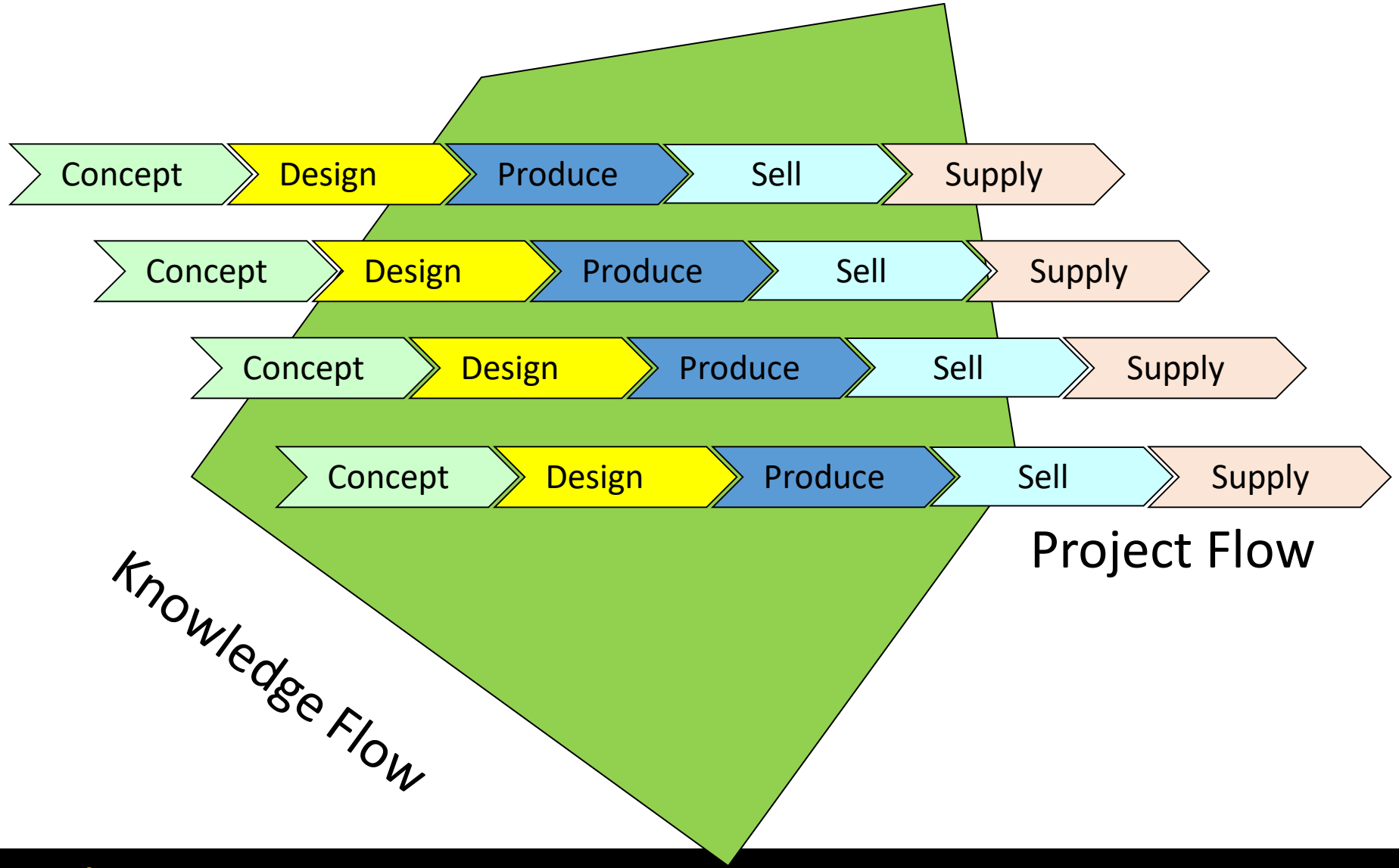
Knowledge was traditionally managed well on FUNCTIONS

Need For NEW Knowledge Management



Knowledge Silos

There are 2 Flows in the Value Stream



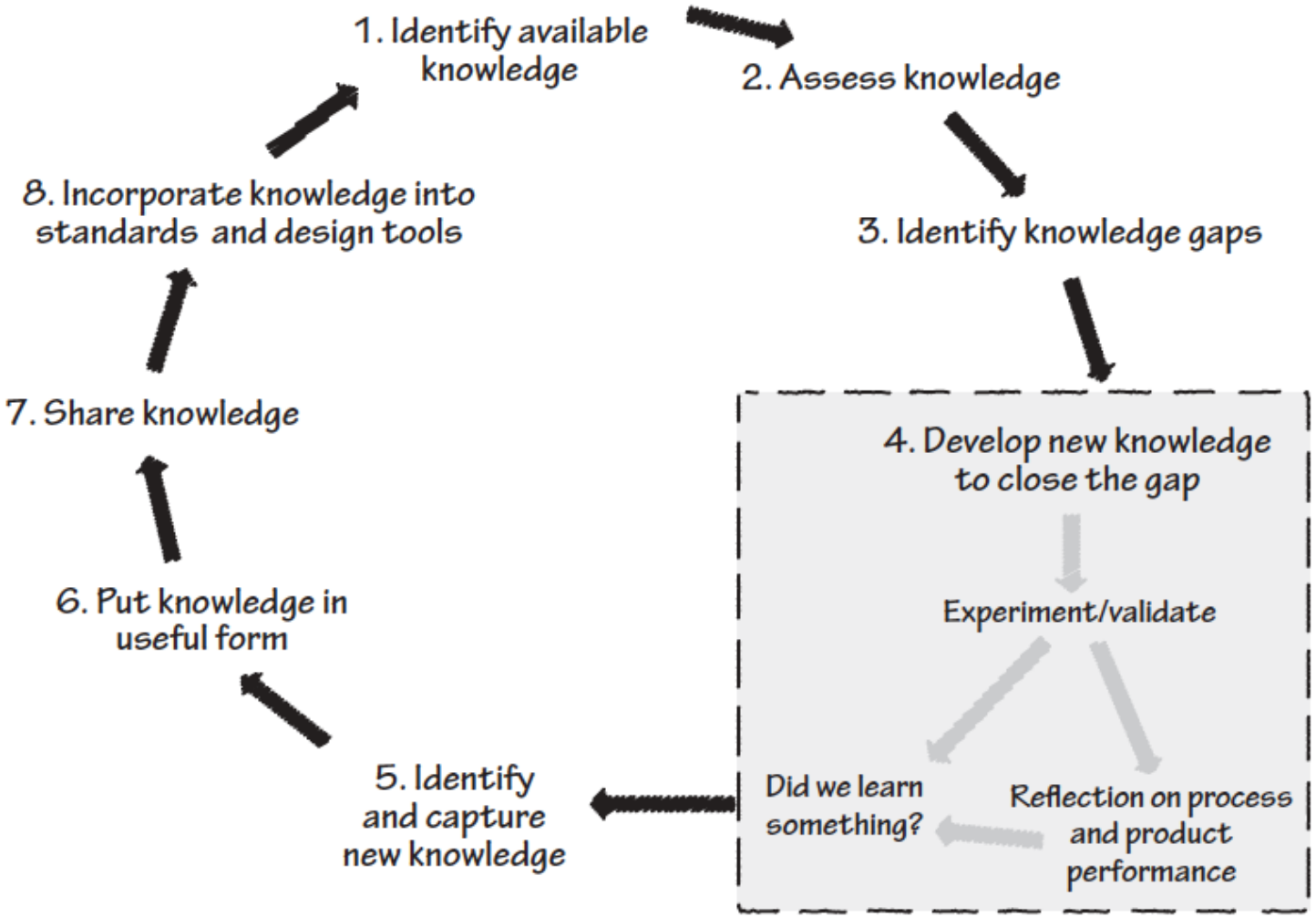
Why knowledge management?

- Eliminate waste and cost in a development process by preventing reinvention
- Manage the risk in product development
- Speed up the development

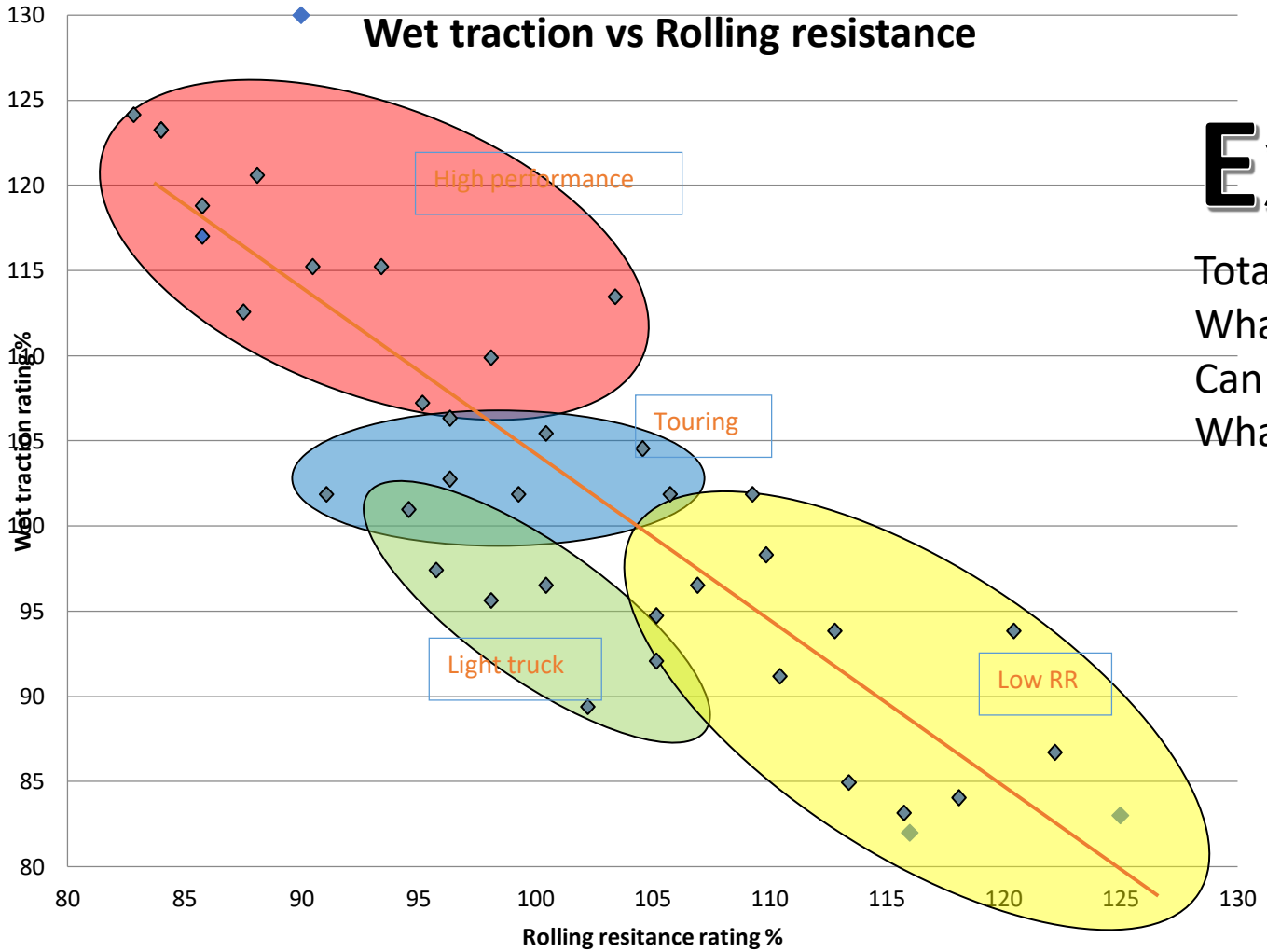
30%

Of knowledge is re-used

My Knowledge Cycle



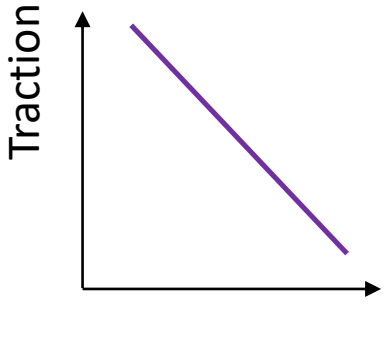
A REAL trade Off Curve

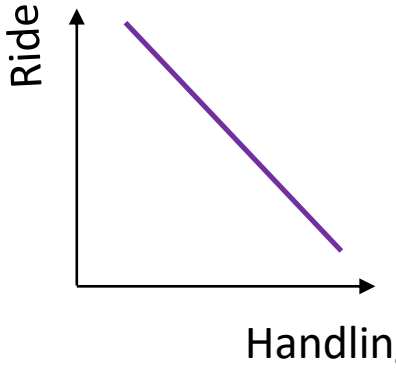


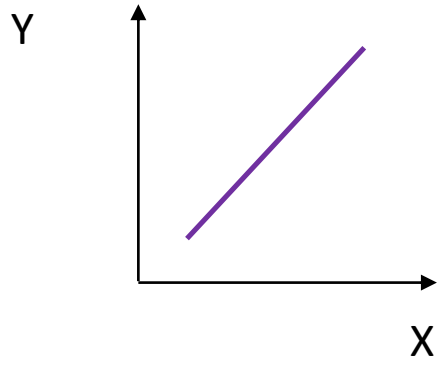
Exercise

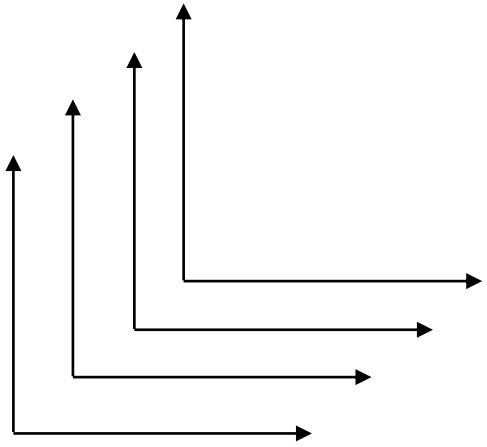
Total non-expert needed
What does the curve tell you?
Can we make a 100/100 tire?
What about a 110/110 tire?

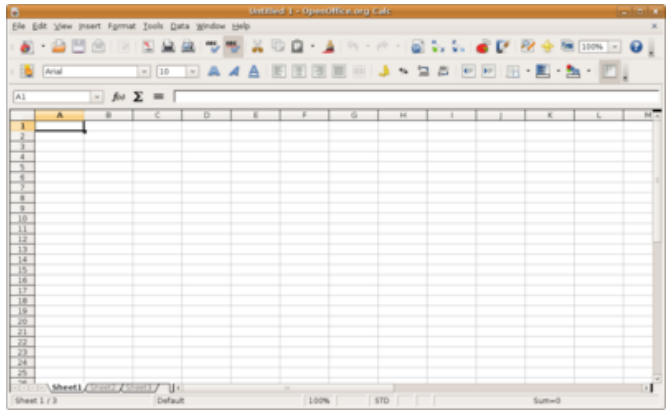
Appropriate Use of Trade Off Curves

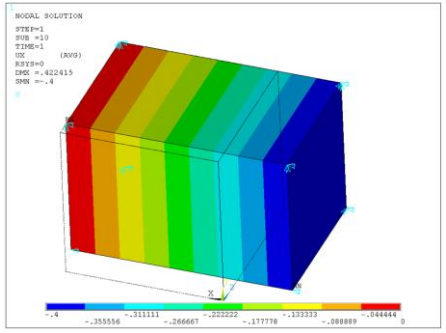












DOE
Set Based
Tagushi
…..

Set based OR OTHER experimental set
– focused on knowledge gaps

Learning from FAILURES

- Nature – adrenalin boost
- People who made a mistake, rarely repeat it
- What about those who were not there???
- Reflection, documentation and sharing
- Who wants to admit to failures?

Levels of Knowledge Management

DATA

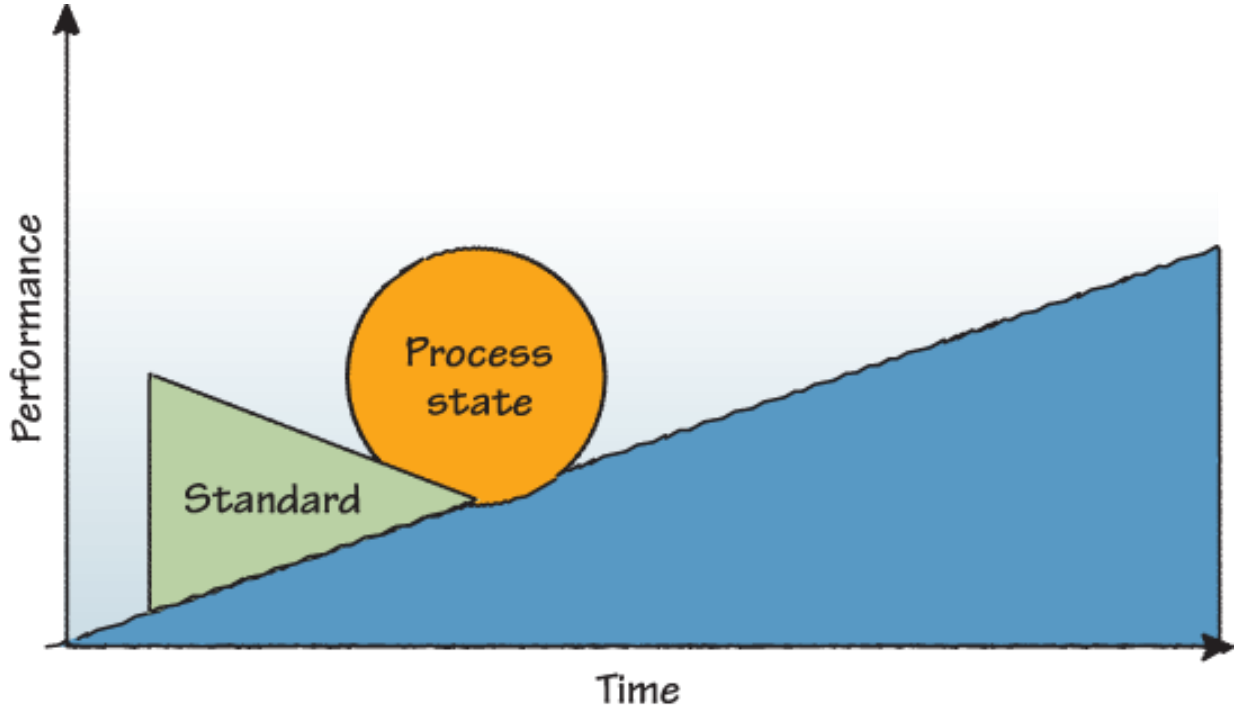
Knowledge

Principles

Laws and formulas

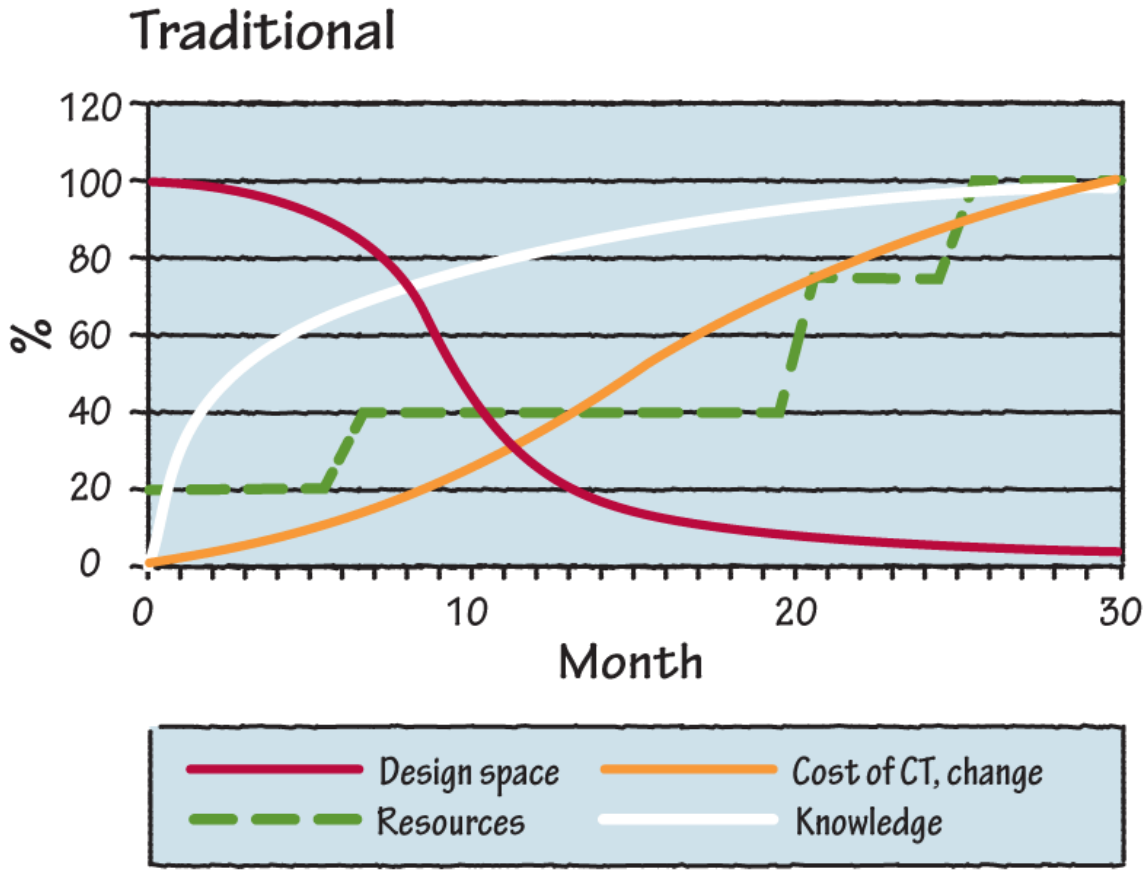
Standards

"Today's standardization, instead of being a barricade against improvement, is the necessary foundation on which tomorrow's improvement will be based. If you think of standardization as the best that you know today, but which is to be improved tomorrow, then you get somewhere. But if you think of standards as confining, then progress stops." Henry Ford, *Today and Tomorrow*. Henry Ford, *Today and Tomorrow*, Doubleday, Page & Co., 1926.

