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INSTITUTE *for* PUBLIC SERVICE

KATA for Workforce, Lean and Technology

The Assembly Show South
April 2023



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UT CIS

- Lean
- ISO
- Quality Systems
- Workforce
- Advanced Manufacturing
- Cybersecurity
- 14 FTEs, 12 Contractors



Dwaine Raper



Misty DePriest



George Aslinger



Todd Reeves



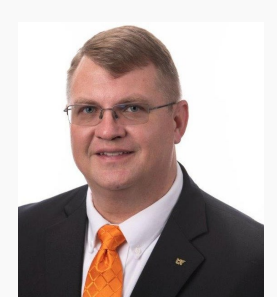
Andre Temple



Norma Wilcox



Kenny Smith



Harold Booker



Gordon Reed



Kevin Cooper

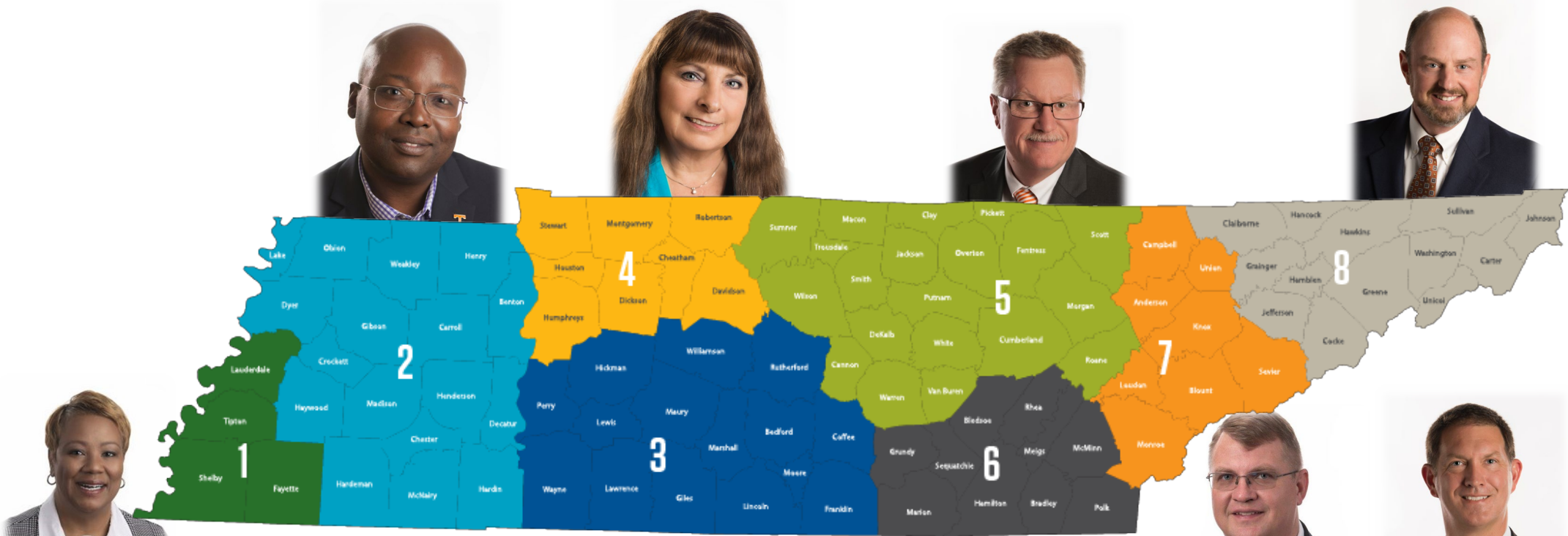


Bill Hicks



Bernadette Fuller





UT CIS Regional Support



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Workforce, Lean and Technology with KATA



Tim Waldo
*Workforce
Development
Consultant*



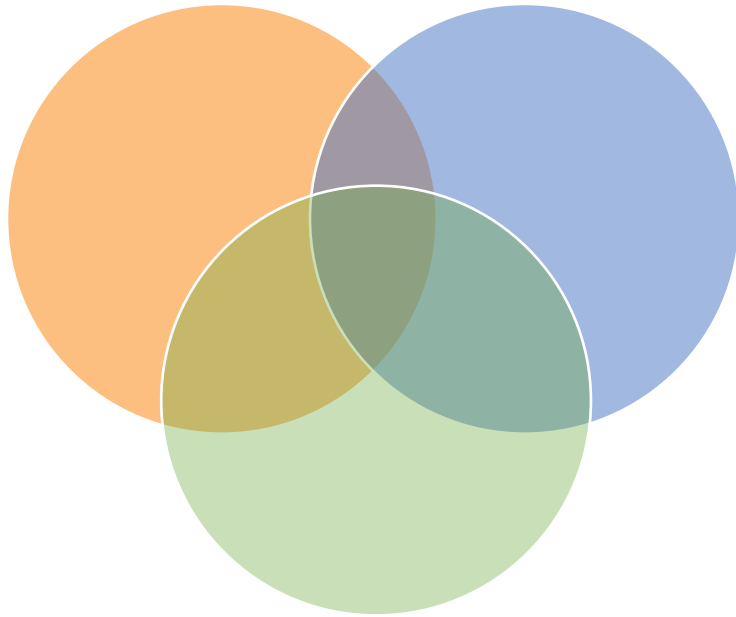
Keith Groves
*Solutions
Consultant*



Danny Norman
*Advanced
Manufacturing
Consultant*

The Assembly Show South 2023

Tennessee Manufacturing Extension Partnership – serving manufacturers across the state of Tennessee with local expertise training.