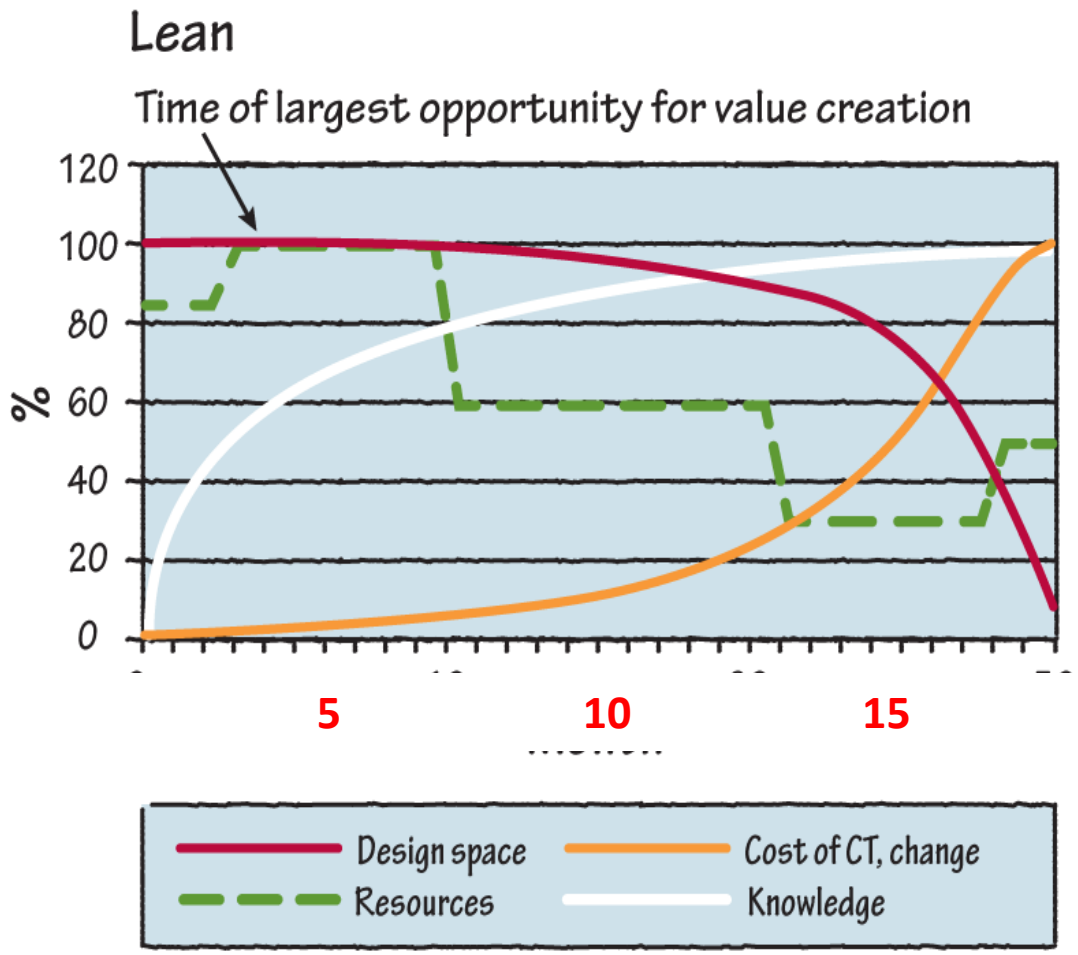


Develop the KNOWLEDGE (GAPS), not the product

Manage the Design Space



Managing the Design Space

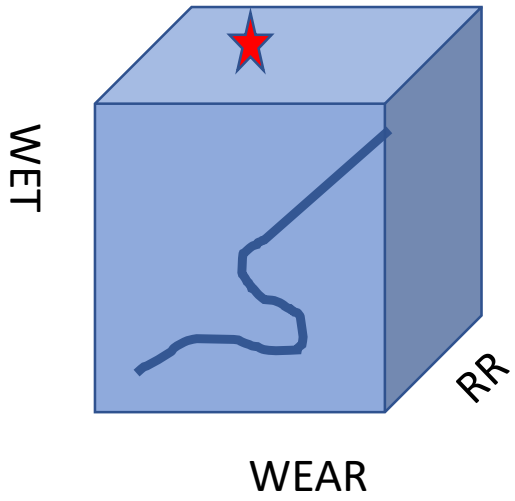


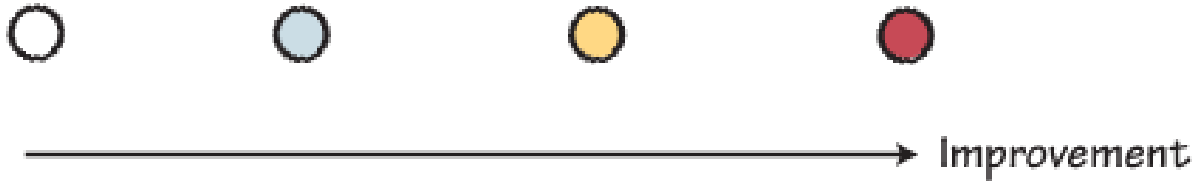
Principles

- Focus on knowledge gaps, not product
- Explore the complete design space
- Front load the process
- Leave options open as long as possible
- Experiment efficiently
- Be agile and flexible – pivot or freeze if needed
- Expect more options than one
- Keep an open mind – and expect surprises
- Chances are that you may not end up where you thought you were going
- Stay flexible
- Mange the product with integration events

Traditional Engineering

Point Based development





Traditional

Etc … etc…..

We need a better motor

It does not go far enough on one charge

It rides like a truck

Now it is too expensive

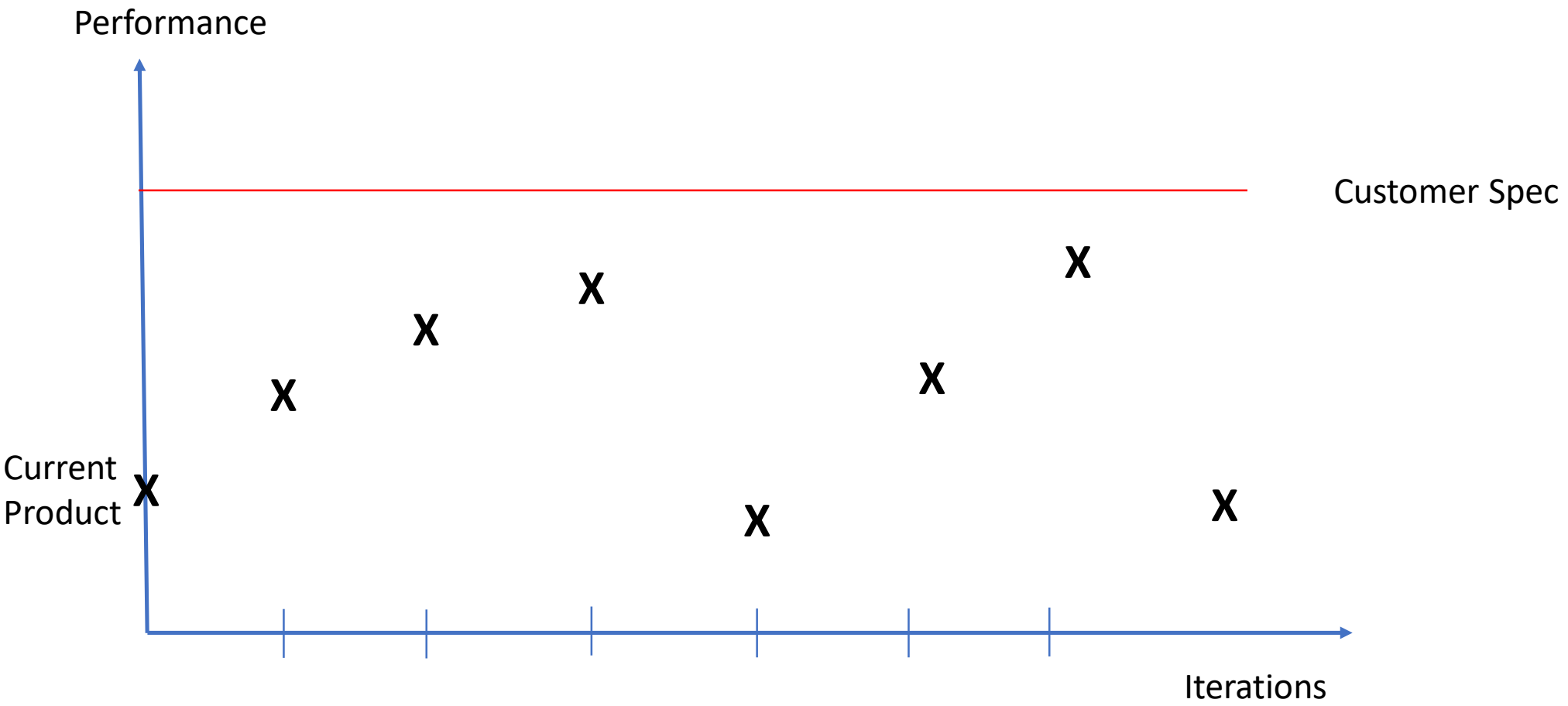
The bike is too heavy

Develop the battery

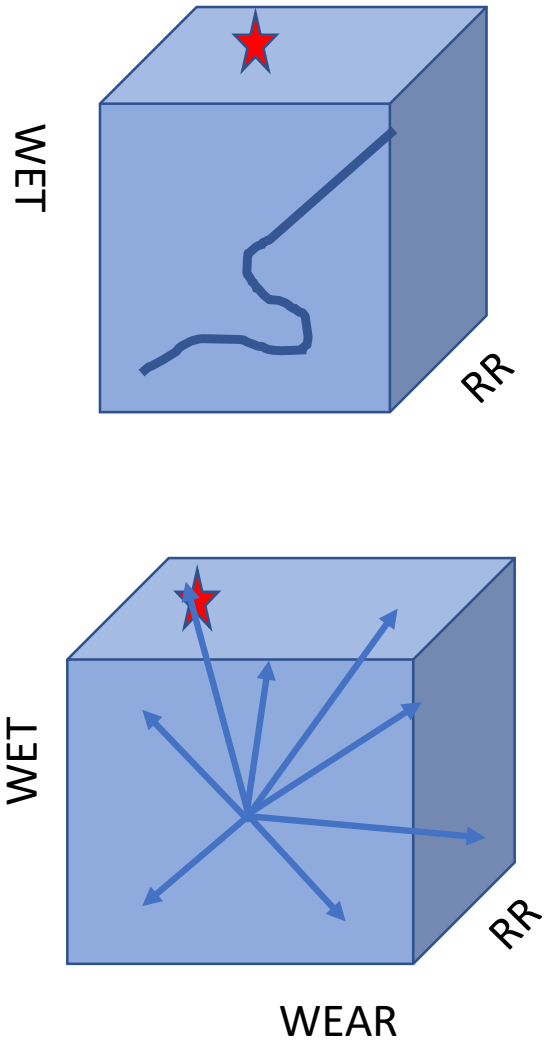
Develop the motor

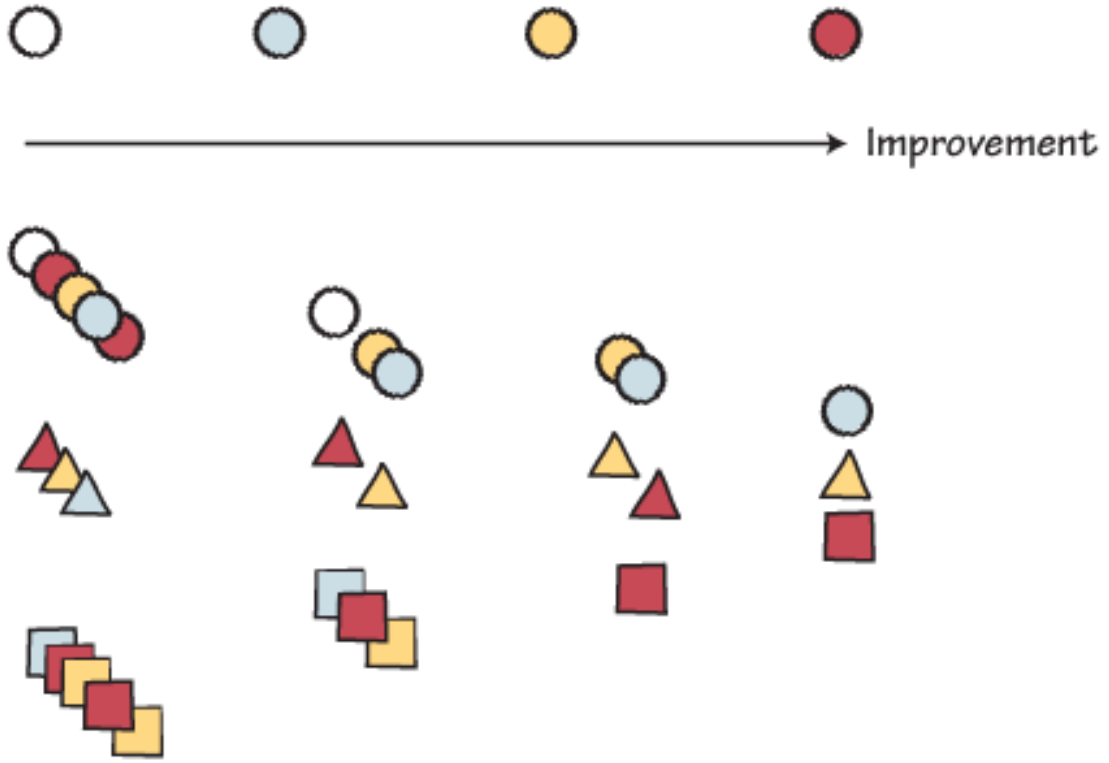
Add a motor

Single Point Iteration vs Set Based/Concurrent



Set Based Concurrent





Product

Knowledge

Maybe Equation or use of visible knowledge

Set Based

- Define the limits
- Where are the gaps in the knowledge
- Develop the knowledge
  - Explore large space
  - In sets - integration
  - Concurrently
  - Make knowledge useful (visible, equation, model …)
- Apply to products

Set Based Concurrent Engineering

- **Explore the full space**
- Set feasible limits
- Define Sets
- Eliminate options by existing knowledge
- Generate new knowledge as needed
- USE theory

E-Bike

- Variables:
  - Frame
  - Wheels
  - Battery
  - Motor

  - Seat
  - Handle bar
  - Pouches
  - ….

ALL knowledge available - Will be addressed during product development phase

Set 1

Steel Frame
Alu Frame
Carbon Frame

Steel wheels
Alu wheels
Carbon wheels

Li Ion battery
Ni Cd 1 Battery
Ni CD 2
Old rechargeable

200 W motor
300 W motor
400 W motor

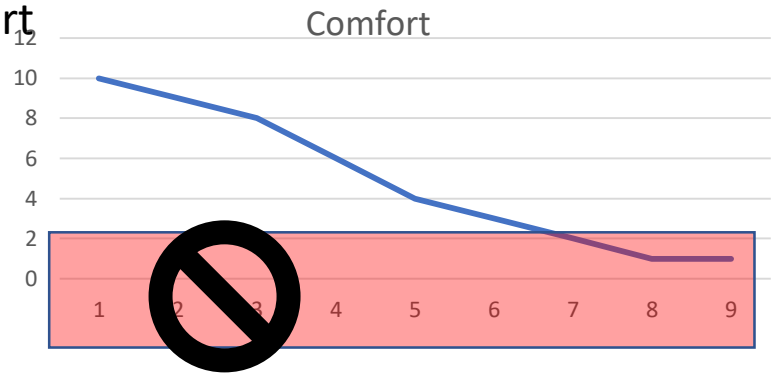
108 Combinations

Set Based Concurrent Engineering

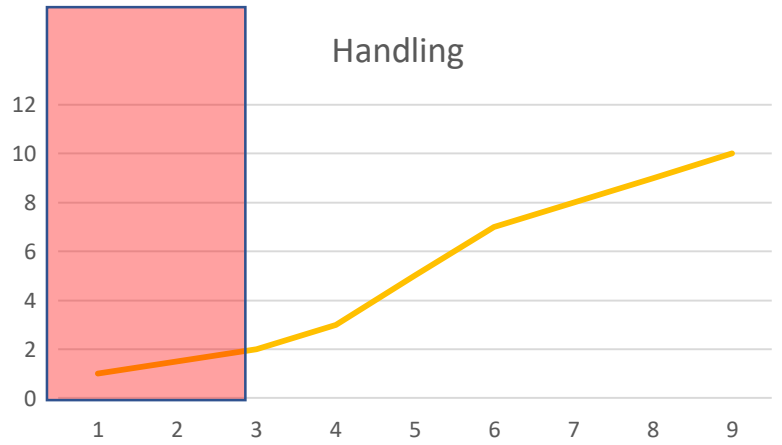
- Explore the full space
- **Set feasible limits**
- Define Sets
- Eliminate options by existing knowledge
- Generate new knowledge as needed
- USE theory

Set Limits

Comfort

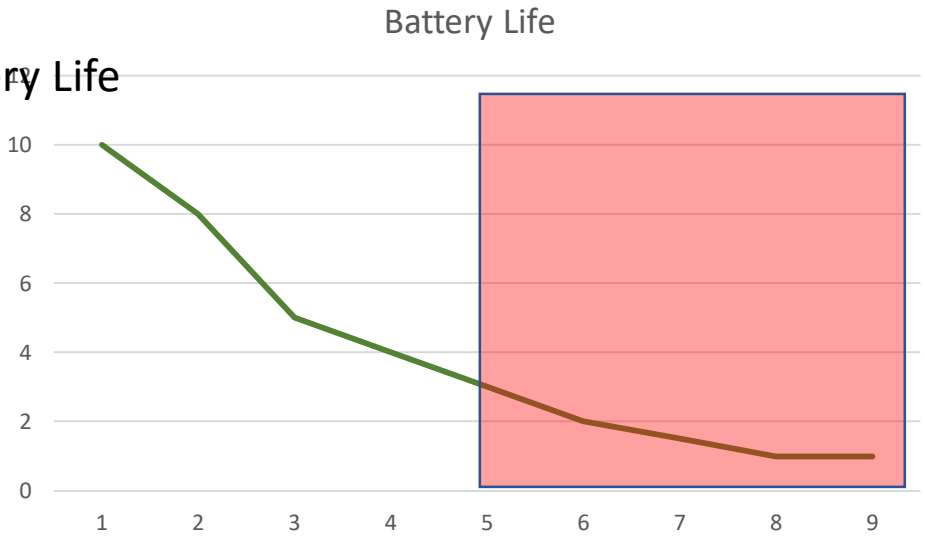


Handling



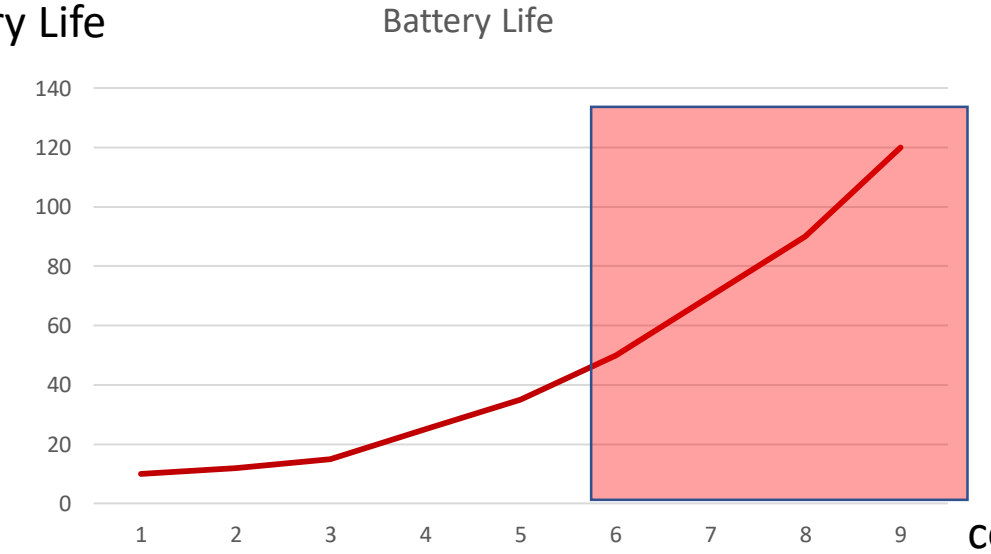
Frame Stiffness

Battery Life



Frame Stiffness

Battery Life



Bike Weight

cost

Set 2

Steel Frame
Alu Frame
Carbon Frame

Steel wheels
Alu wheels
Carbon wheels

Li Ion battery
Ni Cd 1 Battery
Ni CD 2
Old rechargeable

200 W motor
300 W motor
400 W motor

16 Combinations

Set Based Concurrent Engineering

- Explore the full space
- Set feasible limits
- **Define Sets**
- Eliminate options by existing knowledge
- Generate new knowledge as needed
- USE theory

Set 2

Steel Frame
Alu Frame
Carbon Frame

Steel wheels
Alu wheels
Carbon wheels

Li Ion battery
Ni Cd 1 Battery
Ni CD 2
Old rechargeable

200 W motor
300 W motor
400 W motor

Steel Frame
Alu Frame

Steel wheels
Alu wheels

Li Ion battery
Ni Cd 1 Battery
Ni CD 2

200 W motor
300 W motor

16 Combinations

Set 2

Steel Frame
Alu Frame
Carbon Frame

Steel wheels
Alu wheels
Carbon wheels

Li Ion battery
Ni Cd 1 Battery
Ni CD 2
Old rechargeable

200 W motor
300 W motor
400 W motor

Steel Frame
Alu Frame

Steel wheels
Alu wheels

Li Ion battery
Ni Cd 1 Battery
Ni CD 2

200 W motor
300 W motor

16 Combinations

What Knowledge do we have?