Workforce

Wholistic, systems thinking for your people

Lean

Preparing for next generation technologies and workforce

Technology

To address a bottleneck or to reinvent a process

KATA for I4.0

All training, consulting and projects are rooted in a commitment to creating cultures of learning.

A Culture of Innovation

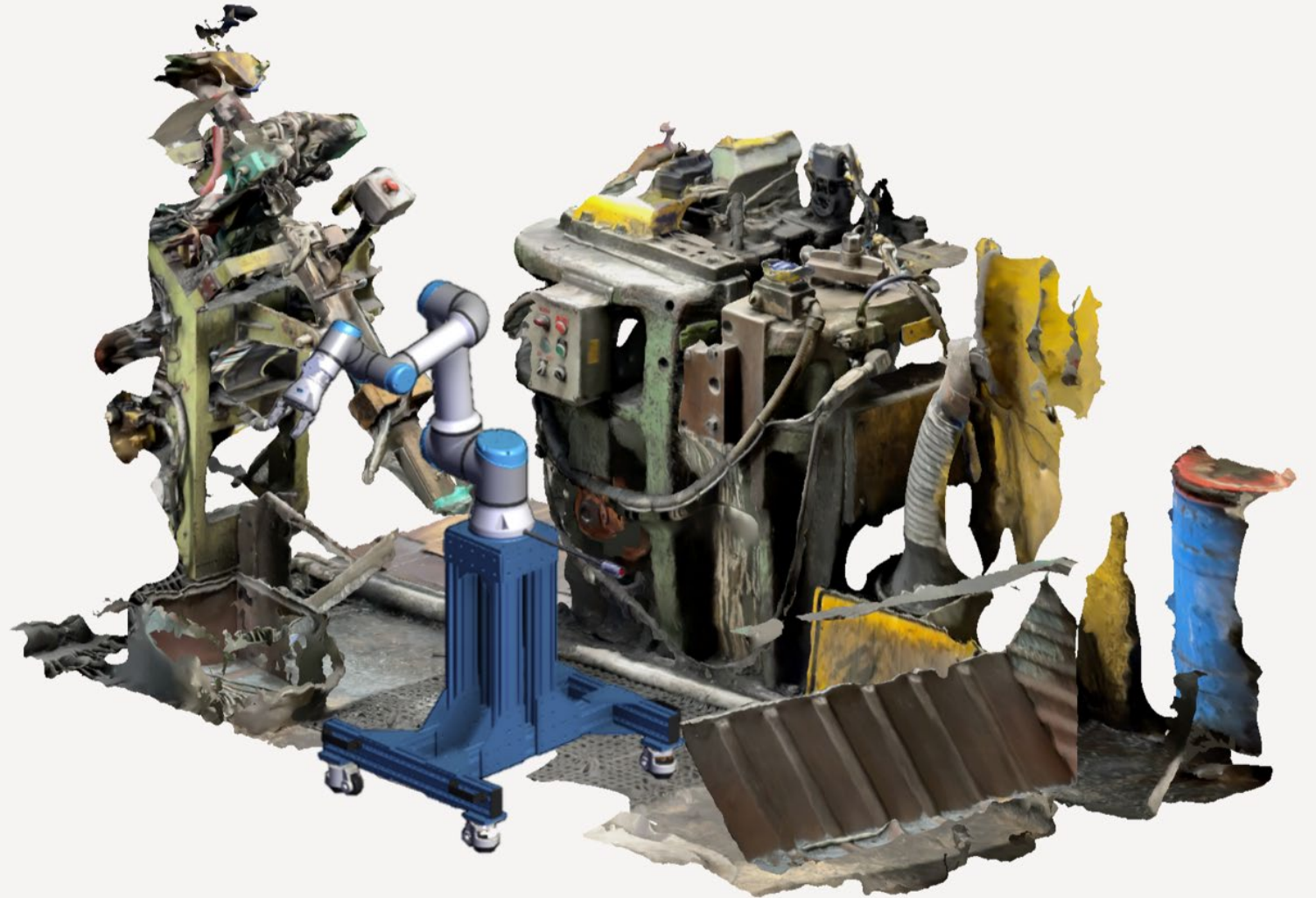
Innovation

Why Should We Care?

The Fears of Innovation

How to Innovate

Avoid Pitfalls



Target Condition

Customers

Solution

Benefit

Fear

Core Competency

Innovation

Target Condition

New Report

Customers

Solution

Benefit

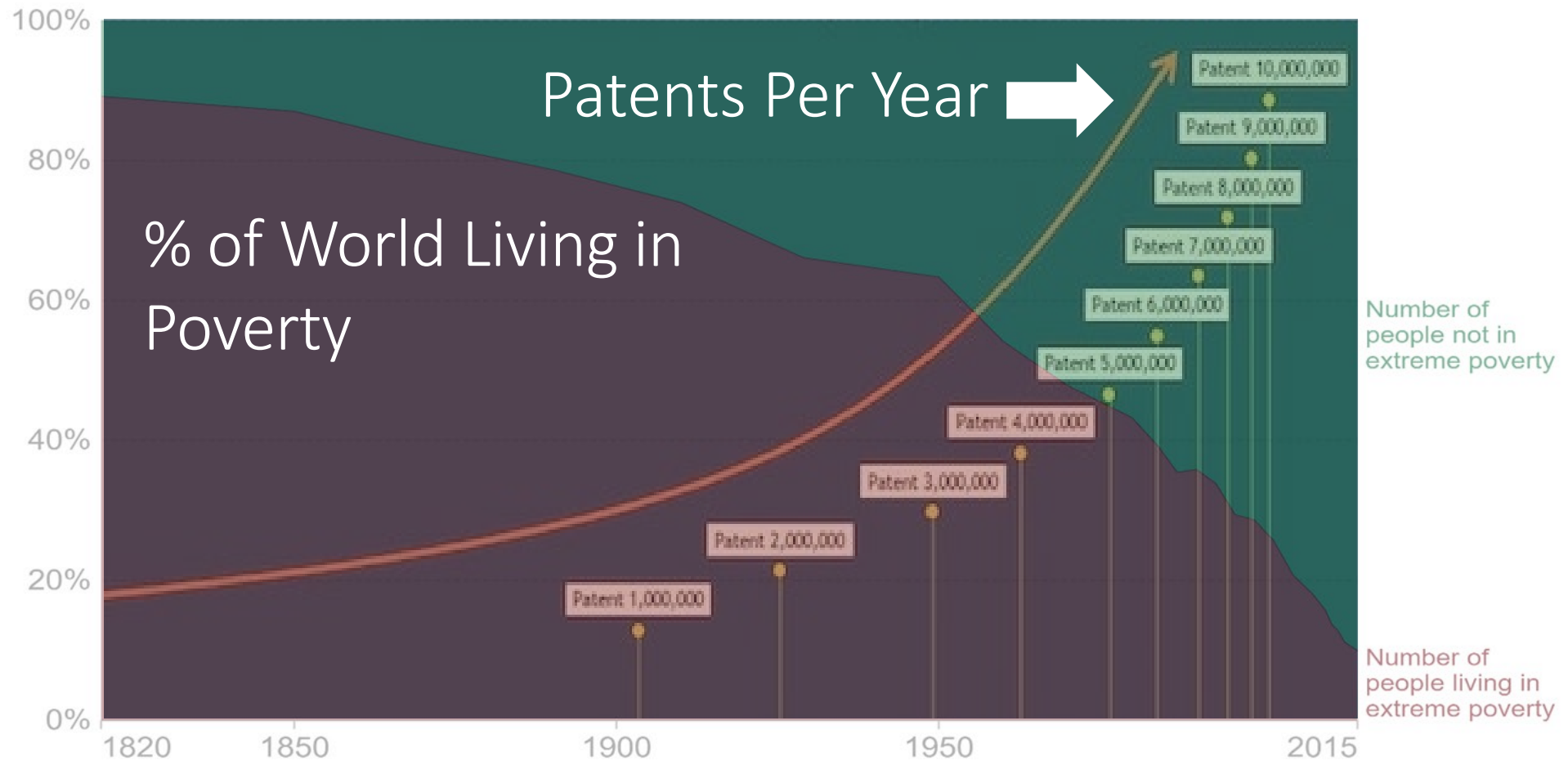
Fear

Core Competency

Innovation



Why Innovation?



Moving from the Why to the How...