Set Based Concurrent Engineering

- Explore the full space
- Set feasible limits
- Define Sets
- Eliminate options by existing knowledge
- Generate new knowledge as needed
- USE theory

Set 2

16 Combinations

Steel Frame
Alu Frame
Carbon Frame

Steel wheels
Alu wheels
Carbon wheels

Li Ion battery
Ni Cd 1 Battery
Ni CD 2
Old rechargeable

200 W motor
300 W motor
400 W motor

Steel Frame
Alu Frame

Steel wheels
Alu wheels

Li Ion battery
Ni Cd 1 Battery
Ni CD 2

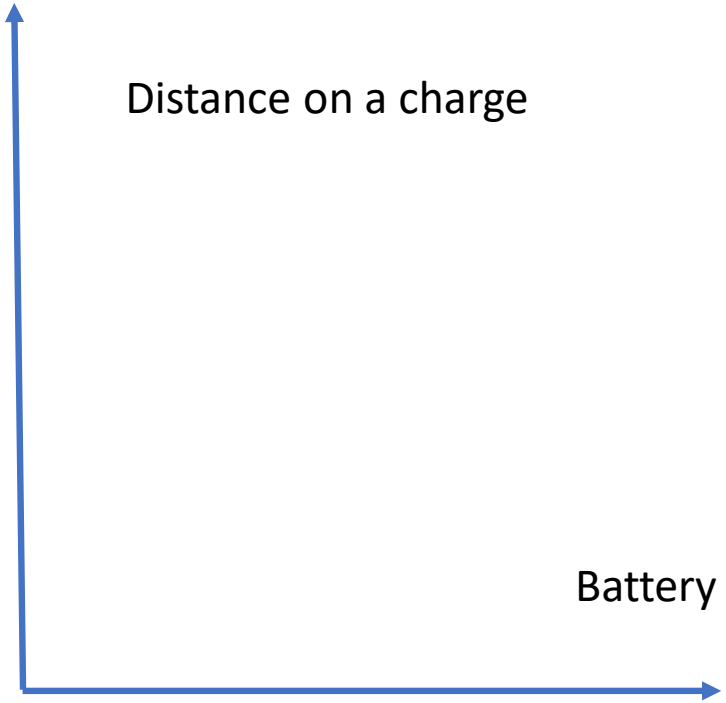
200 W motor
300 W motor

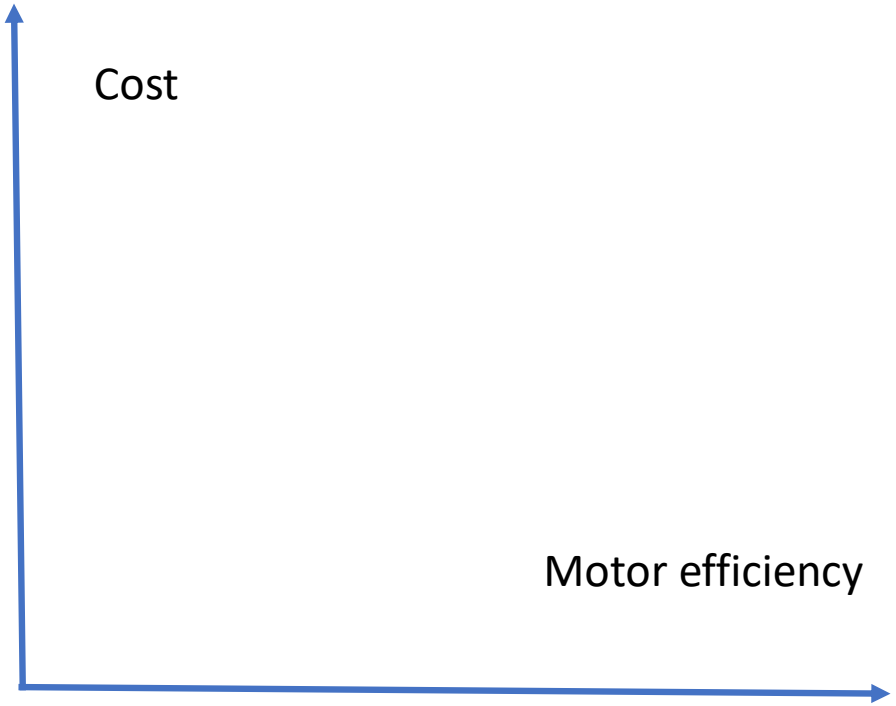
4 Combinations

Set Based Concurrent Engineering

- Explore the full space
- Set feasible limits
- Define Sets
- Eliminate options by existing knowledge
- Generate new knowledge as needed
- USE theory

Missing Knowledge





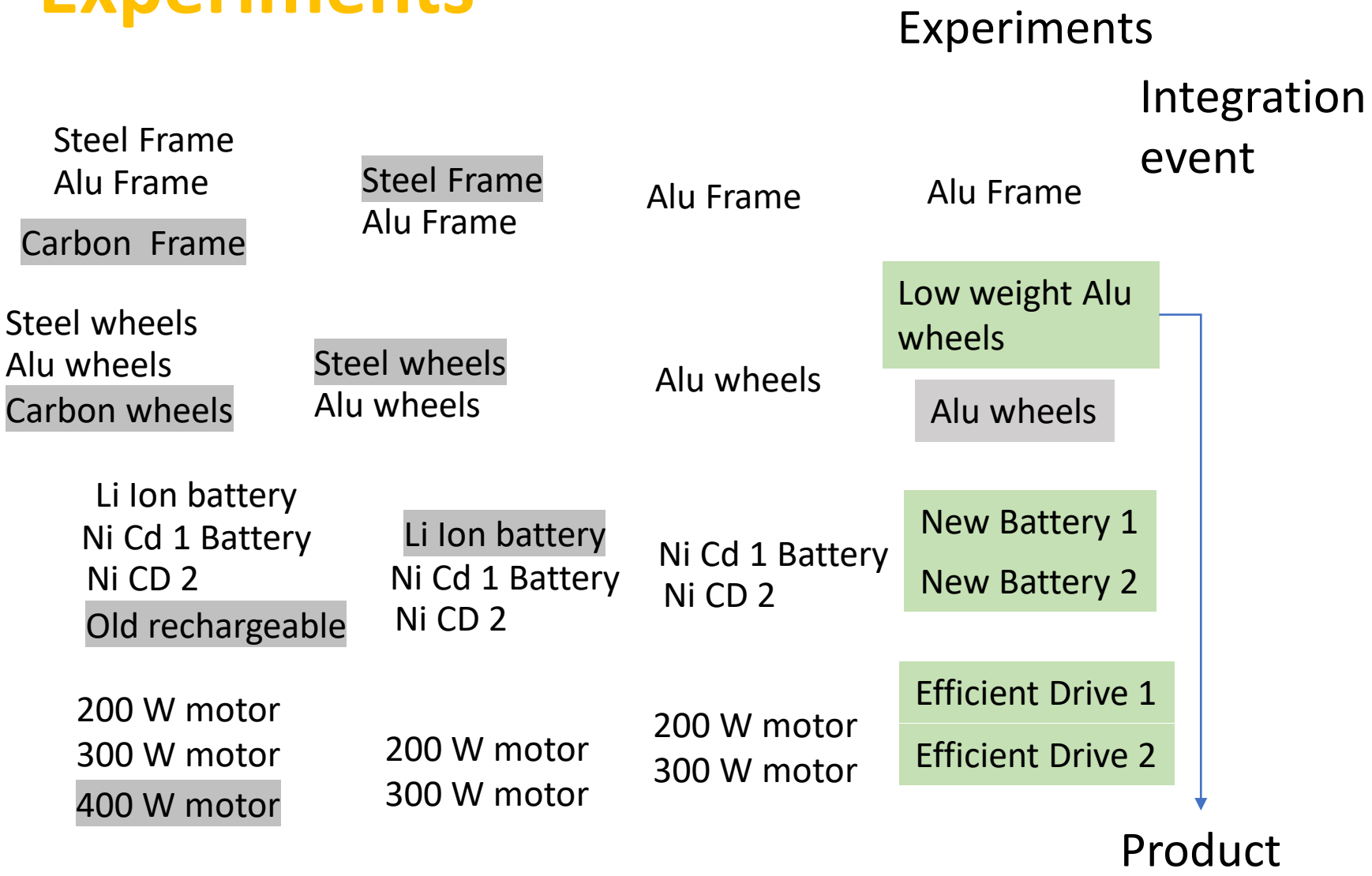
Set 2

16 Combinations

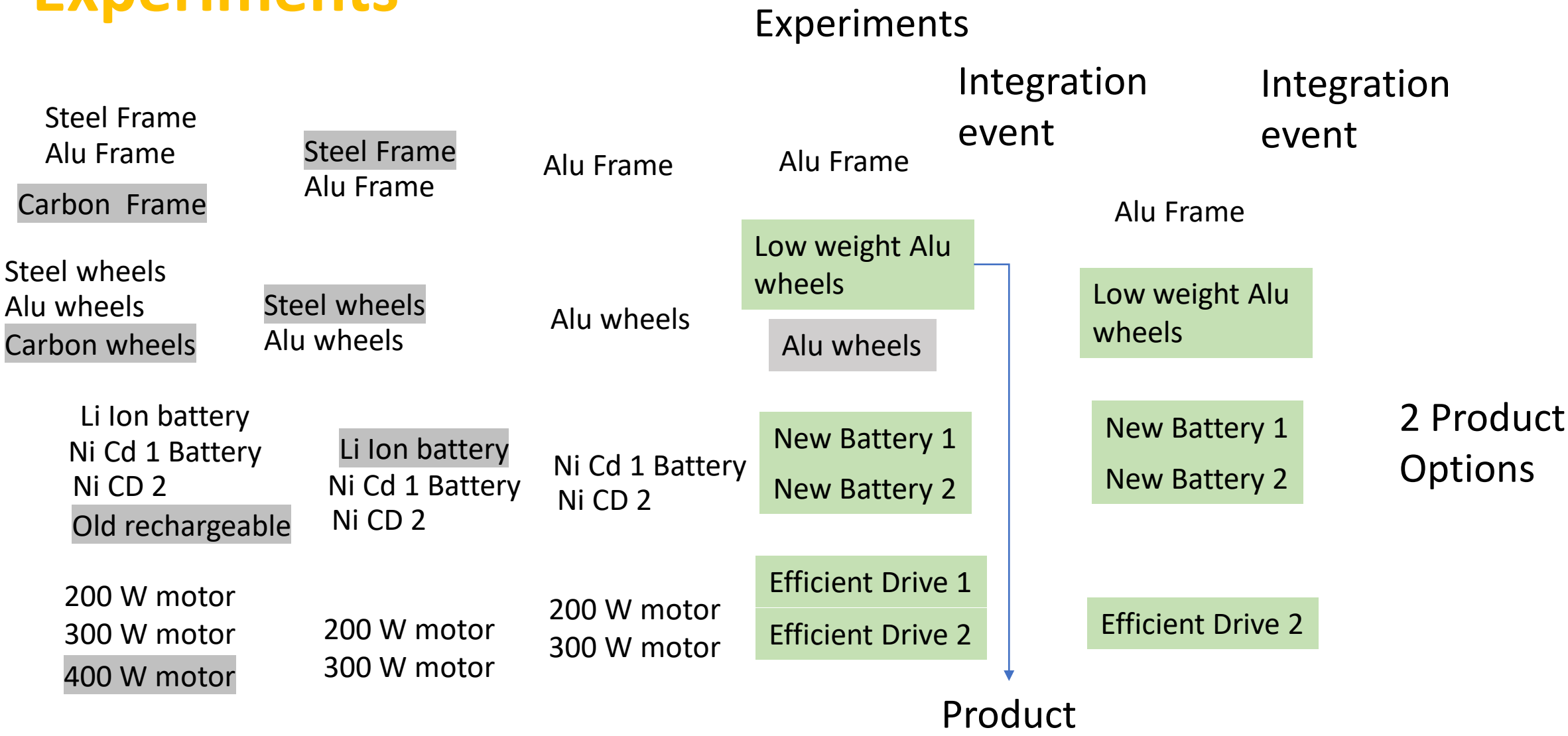
4 Combinations

Steel Frame Alu Frame Carbon Frame	Steel Frame Alu Frame	Alu Frame	Alu Frame
Steel wheels Alu wheels Carbon wheels	Steel wheels Alu wheels	Alu wheels	Low weight Alu wheels Alu wheels
Li Ion battery Ni Cd 1 Battery Ni CD 2 Old rechargeable	Li Ion battery Ni Cd 1 Battery Ni CD 2	Ni Cd 1 Battery Ni CD 2	New Battery 1 New Battery 2
200 W motor 300 W motor 400 W motor	200 W motor 300 W motor	200 W motor 300 W motor	Efficient Drive 1 Efficient Drive 2

Experiments



Experiments



Other Sets Run Concurrently

- Purchasing confirmed supply of new batteries is assured – but at a 2% higher cost than originally estimated
- Manufacturing made a trial no problem assembling
- Service confirms no expected problems with maintenance
- Sales had put a webpage out with a picture of the new bike – more than enough people hit the “buy” button

The obsolete options …

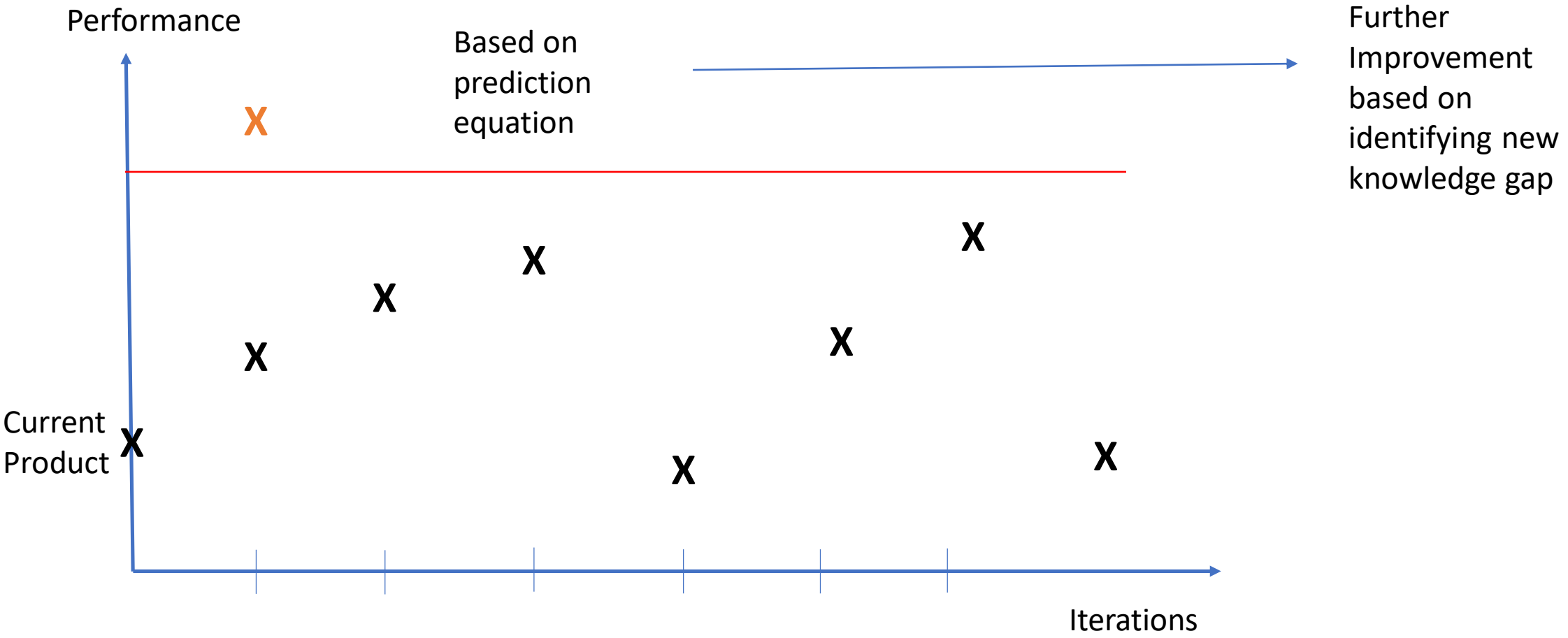
- Put on shelf (rarely used) – may be waste
- Use in different brand
- Capture knowledge (but is it useful)

- ALL about proper planning – there **is value** in CONSIDERING many options but there is not always value generated by FINISHING more options than are needed …….

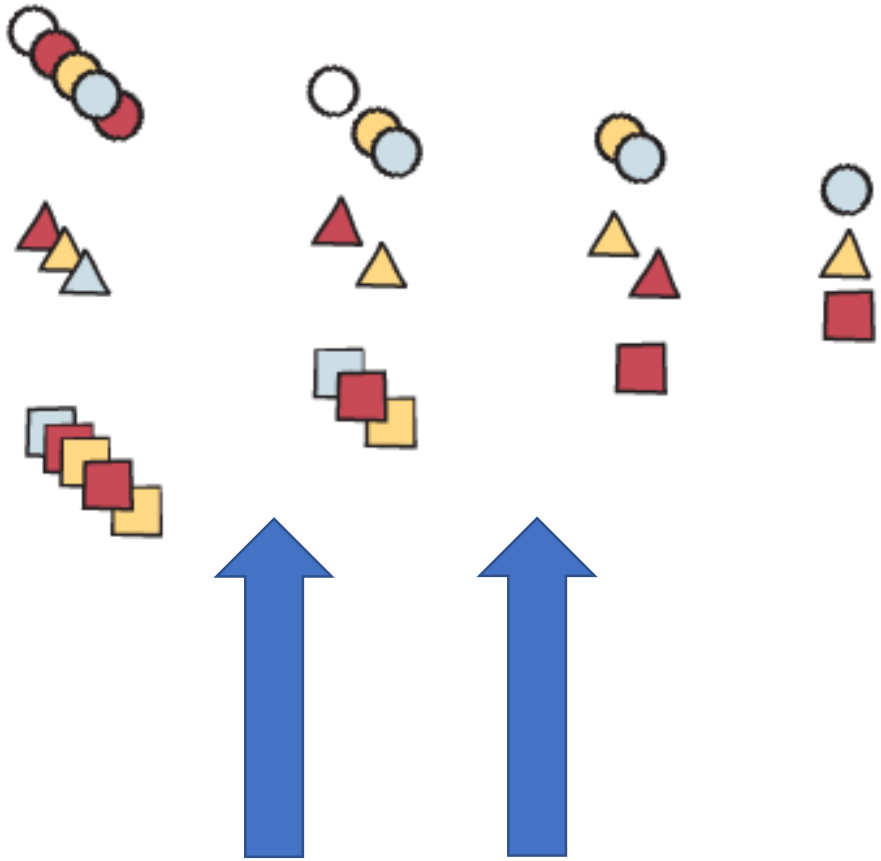
The Happy END

- This became a very successful bike
- It was developed in less than 3 months
- Pedal Works was able to leverage the internet market to drive market share
- Selling price was gradually increased as massive advertisement campaign ramped down
- ….