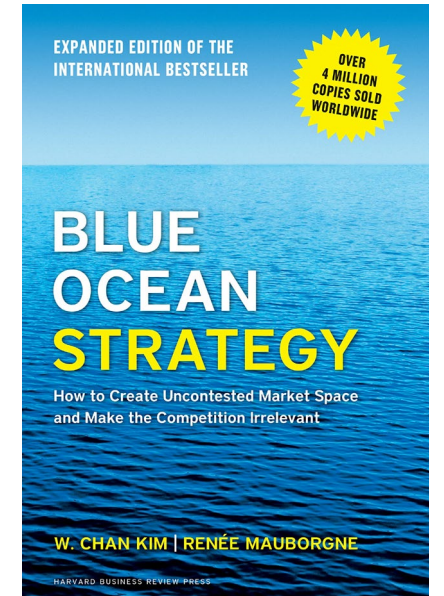
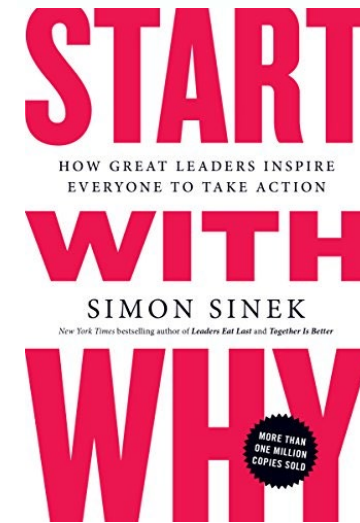
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Target Condition	New Report
Customers	ABC Co, Supervisor
	Supervisor
Solution	Tableau Software
Benefit	Save Time, Communicate
Fear	
Core Competency	
Innovation	

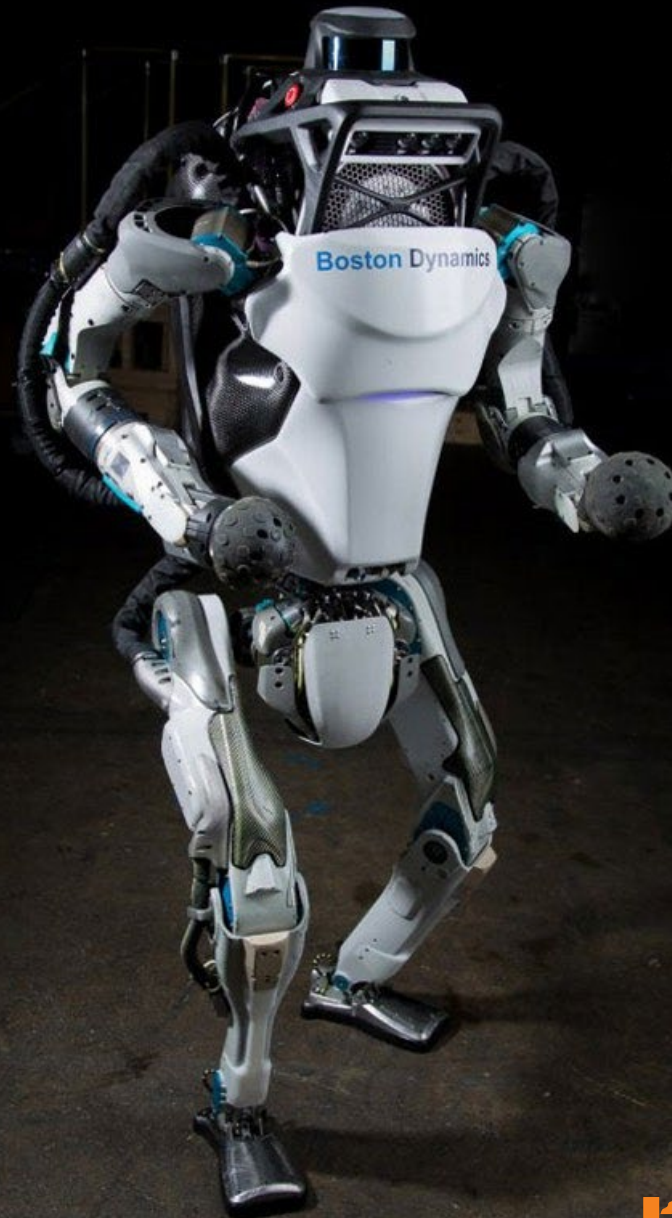
How to Innovate



Steve Blank



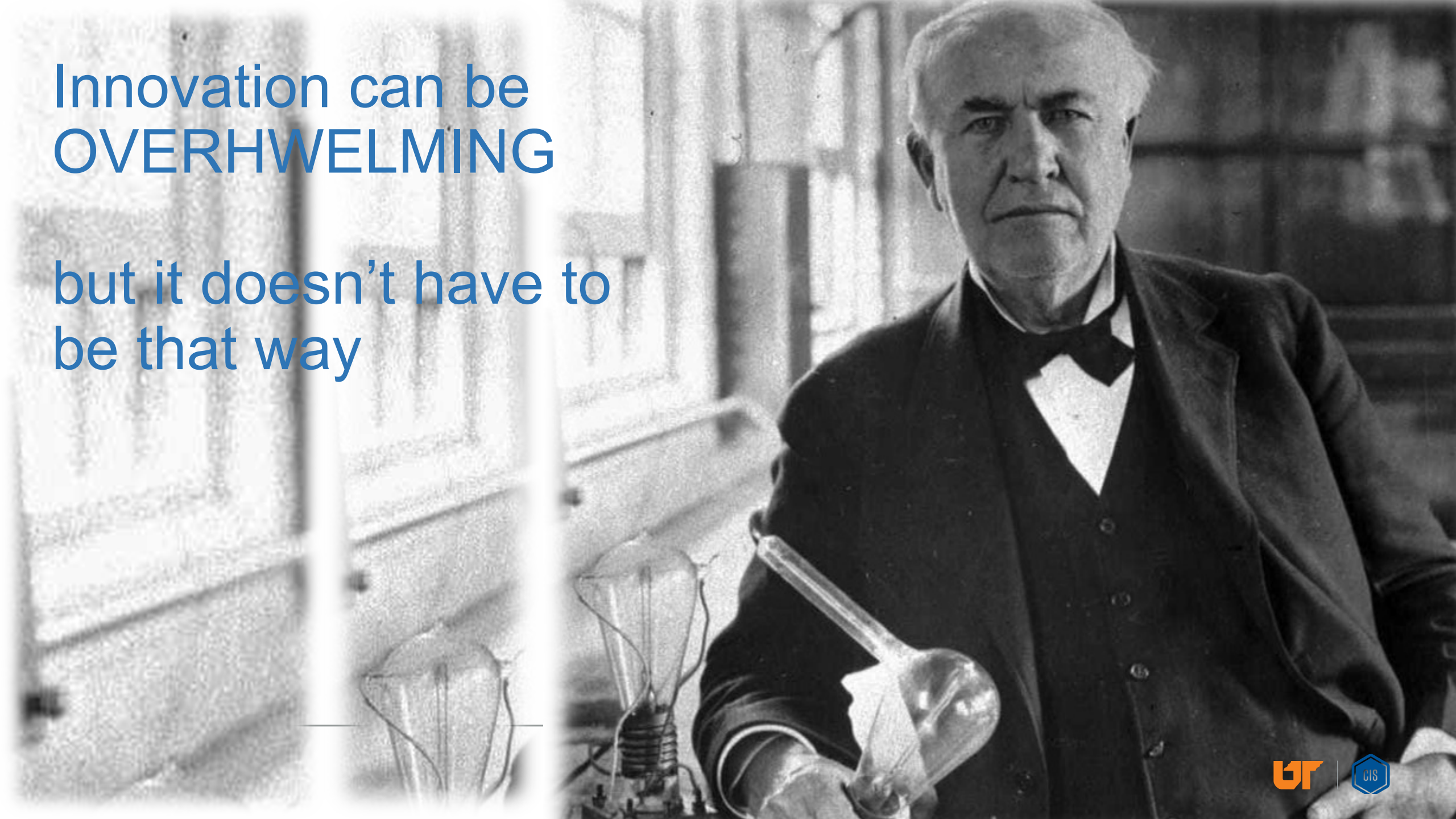
Innovation can be scary,
but it doesn't have to be.



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Innovation can be
OVERHWELMING

but it doesn't have to
be that way



Target Condition	New Report
Customers	ABC Co, Supervisor
	Supervisor
Solution	Tableau Software
Benefit	Save Time, Communicate
Fear	I can't learn new software
Core Competency	
Innovation	



Step #1 Be
Like Borla:
Innovate by
Building on
the Value
that You
Bring to
Customers



How to Innovate

- Fall in Love with the Benefits
- Stay True to Who You Are
- Partner with Others



Target Condition	New Report
Customers	ABC Co, Supervisor
	Supervisor
Solution	Tableau Software
Benefit	Save Time, Communicate
Fear	I can't learn new software
Core Competency	Building Relationships
Innovation	

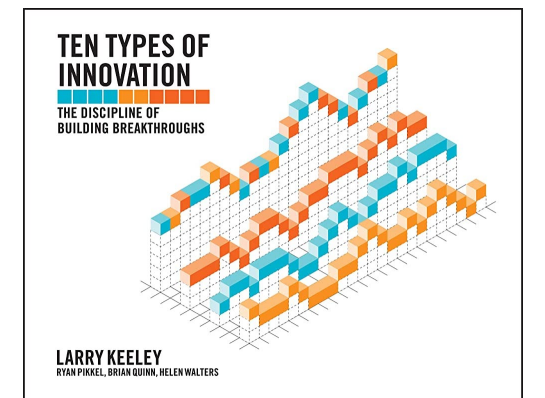
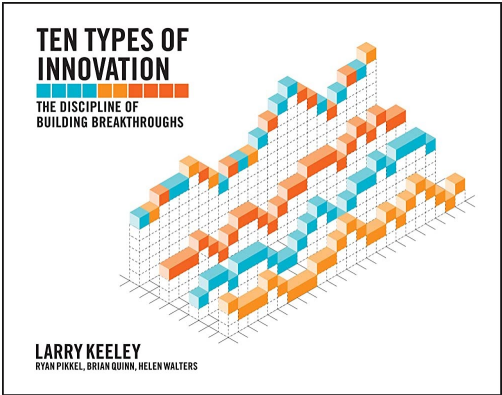
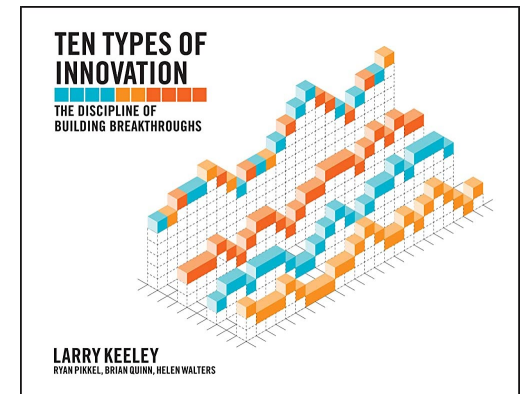