Single Point Iteration vs Set Based/Concurrent

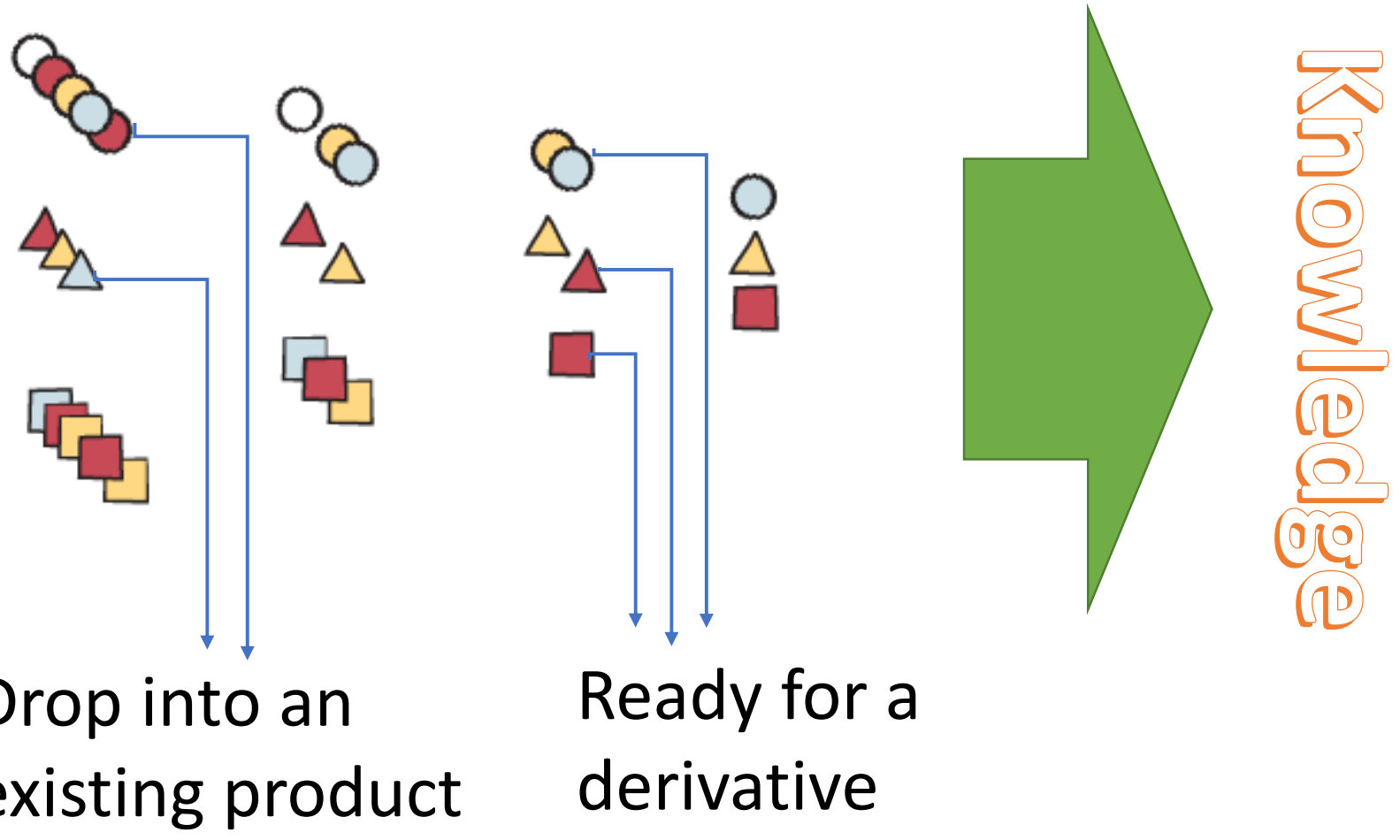


Integration Events



Integration Events

Set Based Concurrent



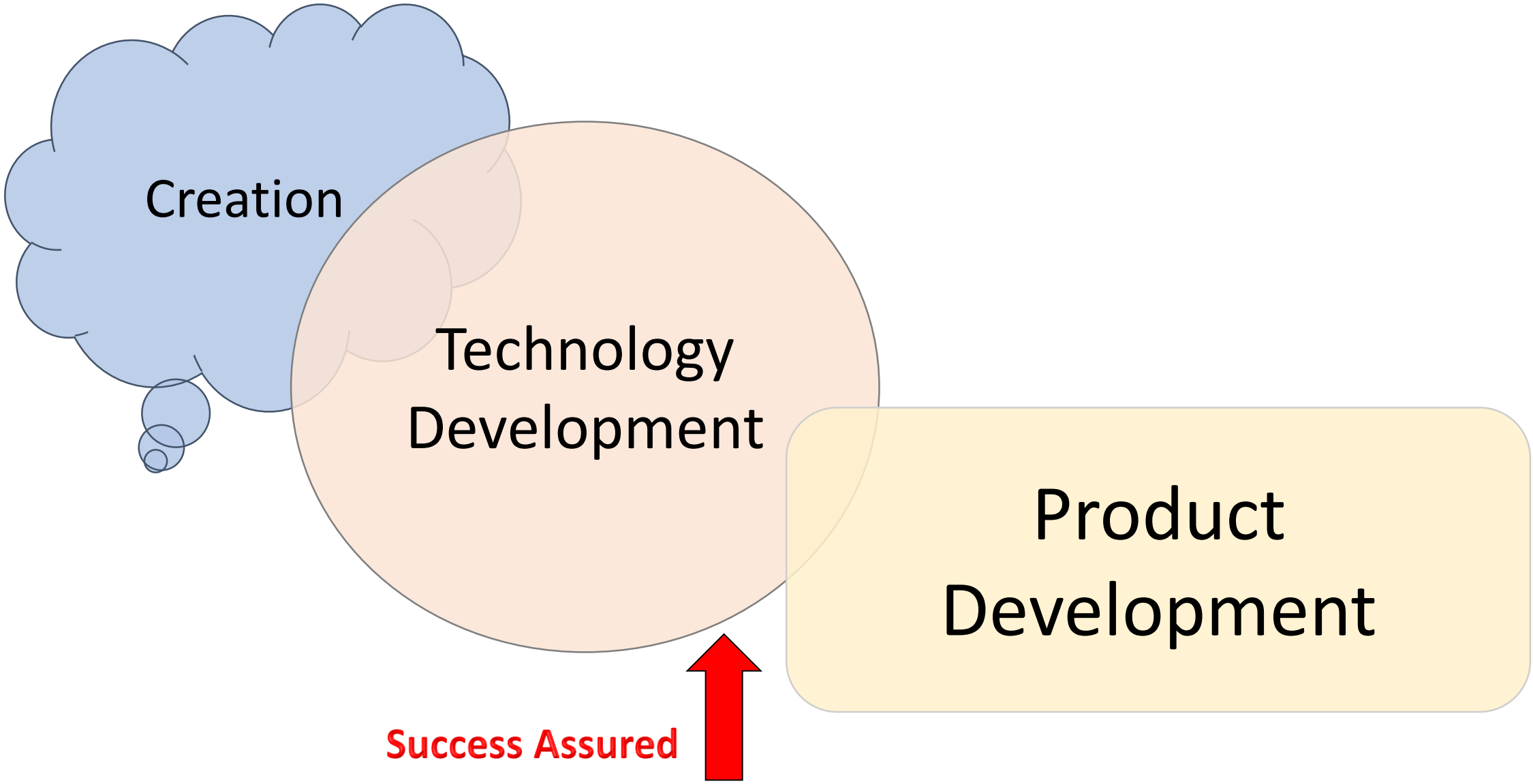
Drop into an existing product

Ready for a derivative

What I learned

- Find knowledge gaps
- Set based approach has higher chance to find the best solution
- More work upfront – pays off later
- Leave options open as long as possible
- Surprised how much more you get

Maybe not the silver bullet but it works well where it fits



Failure is not an option

Lean Product Development

Flow Based

Manufacturing

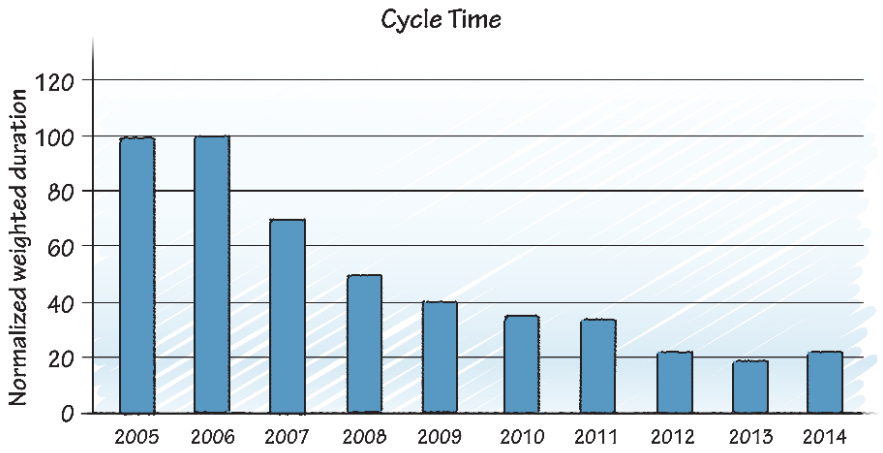
Execution Phase

- Generates company income – and platform for launching innovation
- Inspired by lean manufacturing
- Goodyear 2016 AME Excellence Award - Innovation Center
- 100% delivered on time/target
- **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.

Faster Project Delivery

- *First-mover benefits*
- *Tap new technology*
- *Agile capability*
- *Faster learning and process improvements*
- *Capitalize quickly on cost savings*
- *Better cash flow and faster return on investment (ROI)*
- *Motivated and engaged engineers*
- *……*

Speed Agenda

- Work on the right thing
- Level the Incoming Work
- Schedule to CAPACITY
- Reuse product, components and knowledge
- Mange projects
- Eliminate WASTE
- Create Flow >>> Speed

Incoming Work

- Can an R&D organization handle all incoming work?

Need a Process

Gating
Sharktank
Match with budget
Etc ……..

There is nothing so useless than developing a product that does not sell or makes no money

At this time we HAVE the information needed to make a good decision

Portfolio Management

- Business (and even R&D) projects should not be be considered in isolation
- Consider the TOTAL value of the portfolio (NPV)
- Project decisions must be made based on the change of the total portfolio value

NPV

Net present value (**NPV**) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. **NPV** is used in capital budgeting to analyze the profitability of a projected investment or project.

$$NPV = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} - C_o$$

In this equation:
C_t = net cash inflow during the period t
C_o = total initial investment costs
r = discount rate, and
t = number of time periods

Simple Rules

- Take old ones OUT
- BALANCE
  - Offering
  - risk
- 30% sales from new products (less than 3 years old)
- X% from new CUSTOMERS

Similar to Investment Portfolio

Speed Agenda

- Work on the right thing
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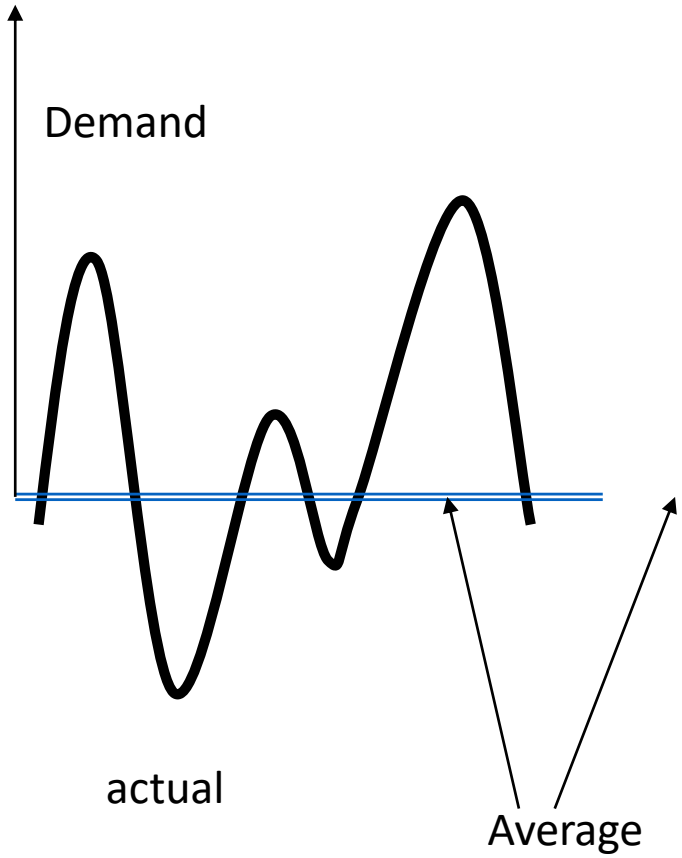
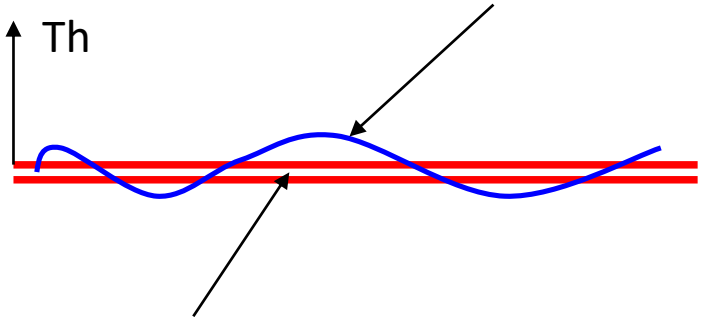
- Schedule to CAPACITY
- Reuse product, components and knowledge
- Mange projects
- Eliminate WASTE
- Create Flow >>> Speed

Incoming Work

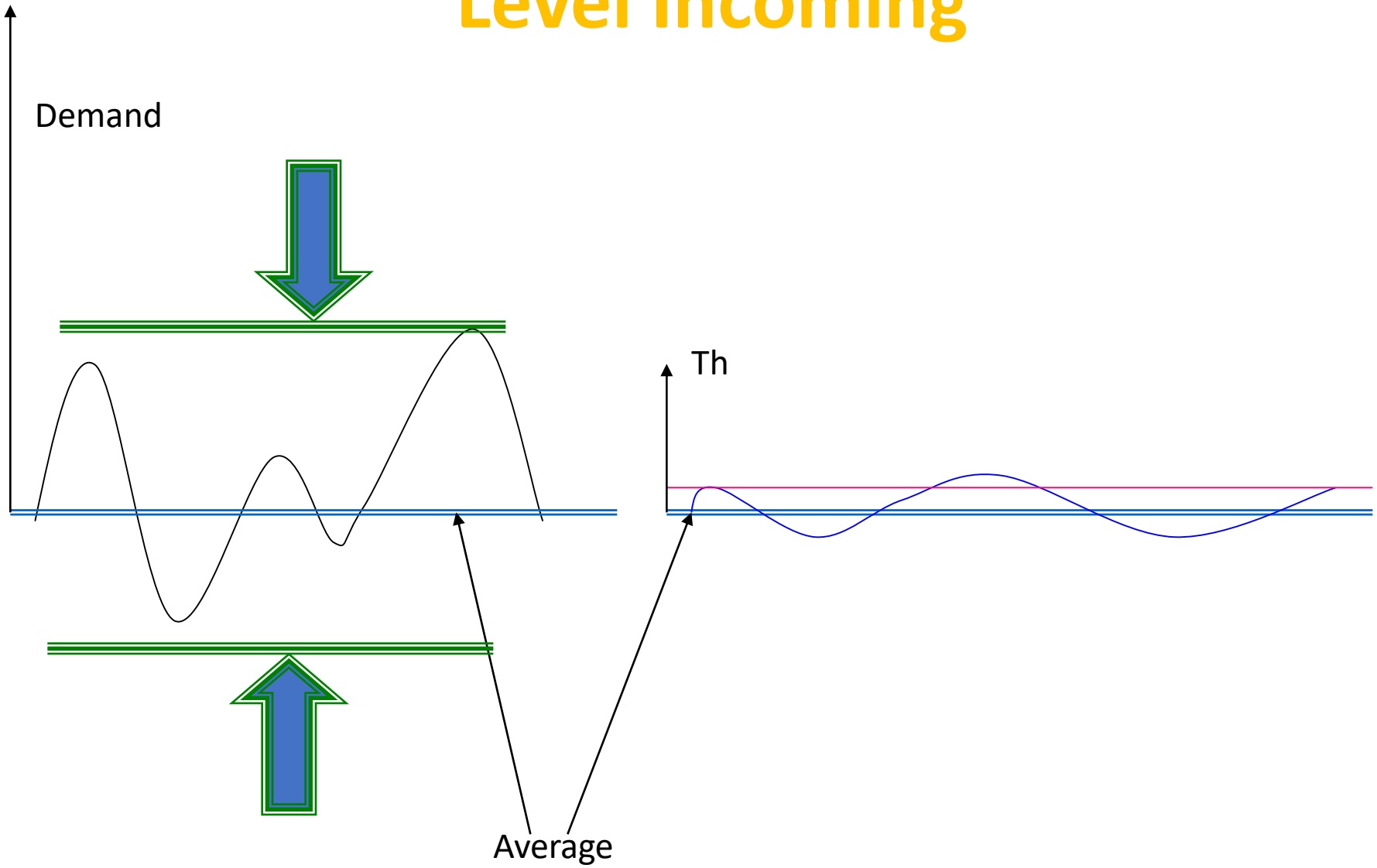


Caused by natural variation of the operation

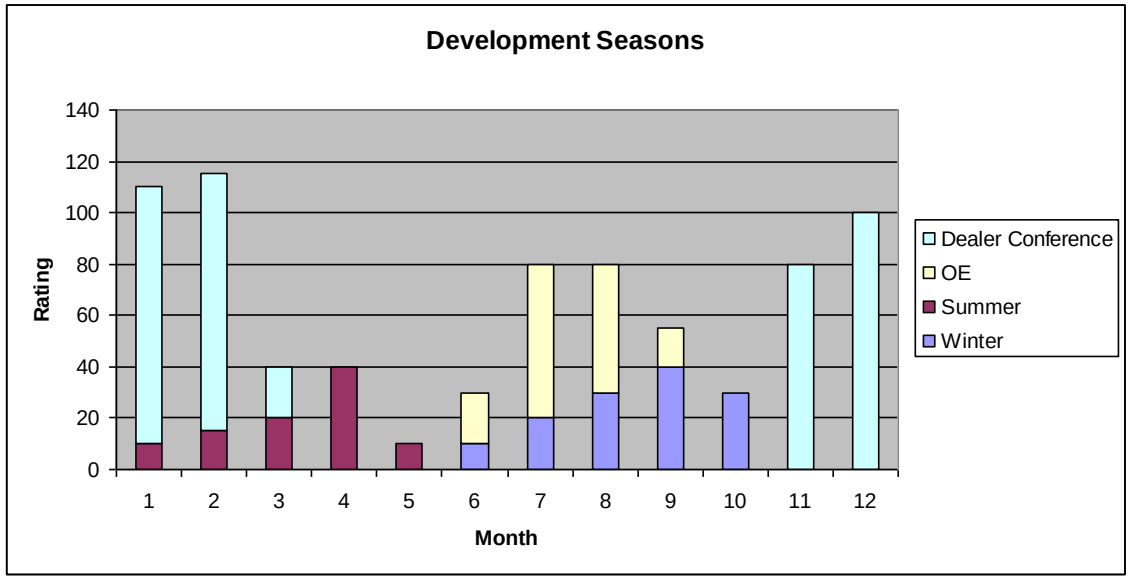


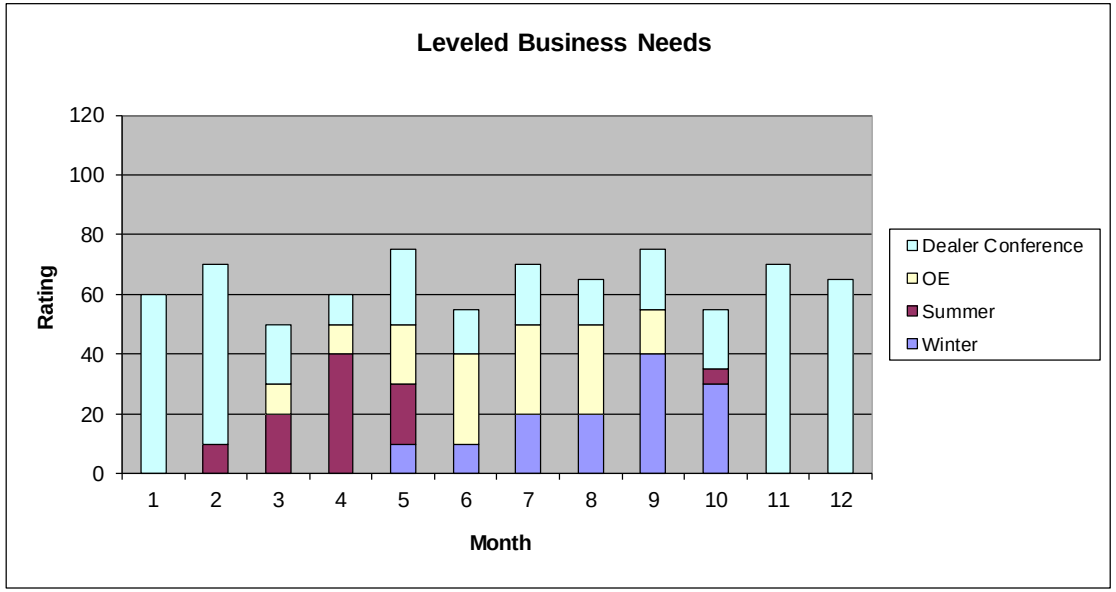
Desirable for any operation

Level Incoming



Leveling Business Needs (HIGHEST LEVEL)