Tableau Software



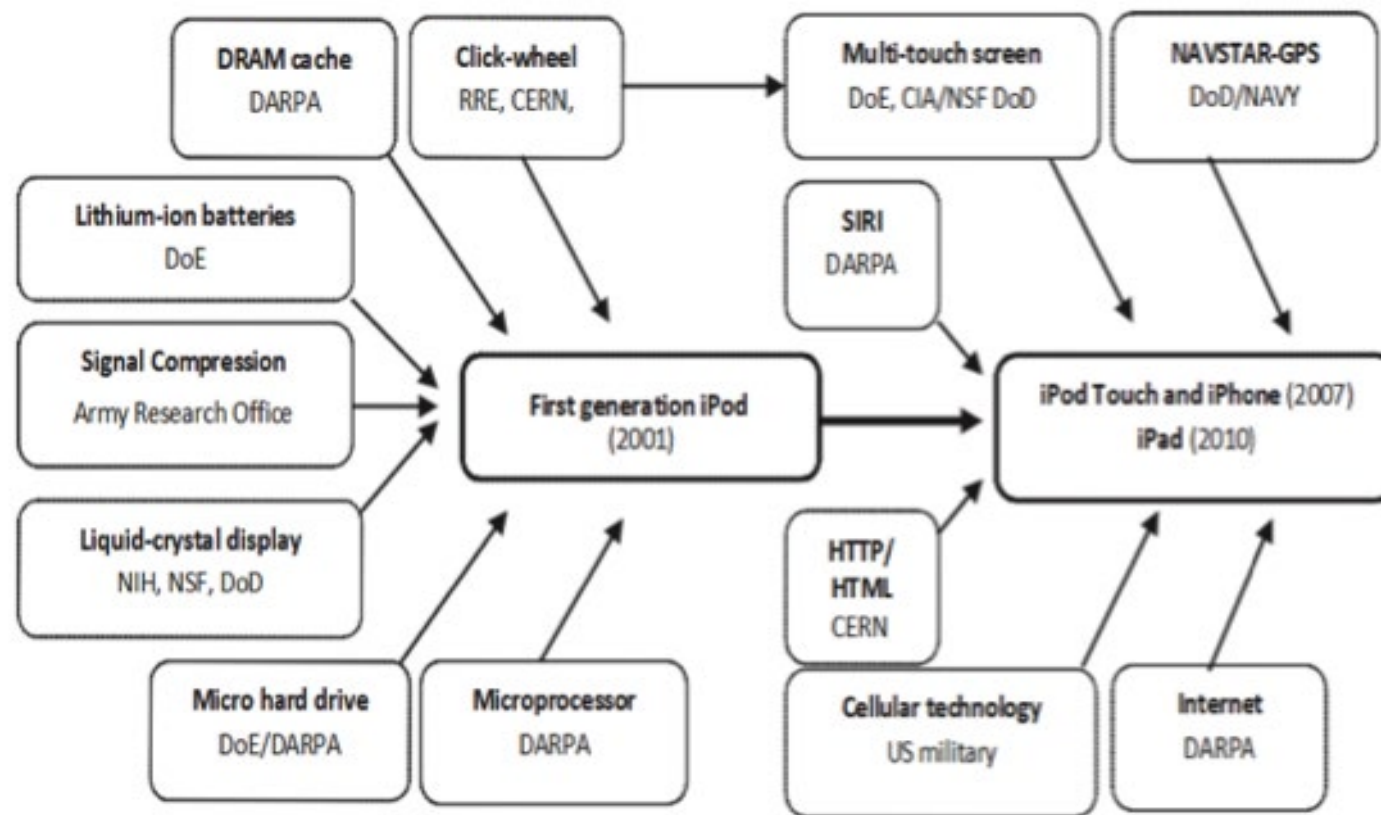
Target Condition	New Report
Customers	ABC Co, Supervisor
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Solution	Tableau Software
Benefit	Save Time, Communicate
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Core Competency	Building Relationships
Innovation	

Tableau Software



Target Condition	New Report
Customers	ABC Co, Supervisor
	Supervisor
Solution	Tableau Software
Benefit	Save Time, Communicate
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Find Partnerships that Compliment You