Speed Agenda

- Work on the right thing
- Level the Incoming Work
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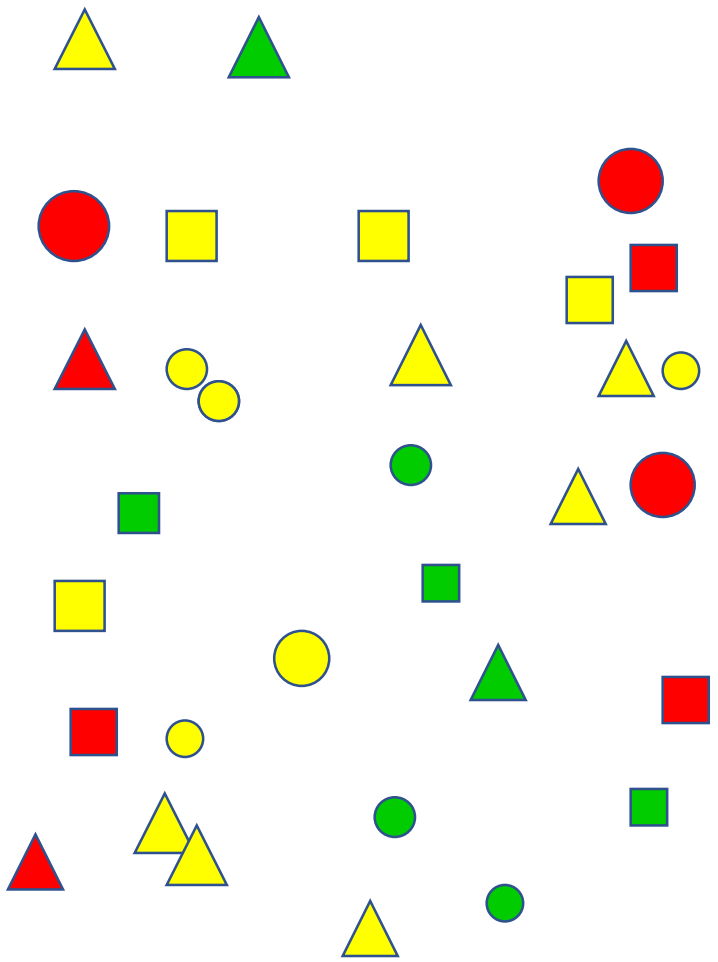
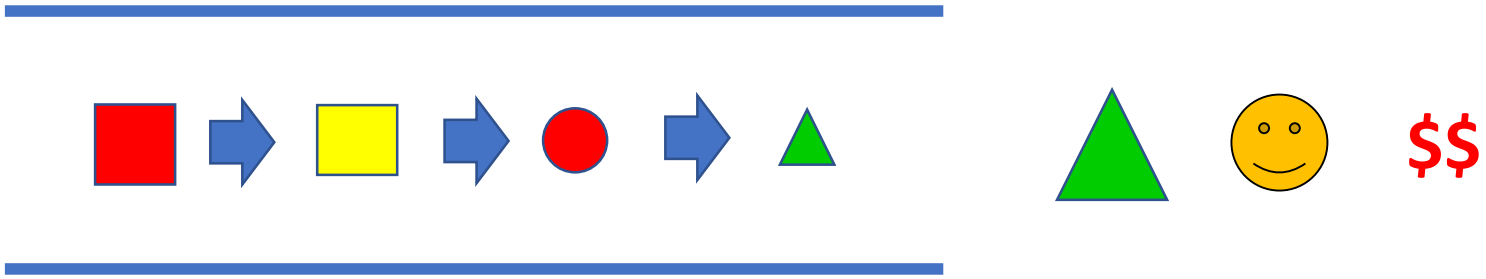
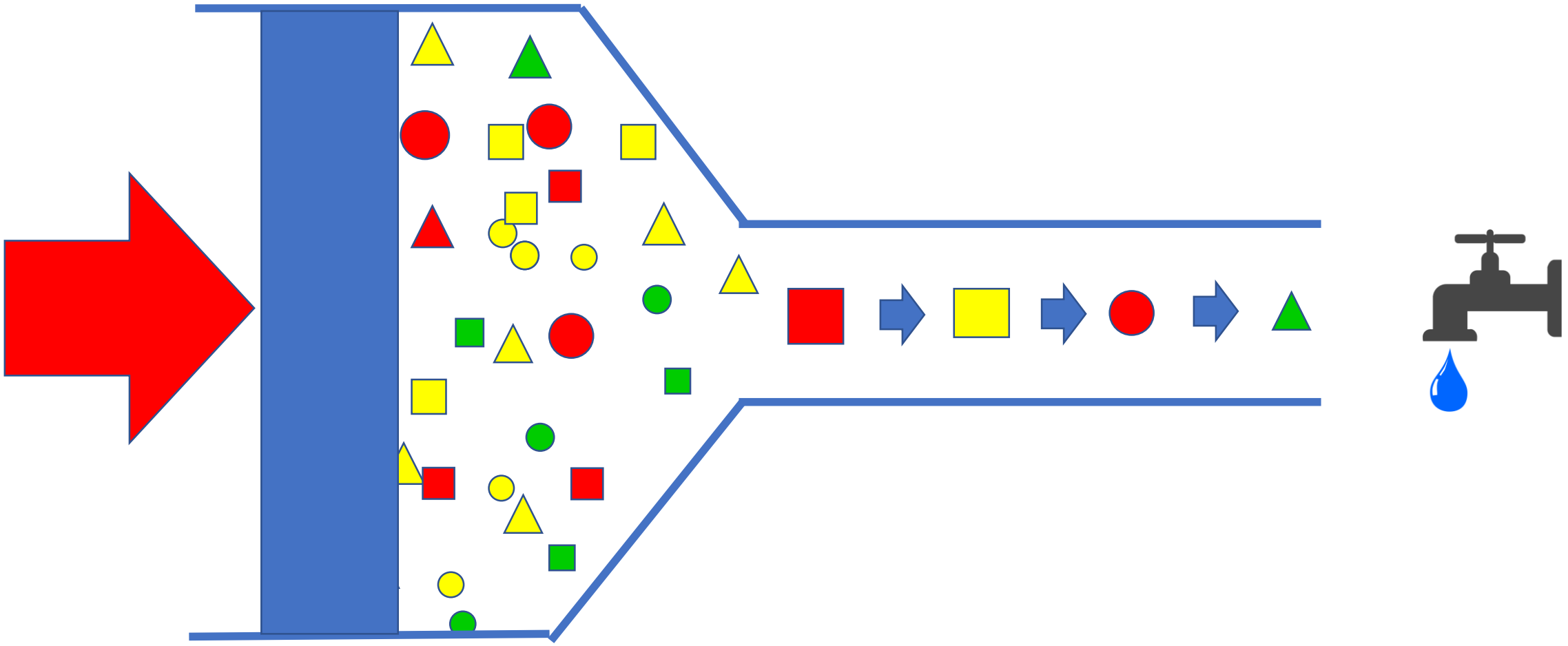
- Reuse product, components and knowledge
- Mange projects
- Eliminate WASTE
- Create Flow >>> Speed

Schedule For Flow





Hydraulic Principle



Speed Agenda

- Work on the right thing
- Level the Incoming Work
- Schedule to CAPACITY
- Reuse product, components and knowledge
- Mange projects
- Eliminate WASTE
- Create Flow >>> Speed

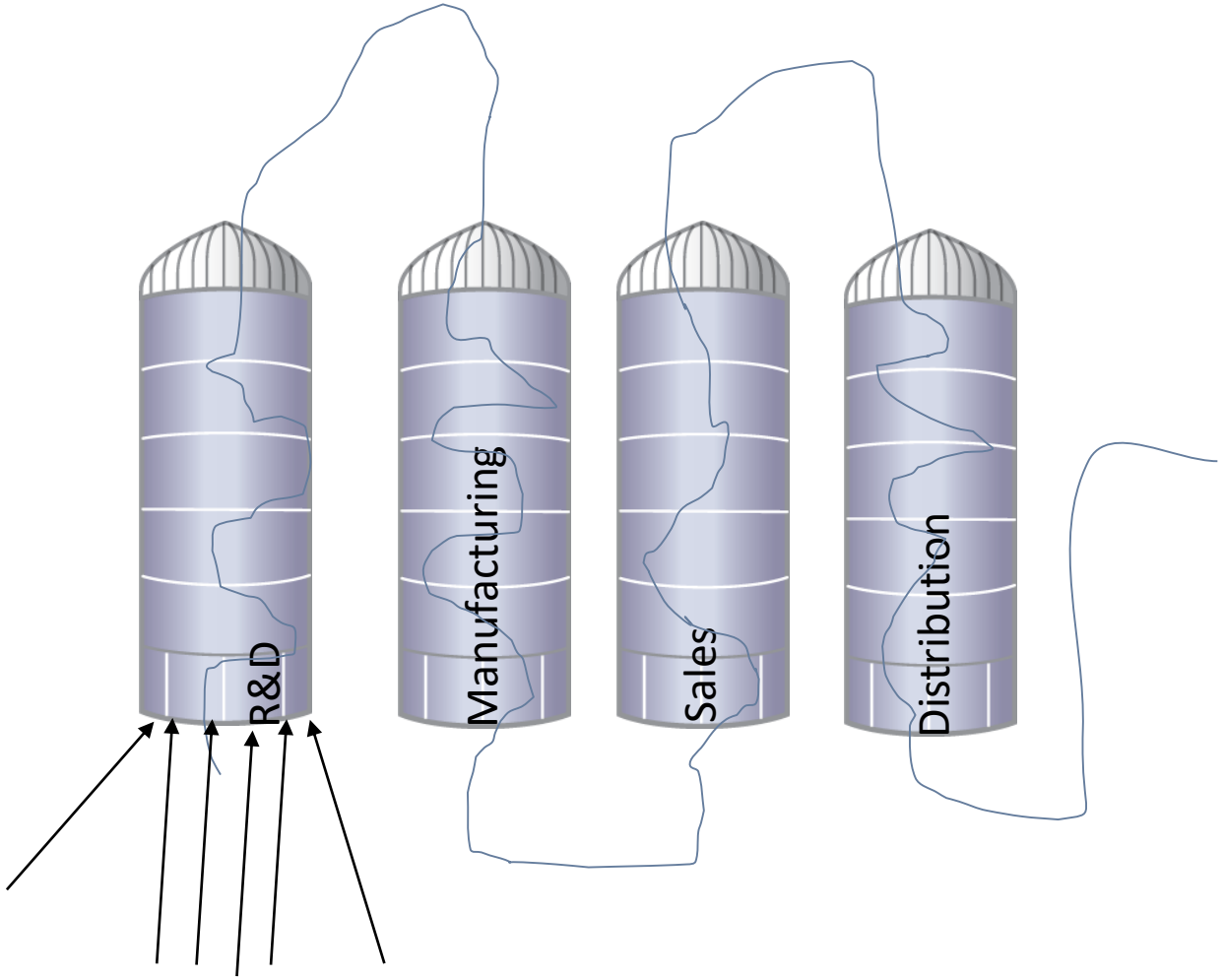
Re-Use

- Product – paint job
- Components
  - Electronics example
  - Goodyear catalogue
- Knowledge

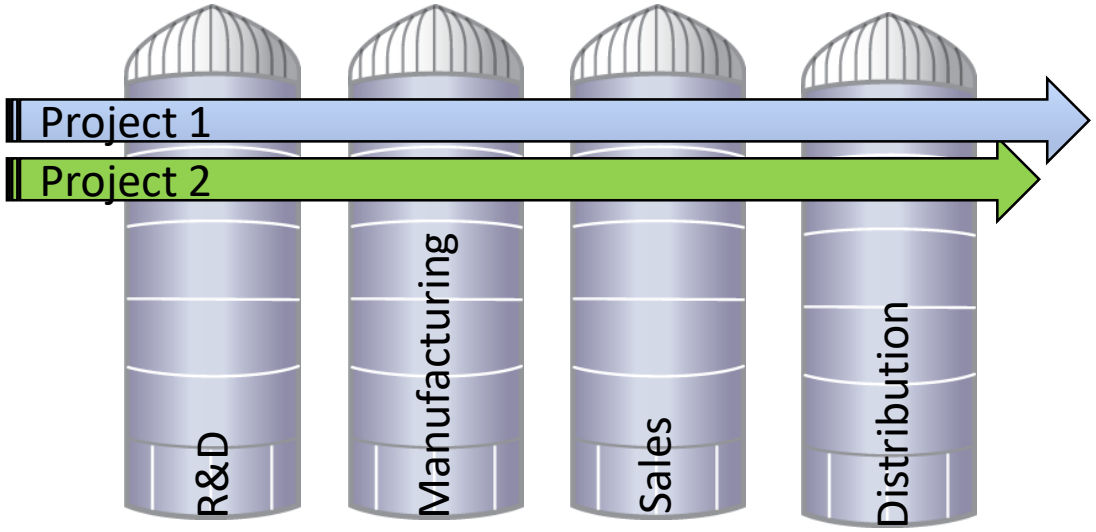
Speed Agenda

- Work on the right thing
- Level the Incoming Work
- Schedule to CAPACITY
- Reuse product, components and knowledge
- Mange projects
- Eliminate WASTE
- Create Flow >>> Speed

Functional Speed



Matrix



The Importance of Project Management

- Projects cross functional boundaries
- Good project management becomes essential
- Project management is one of the main contributors to speed
- Project management is a skill like many other skills in R&D
- PMO should be established as a FUNCTION

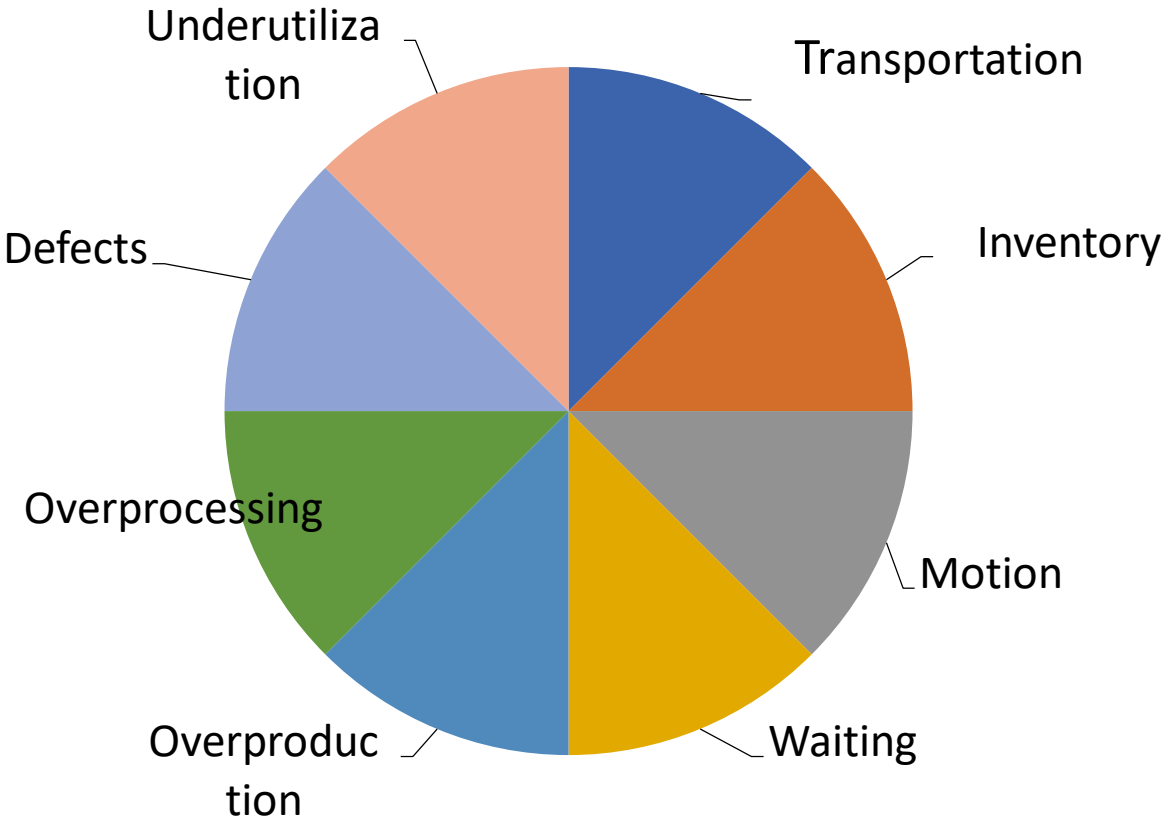
Speed Agenda

- Work on the right thing
- Level the Incoming Work
- Schedule to CAPACITY
- Reuse product, components and knowledge
- Mange projects
- Eliminate WASTE
- Create Flow >>> Speed

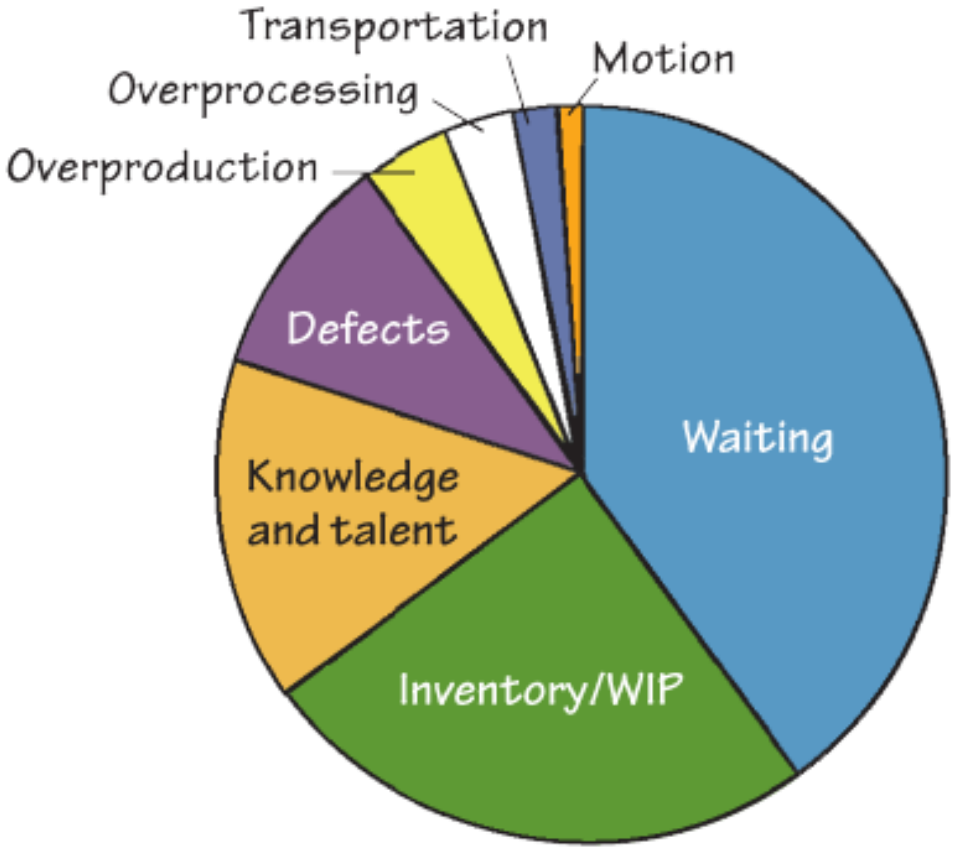
Biggest R&D wastes

1. Not doing anything
2. Functional ahead of overall
3. Not improving on the highest level
4. Developing the wrong product

Waste


Underutiliza
tion
Transportation
Defects
Inventory
Overprocessing
Motion
Overproduc
tion
Waiting

Waste


Transportation
Motion
Overprocessing
Overproduction
Defects
Waiting
Knowledge and talent
Inventory/WIP

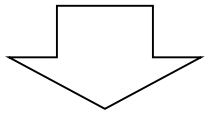
Specific Product Development Waste

1. Work on the wrong project
2. Not knowing how value is created (hospital)
3. Functional efficiency over creating value
4. Making partial improvements (furniture)

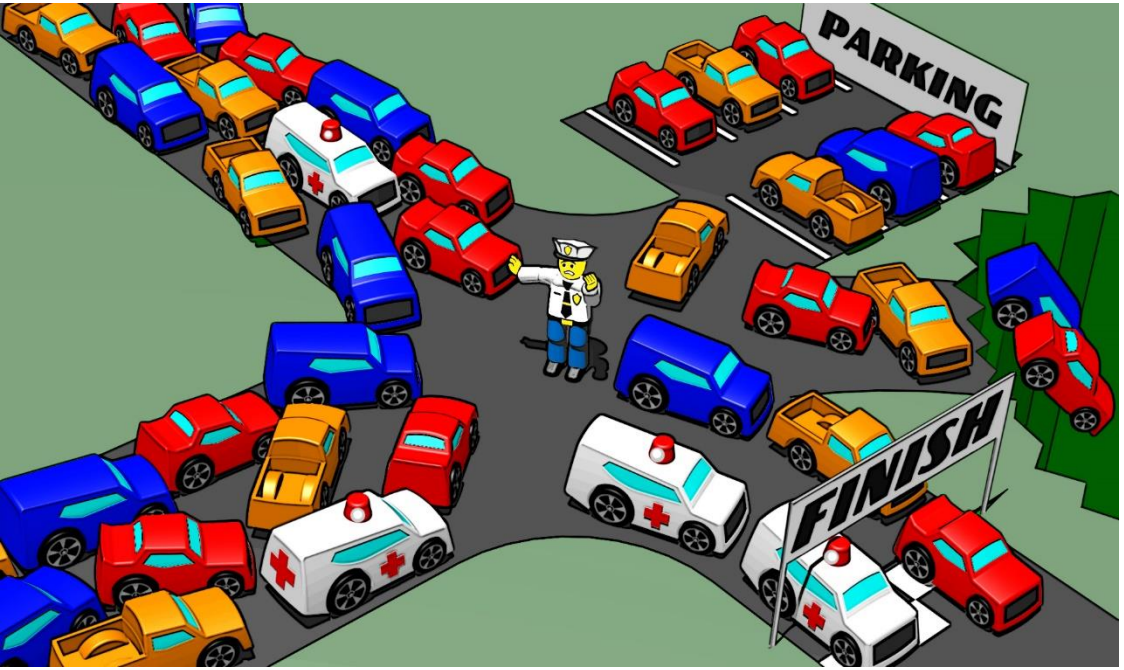
Speed Agenda

- Work on the right thing
- Level the Incoming Work
- Schedule to CAPACITY
- Reuse product, components and knowledge
- Mange projects
- Eliminate WASTE
- Create Flow >>> Speed