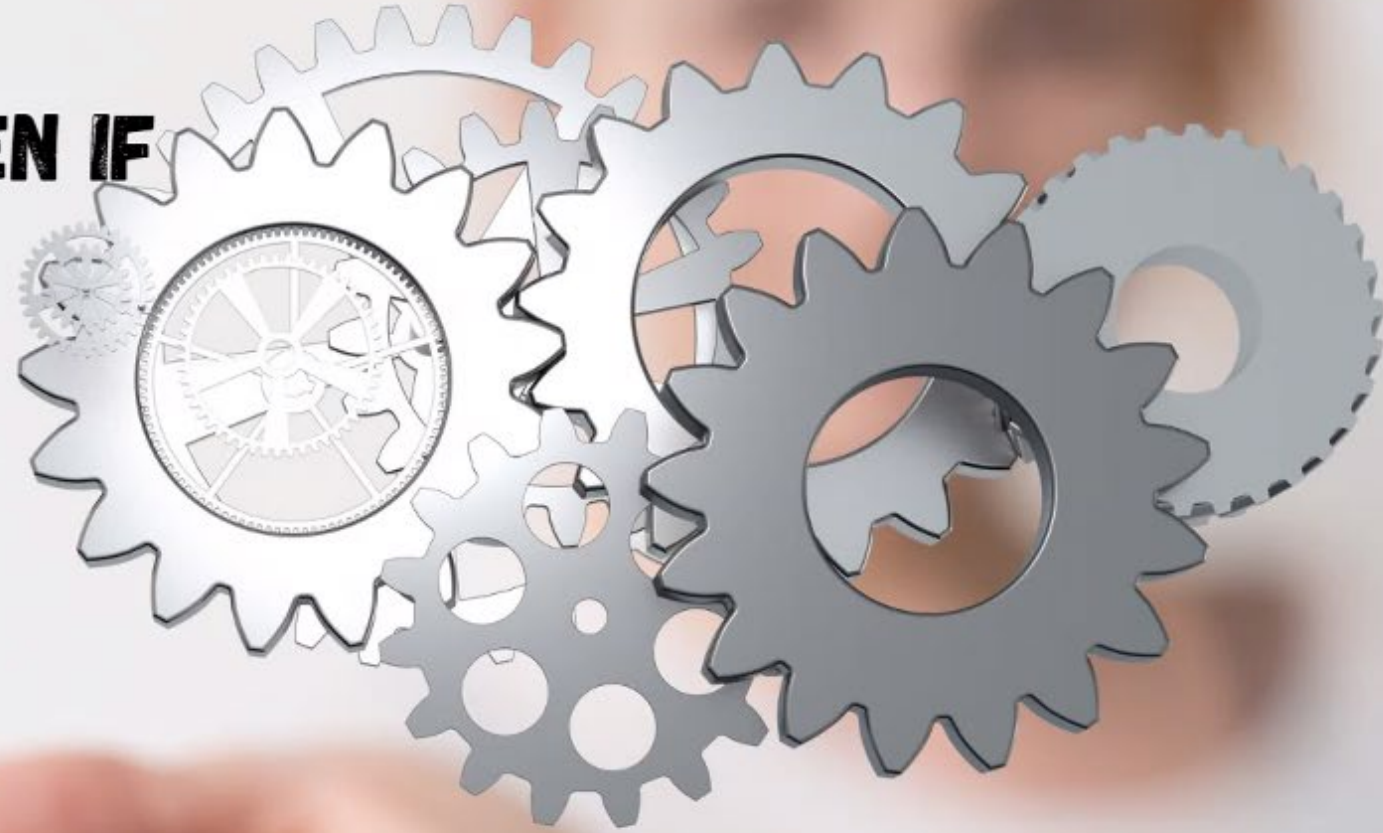


› [The Entrepreneurial State: debunking private vs. public sector myths](#), p. 109, Fig. 13

Target Condition	New Report
Customers	ABC Co, Supervisor
	Supervisor
Solution	Tableau Software
Benefit	Save Time, Communicate
Fear	I can't learn new software
Core Competency	Building Relationships
Innovation	Weekly Phone Call Call