FLOW

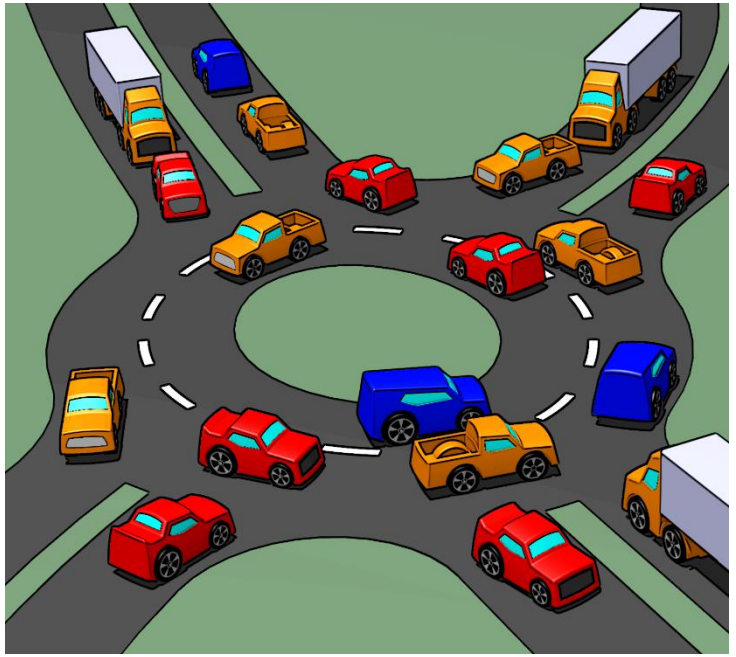


SPEED



From

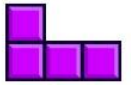
To

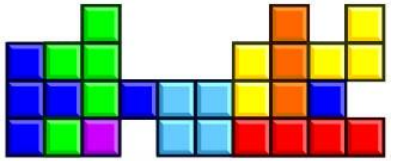


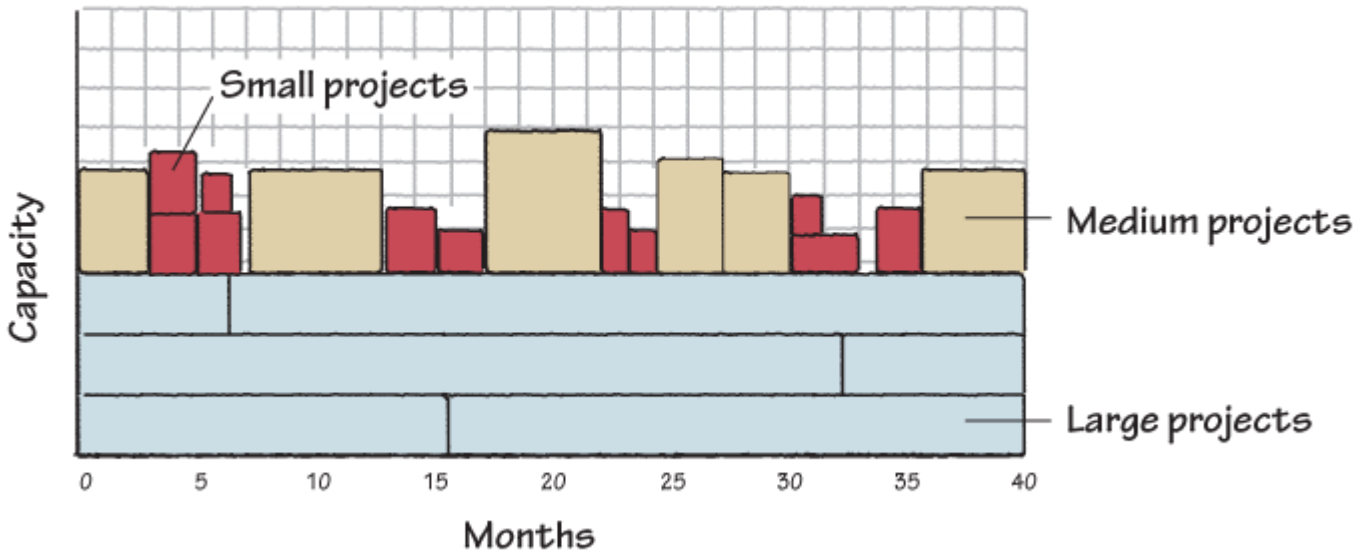
Fast is Better Than Slow

- ❑Manage work in small pieces
- ❑Visual management
- ❑Cadence
- ❑Multitasking
- ❑Single piece flow or CONWIP
- ❑Level work with (70% of) capacity
- ❑Late start
- ❑Concurrent work
- ❑Critical path management
- ❑5S
- ❑Colocation
- ❑Pull
- ❑Standard work / flexible capacity

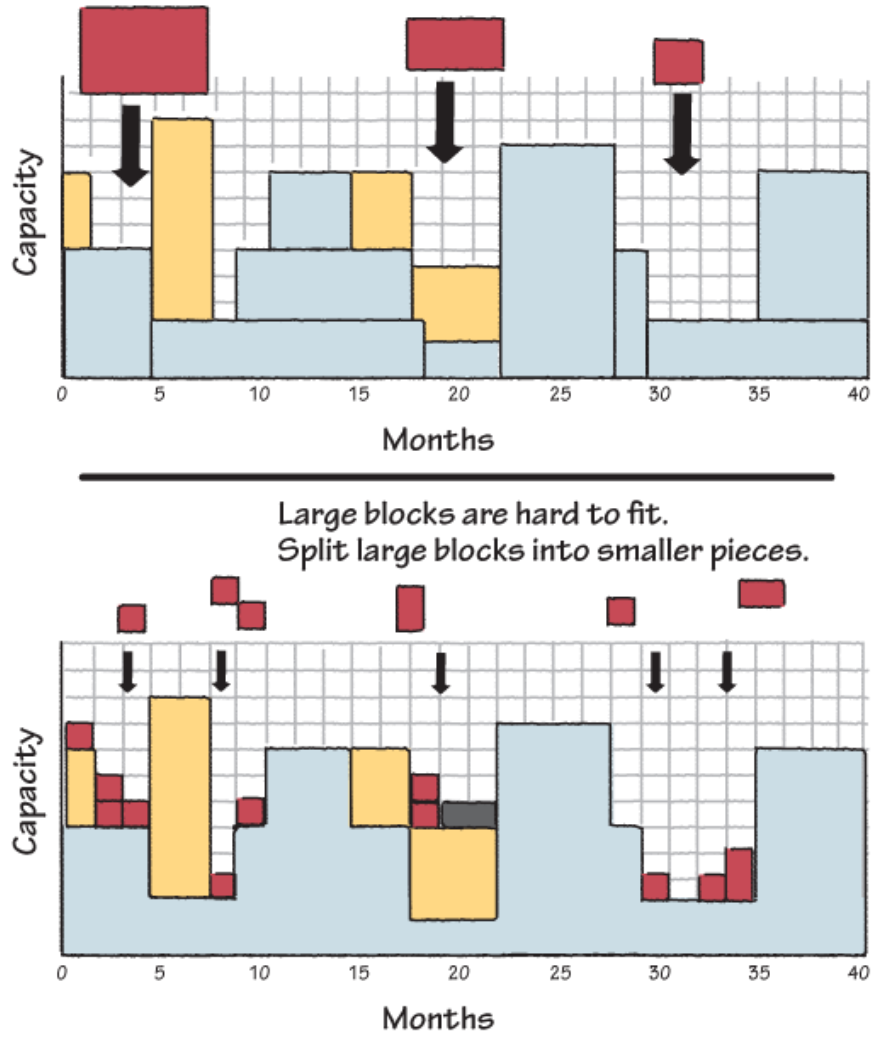
Tetris Schedule



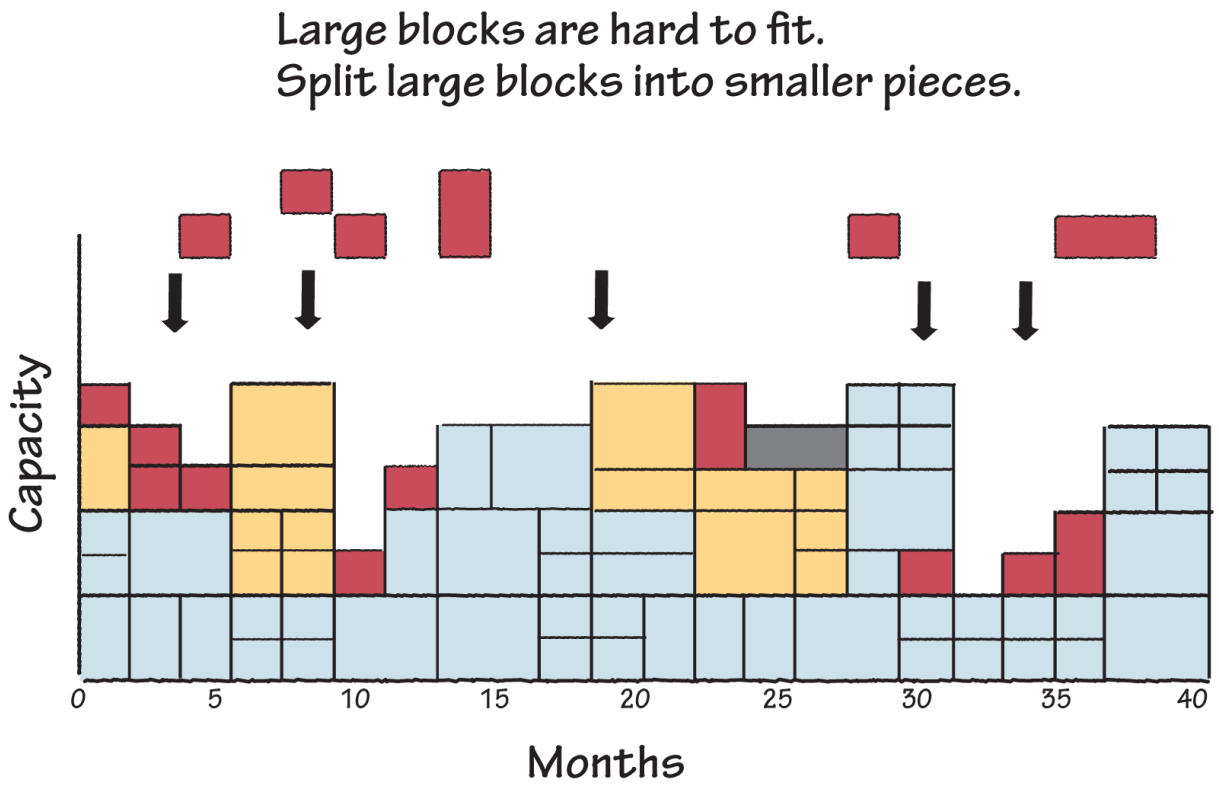




Tetris Schedule

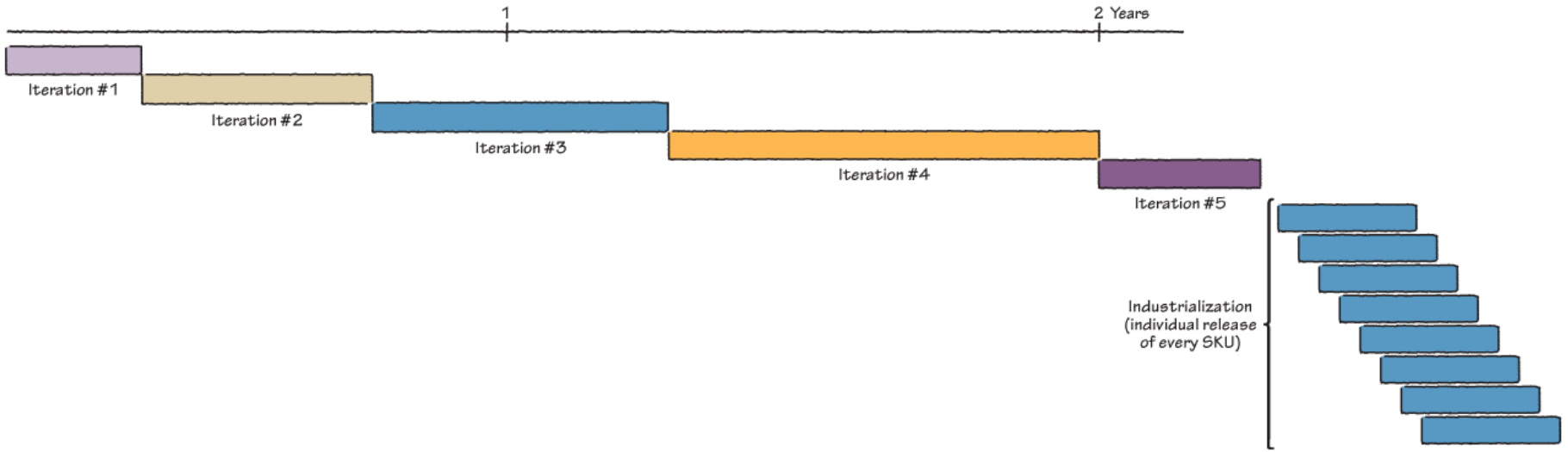


Managing Projects in Small Steps

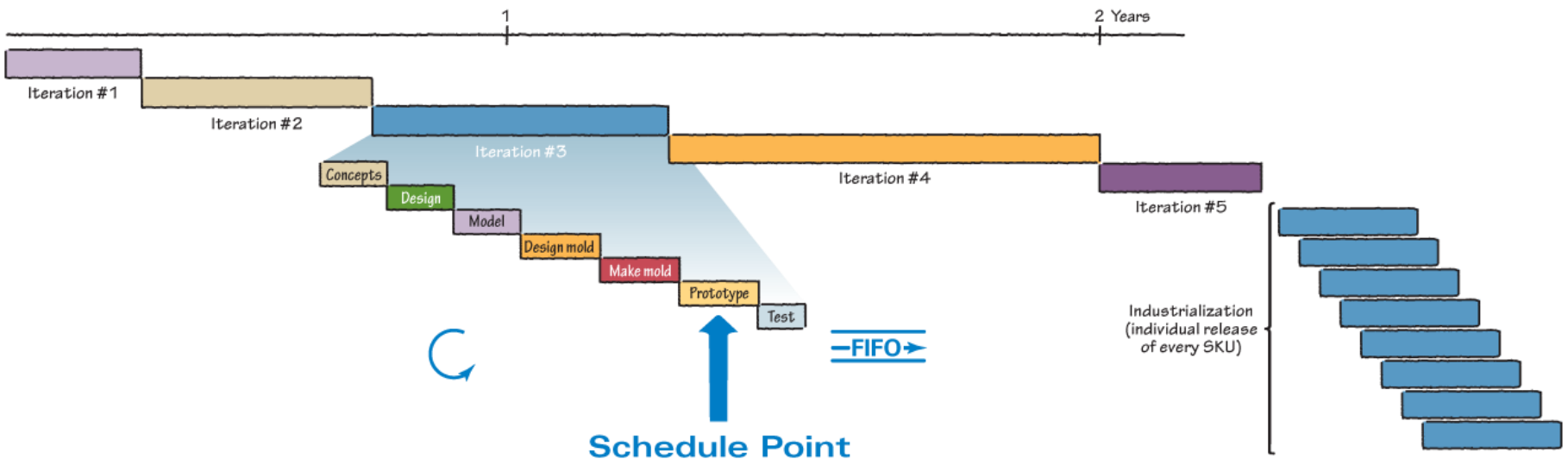


- They are easier to schedule
- Allow better risk management
- Create knowledge faster
- Create agility

Goodyear Iterations



Goodyear Iterations



Advantages of Working in Small Cycles

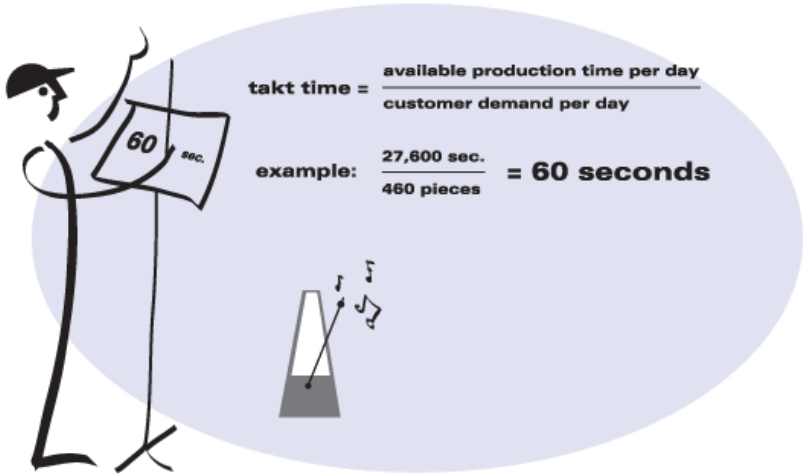
- Easier to schedule
- Uncontrollable variability/delay .. get spread over may chunks, reducing the impact
- Better risk management
- Allocate money in small chunks
- Faster learning
- Ability to get back with the customer and adjust
- Launch when good enough

Fast is Better Than Slow

- ❑Manage work in small pieces
- ❑Visual management
- ❑Cadence
- ❑Multitasking
- ❑Single piece flow or CONWIP
- ❑Level work with (70% of) capacity
- ❑Late start
- ❑Concurrent work
- ❑Critical path management
- ❑5S
- ❑Colocation
- ❑Pull
- ❑Standard work / flexible capacity

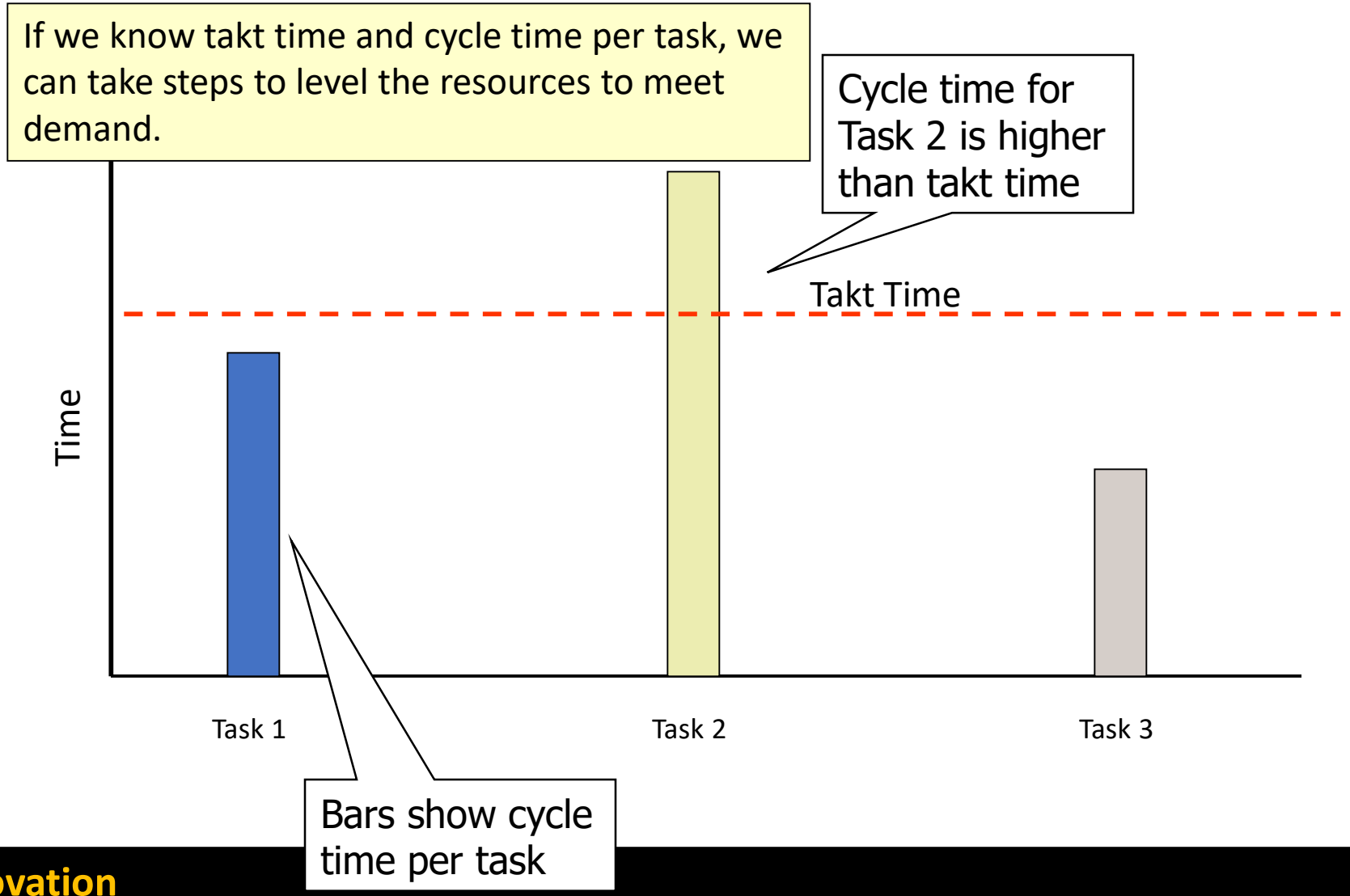
Observations

- The takt is sacred
- All kinds of models are produced on the same line
- Different staffing at stations
- Filler jobs – idle time
- Workers are skilled in task
- Job aids

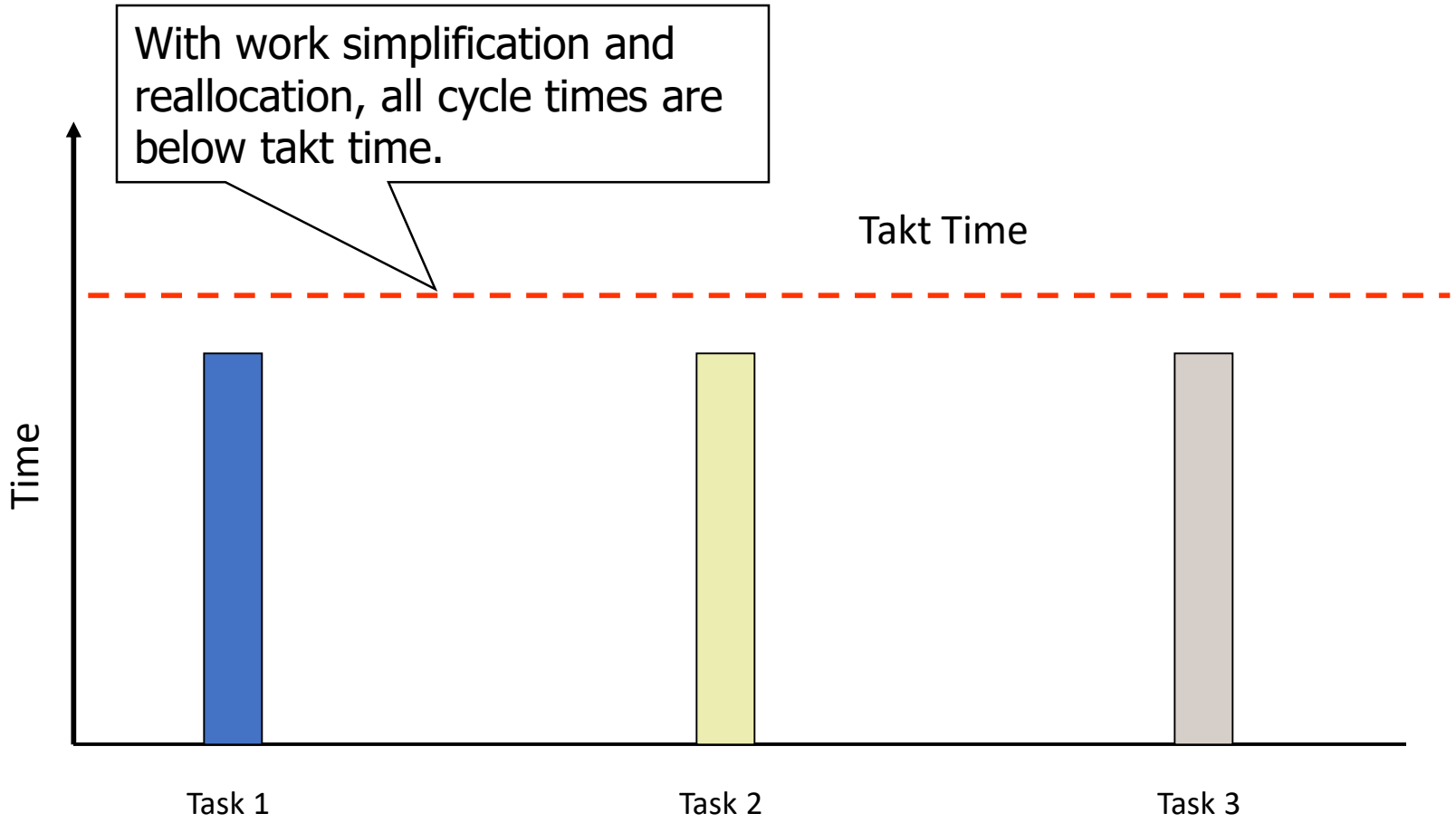


An example of calculating takt time.

Resource Leveling



Resource Leveling



Fast is Better Than Slow

- ❑Manage work in small pieces
- ❑Visual management
- ❑Cadence
- ❑Multitasking
- ❑Single piece flow or CONWIP
- ❑Level work with (70% of) capacity
- ❑Late start
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- ❑Standard work / flexible capacity

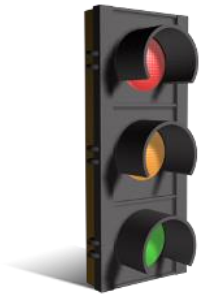
Multitasking

- Exercising, listening to music and talking or cooking and talking on the cell phone could be considered doing two or more things at the same time!
- Doing two projects at the same time is not as easy – normally one is being worked on, the other one waits.
- This multi-task game may be a little like trying to handle too many projects at the same time…

http://www.kongregate.com/games/IcyLime/multitask

Stop and Go

- A lot of people who think they multitask are actually only working on one task at the same time – all other tasks wait.
- This leads to “stop-and-go.”
- Doing a task in “stop-and-go” mode adds extra time due to “restart delays.”
- A good analogy is traffic:
  - Red lights
  - Stop Signs
  - Roundabouts



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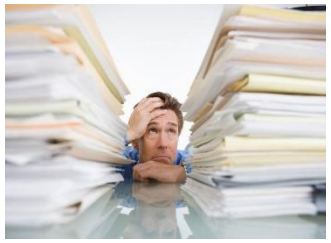
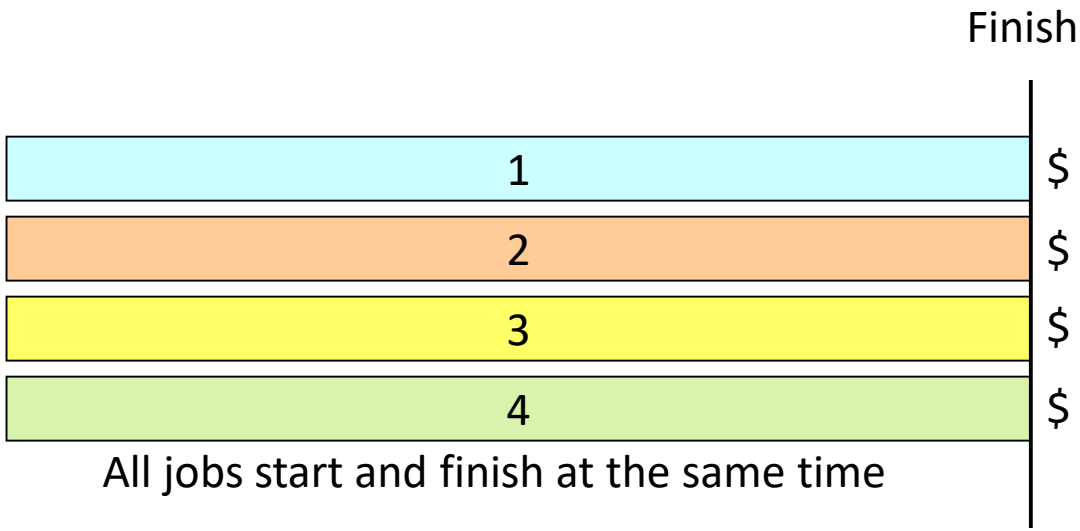
Little's Law

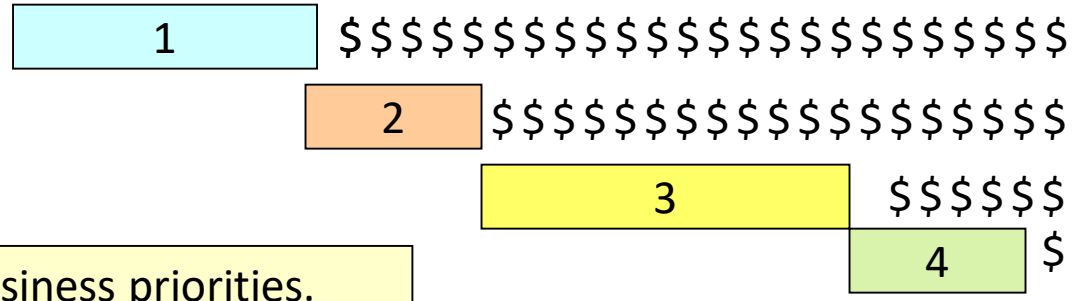
$$CT = \frac{WIP}{Th}$$



Multi-tasking (= Batching)
One Engineer, Four Jobs



WIP = 4 jobs
Average cycle time = 1 (year)
No economic value until all jobs are complete.



WIP = 1 job
Average cycle time = 0.25 (year)
Economic value starts after 1st job is complete.

1,2,3,4, = business priorities.
The delay of #4 is less costly than the delay of #1.

Note: This is multi-tasking by the same resource

Multitasking

One major project per engineer at one time

- Must have back-up and filler tasks
- People can only do one complicated task at one time
- Can lead to mistakes / poor quality
- Task switching is inefficient – often result of too many priorities
- Multitasking often root cause of slow progress

Fast is Better Than Slow

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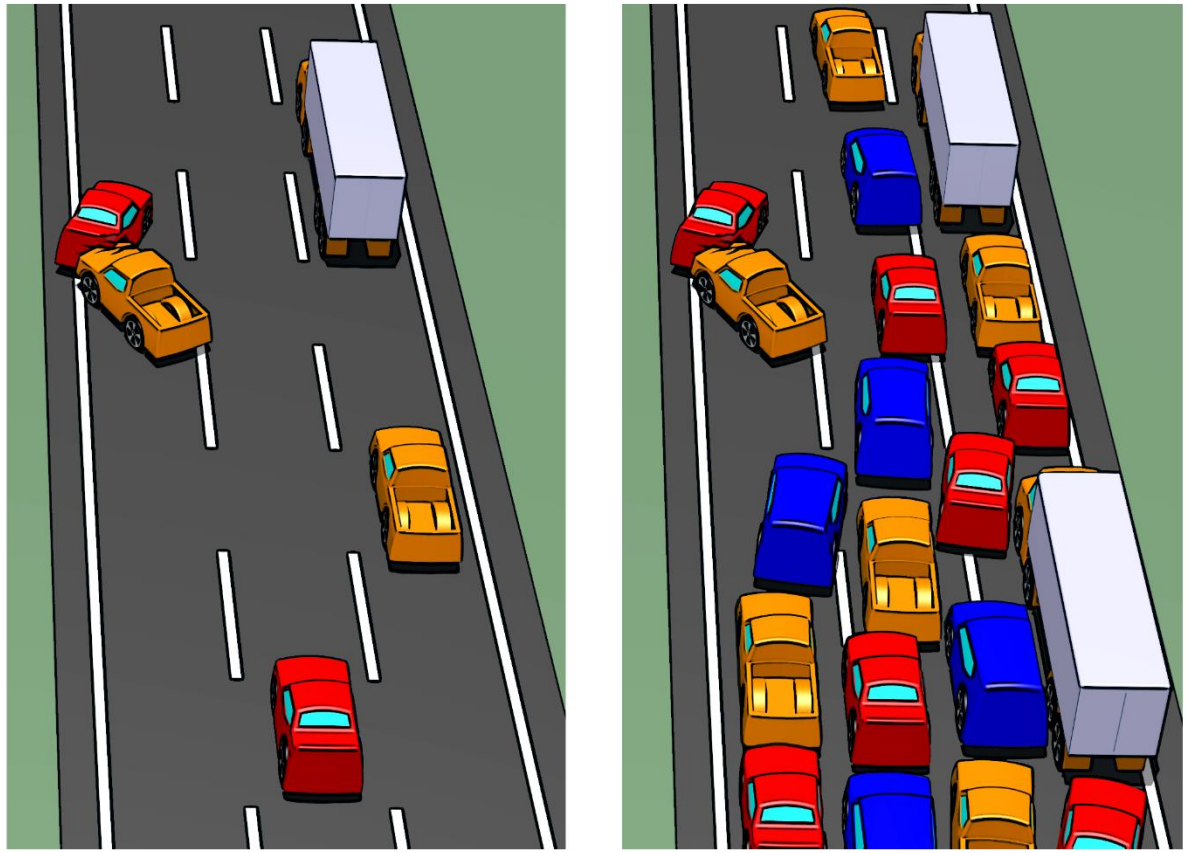
More Traffic Analogies

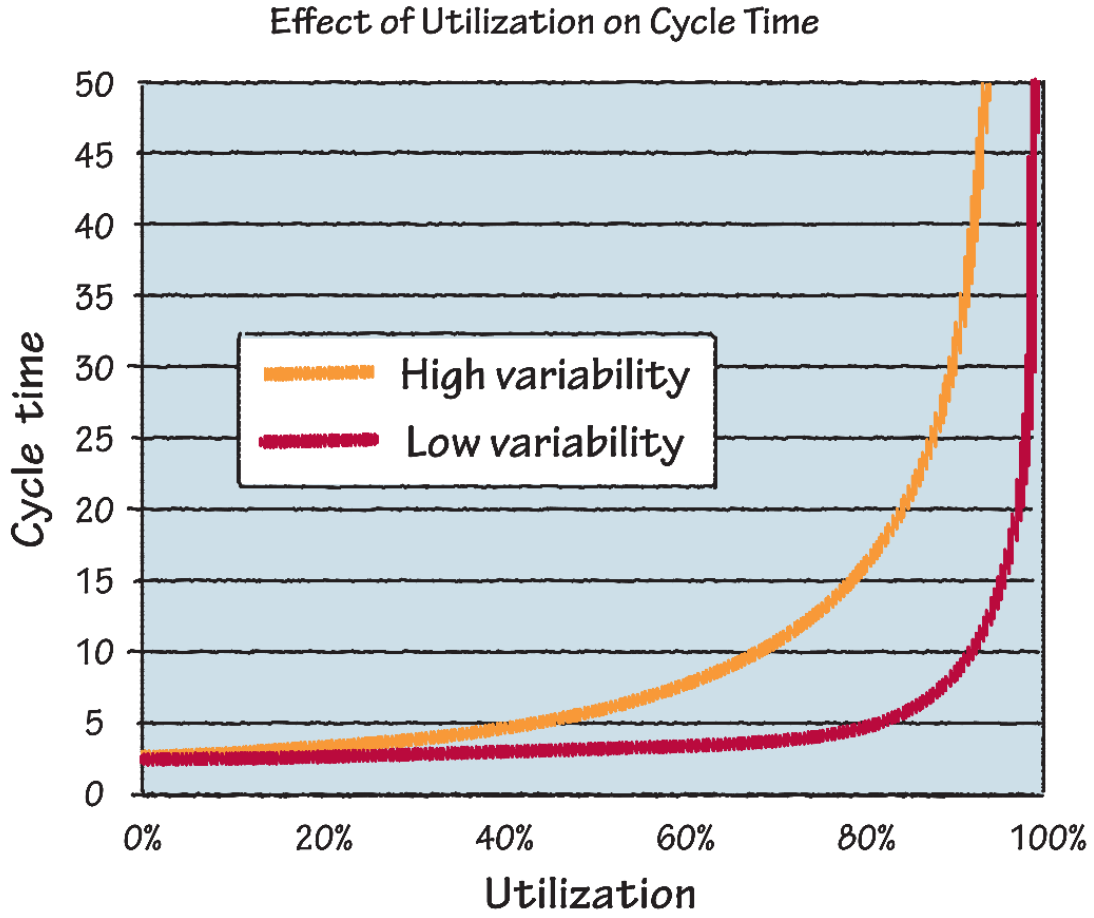
5:00 AM



5:00 PM

Utilization and Cycle Time

Kingman Equation



*The basic relationship:

CT = Average Processing Time * (Utilization Ratio / (1-Utilization Ratio)).

Search “Kingman’s formula” and related for more information.

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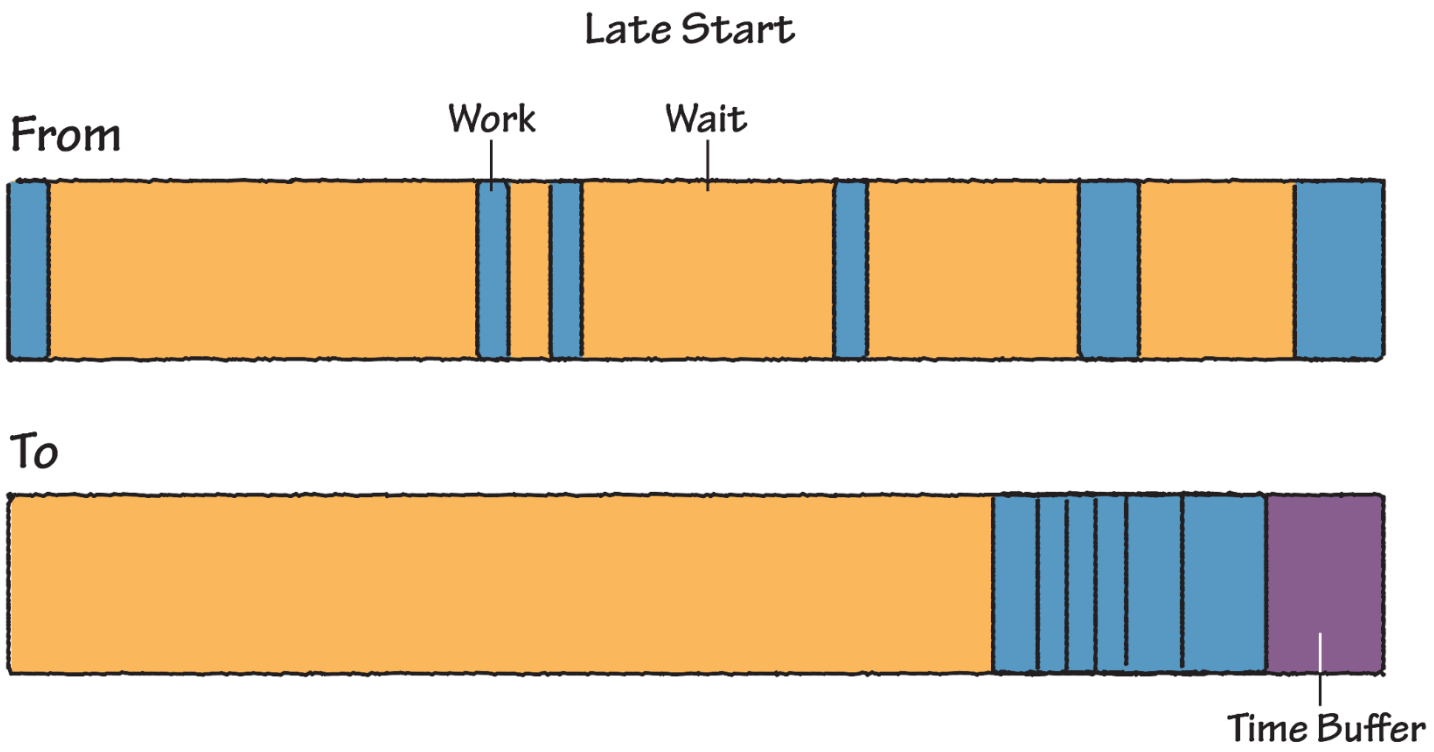
Late Start



Late Start

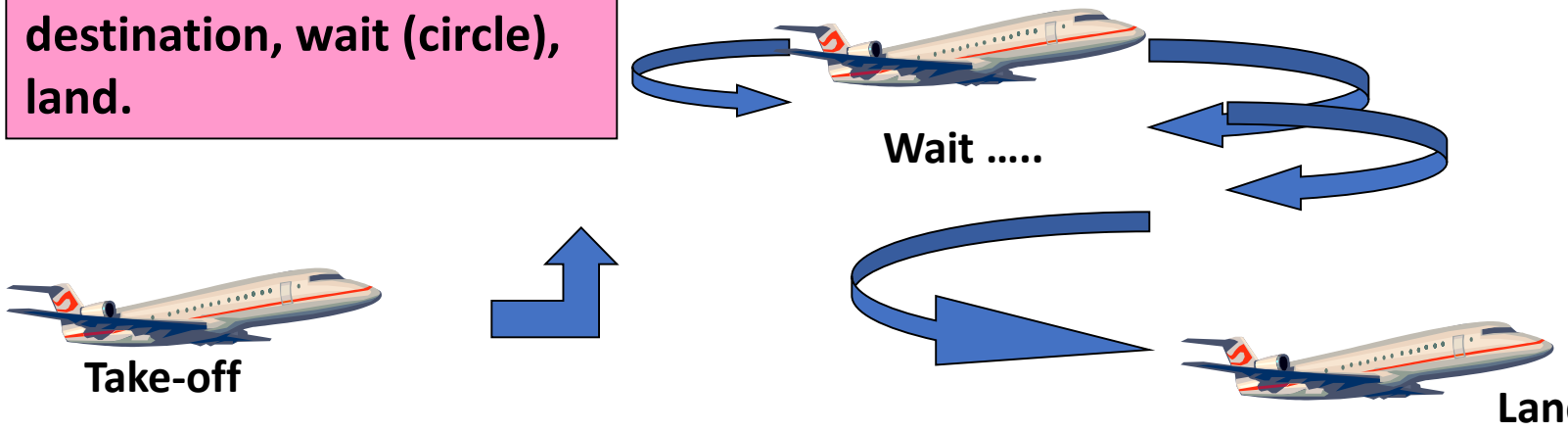
Every iteration is started as late as possible but with enough time to finish, including a small buffer to account for variability

- Dealing with perishable information
- Manage changes
- Lock in designs as late as possible
- Dealing with engineers (Parkinson Principle)
- Investment
- WIP or inventory
- Latest technology and opportunities

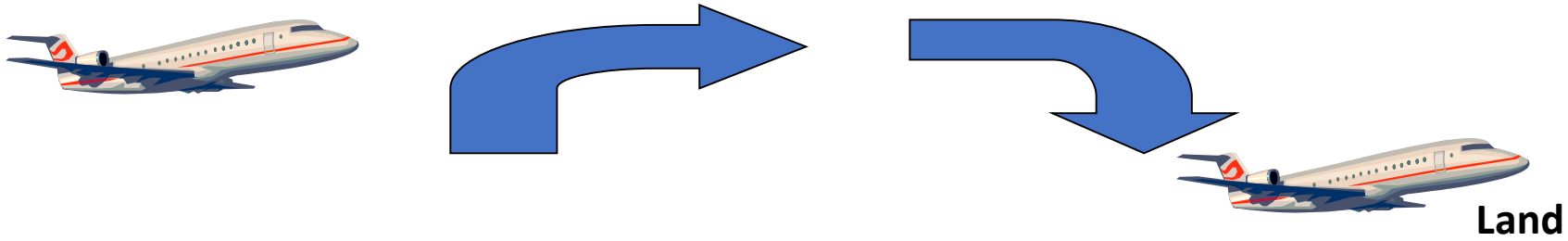
Start late to finish on time.

Lean Air Traffic Control: The Model for GIC

Take-off, fly to destination, wait (circle), land.

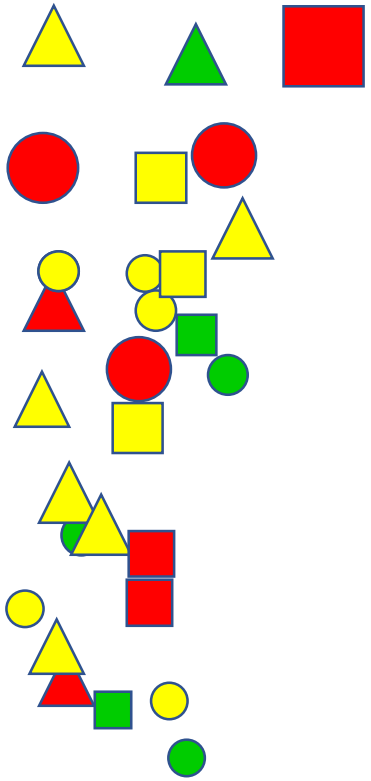


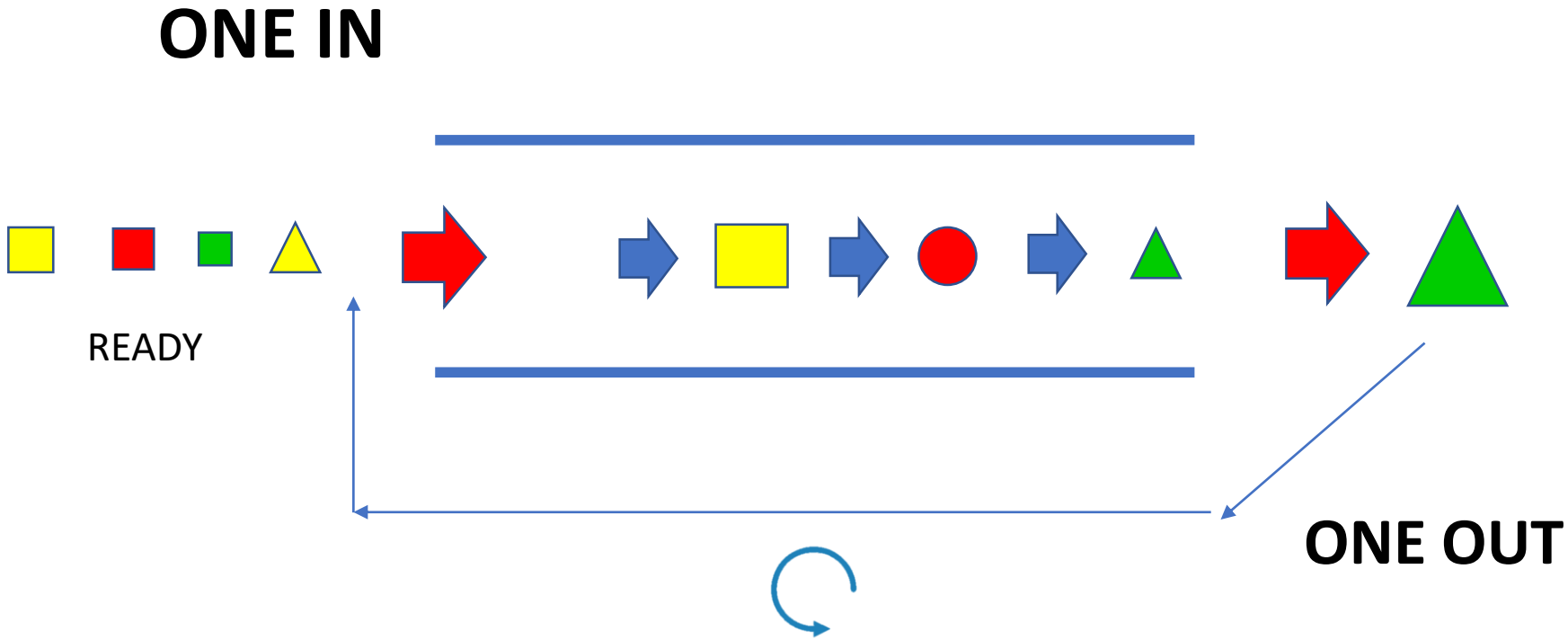
Wait for the take-off, fly to destination, land.



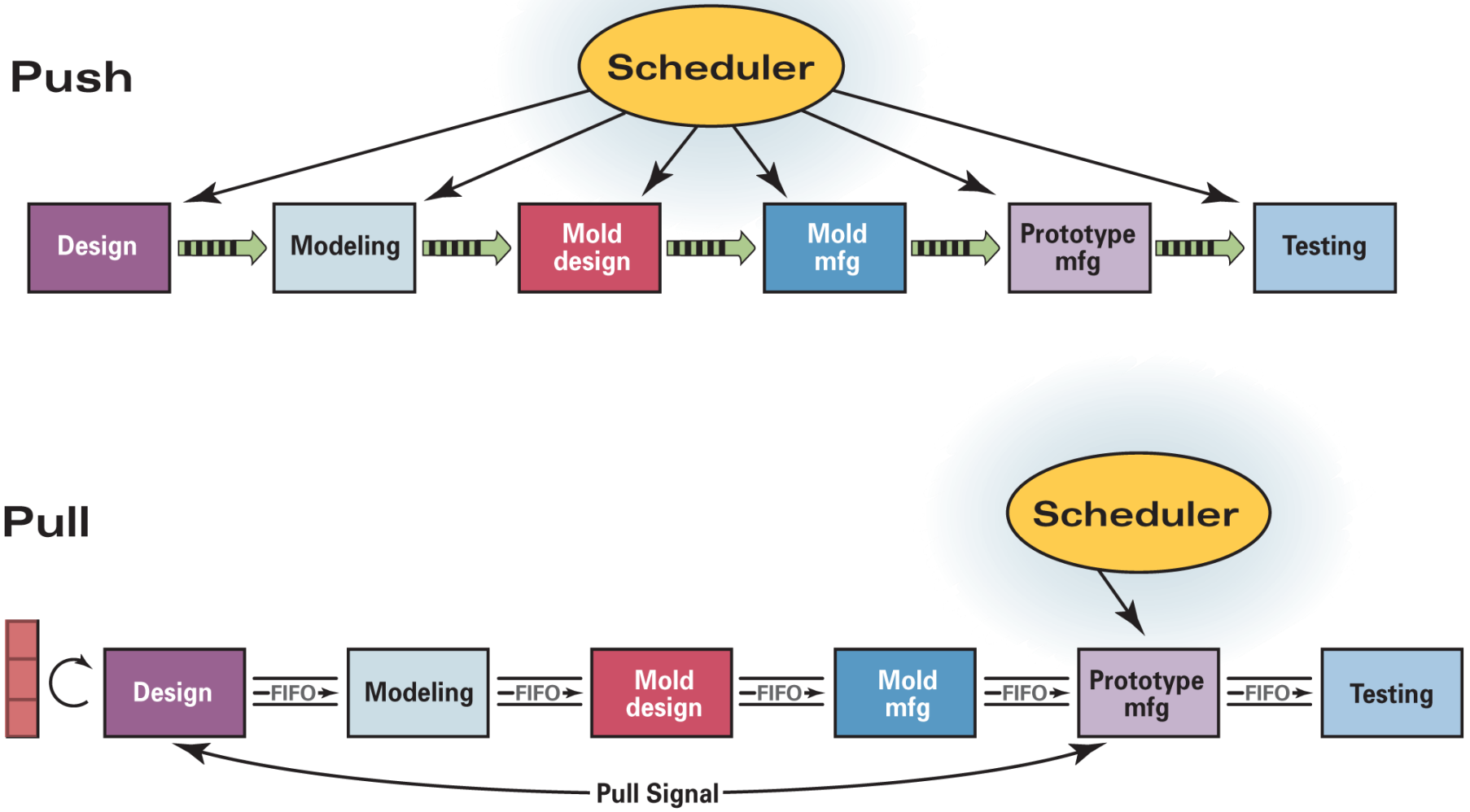
Pull

Virtual
Queue





Push and Pull



Advantages/Disdvantages

- Adjust for variability - Self adjusting – speed up, slow down
  - ✓ No tires in the aisles
- Keeps the WIP constant

- But it is a little slower

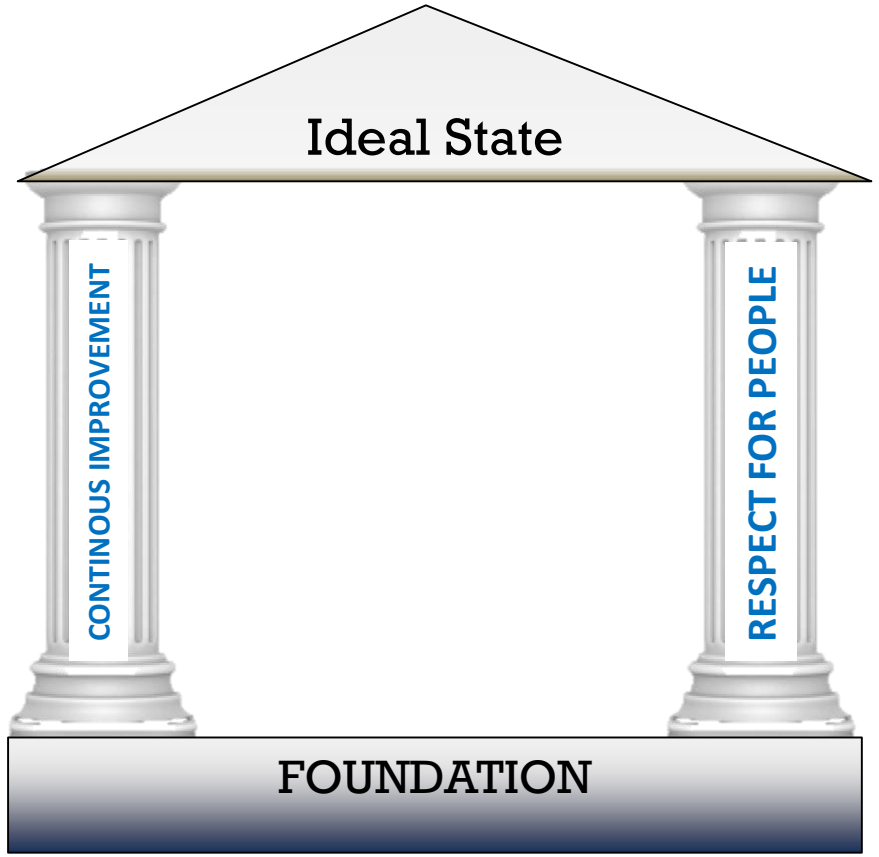
Survey?

- ❑ Process
- ❑ People

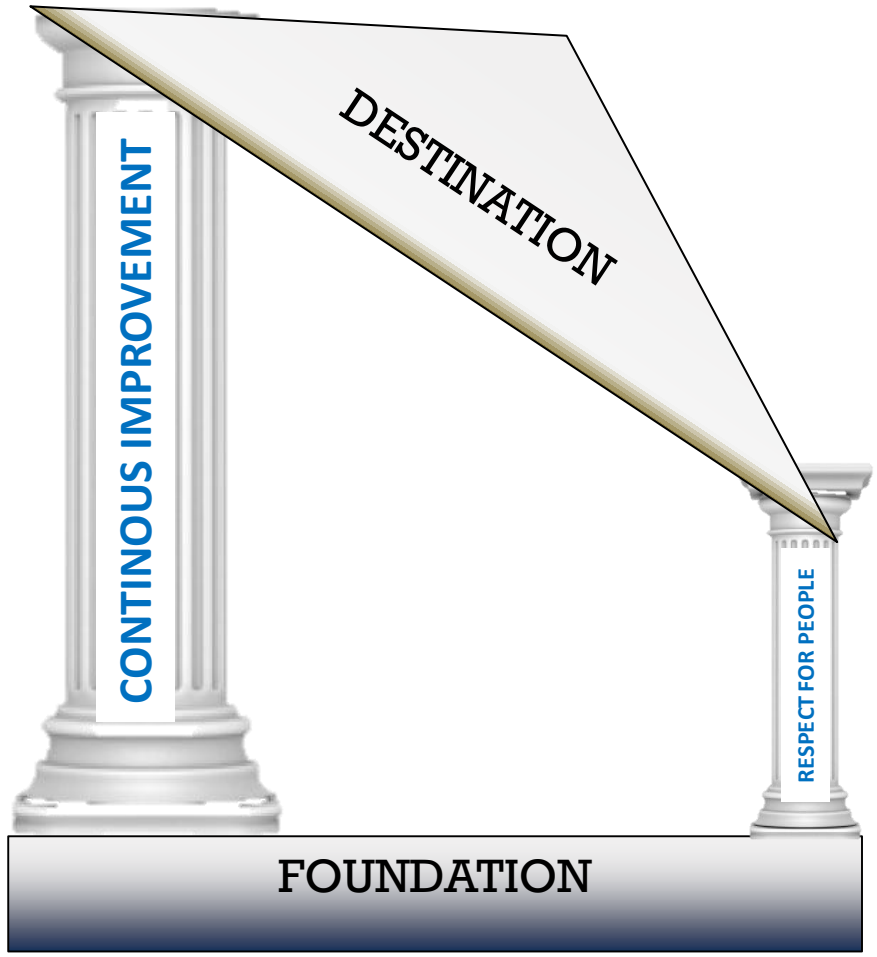
So why the obsession with TPS

Or is TPS the Toyota **PEOPLE** System

(my) Desired State



Current State



Average of 70% of people are not engaged*

*Jerry Solomon - Lean Frontiers conference, San Antonio 2016

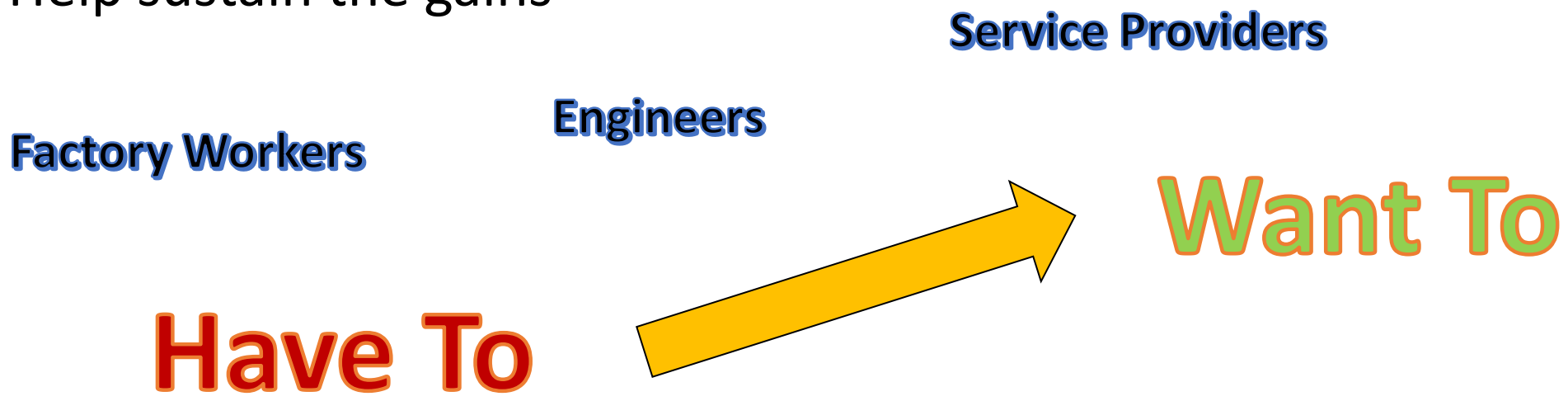
Inside Out Transformation

Who is the best positioned to make recommendations about improving 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

Inside Out Transformation

1. Learn the principles
2. Teach the **principles** to the people who do the work
3. Engage the people and coach them through the transformation
4. Help sustain the gains



Why Engage the People

- They know the process
- You cannot just replace them
- They can improve and sustain the change
- **Engagement motivates people**

HOW to Engage the People

- Communicate, teach (WHY)
- Listen to the concerns
- Ask questions / challenge them
- Go see – build trust - help and support
- Thank and reward
- **Show respect**

Respect

- People come to work to do a good job
- If they cannot, look at process, training, qualification, equipment …
- People deserve meaningful work that challenges them
- Leadership helps the people be successful (ALL)
- People respect each other
- Learn to manage the round peg in the square hole – (google)

Hard on the Process, Easy on the People

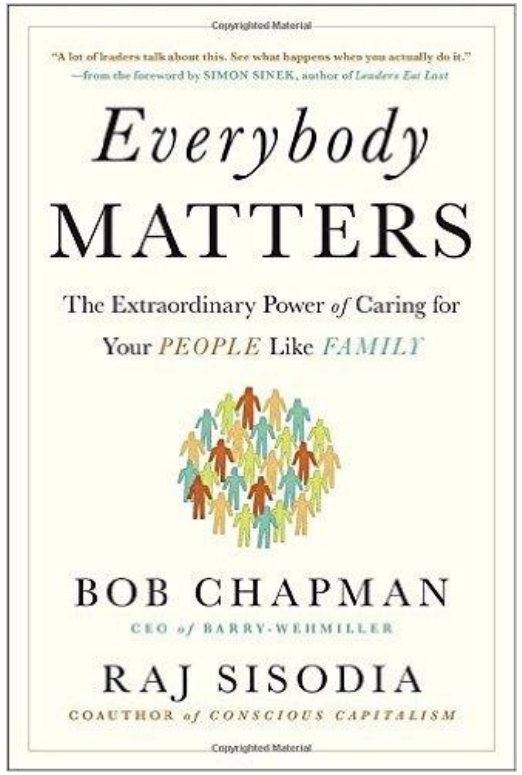
Expressing Respect

- Leave the position at the door
- Ask questions – do not give solutions
- Go see - Listen
- Challenge – trust people
- Appreciate diversity
- Assume positive intent
- Show appreciation
- ……

What is a Lean Leader's Job

Maximize Shareholder
Value by Driving Results

People Centric Lean



Get the process and the people part right and the results will follow

We take care of the precious people entrusted to us

Evolution of a Servant Leader

Responsible?

Here is the solution – go do it

I ask you questions and coach
you towards MY solution
>> A3 cookie trail
John Krafcik

Evolution of a Servant Leader

I coach you towards finding your **own** solution

Let's figure this out together

I agree with your suggestion. You are responsible - keep me informed and I will support you

Leadership Support

Is not enough ….

Leaders must CHANGE

Engaging Leaders – Advice From a Pro

Stress Control

Lean enables healthy active coping

Motivation

Lean makes Work easier

Condition

Positive reinforcement
THANK YOU

Cognitive Dissonance

Focus on behavior – beliefs will follow

Arnoud
Herremans
Change
Scientist*

norbert majerus consulting llc

My Personal Transformation Was The Hardest

Cognitive Dissonance – **BELIEFS >>> /\ <<< BEHAVIORS**

~~**Change the beliefs – behaviors will follow**~~

Change the behavior – beliefs will follow

norbert majerus consulting llc

Goodyear Lean 101 Taught By Leaders

Scania Model

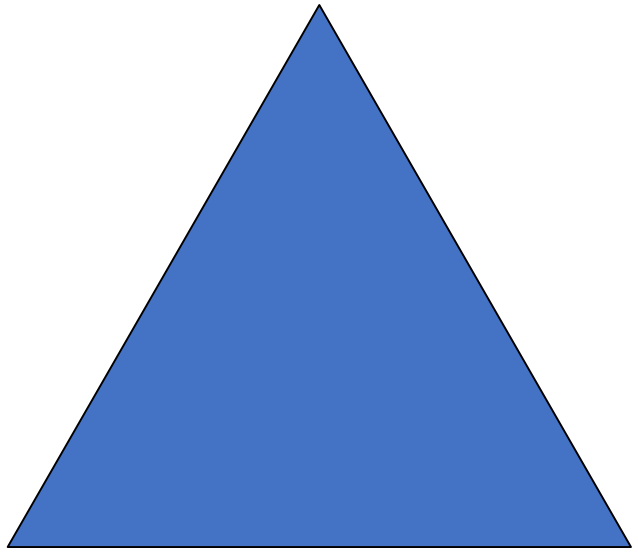
How to Engage Leaders to Become Lean Leaders

- Translate everything into $$$$
- Tell them … ineffective >> Show them is better
- Go see what good looks like
- Move from the “doer” to the enabler/influencer
- Engage them in the change, the problem, the new idea
- Teach them to be a good SPONSOR, Teacher, coach
- Create opportunity developing the right behaviors (self reflection)

Leadership Primer

Magic Triangle

Visual Management



A3 – Problem Solving

Go See

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

Leader’s Role in Transformation

- Have the right expectations
- Understand enough
- Enable
- Help
- Transform first
- Set the example
- Look for results
- Show appreciatiation

Advice to Lean Transformation Leaders

- Say “no” 3 times
- You are a change agent – not a project manager
- **Get an education / become a teacher and coach**
- Have the right expectations
  - Long journey
  - Many restarts and pivots
  - Rarely the right recognition
- Learn to respect people – earn the respect of the organization – appreciate the respect you deserve

Become an Awesome Leader

Keep an updated resume

The Lean Leader

- There is no difference in skill set between a formal leader and an informal leader
  - ✓The formal leader does not **use** power
  - ✓The informal leader does not **have** power
  - ✓Both have to earn authority
- **ALL** lead with respect and humility

Summary

- Lean works extremely well in an R&D/Innovation environment
- Some of the basics:
  - The right organization
  - Focus on the shadows
- There are 3 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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- Cell.: 330 801 3184