“

**YOU CAN
SYSTEMATIZE
INNOVATION EVEN IF
YOU CAN'T
COMPLETELY
PREDICT IT.**



Eric Schmidt,
Former CEO of Google



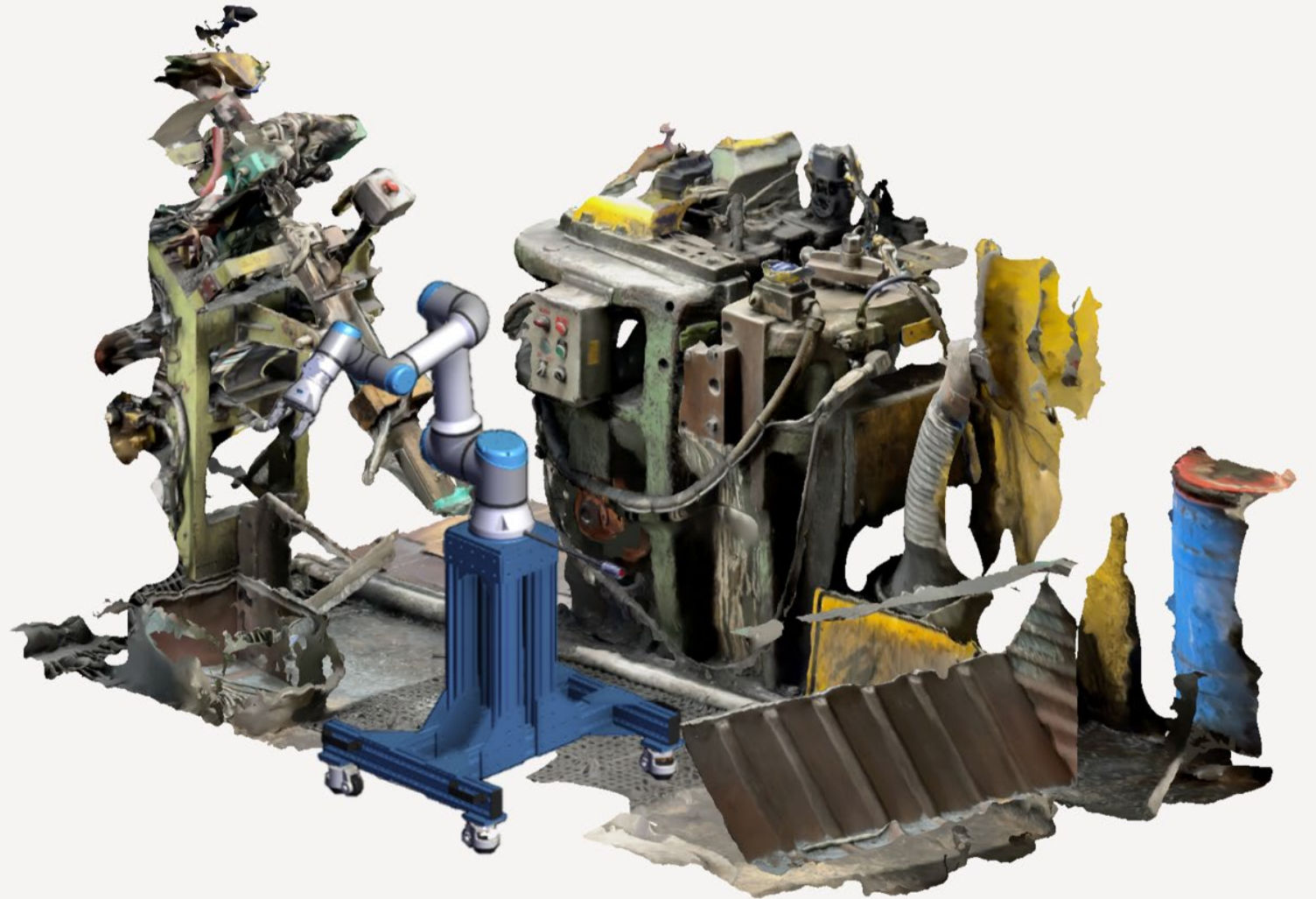
Thank you

Why Should You Care?

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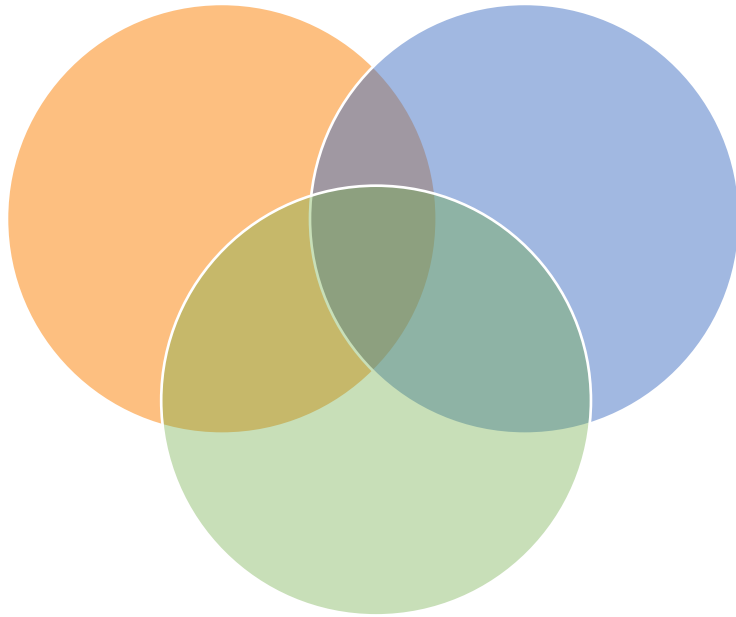




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Analyzing workforce development challenges in Industry 4.0

“In order to take advantage of Industry 4.0 developments, organizations have to alter their structure completely. However, this fundamental change brings many challenges that organizations have to deal with. One of the most significant challenges is related to workforce development.”

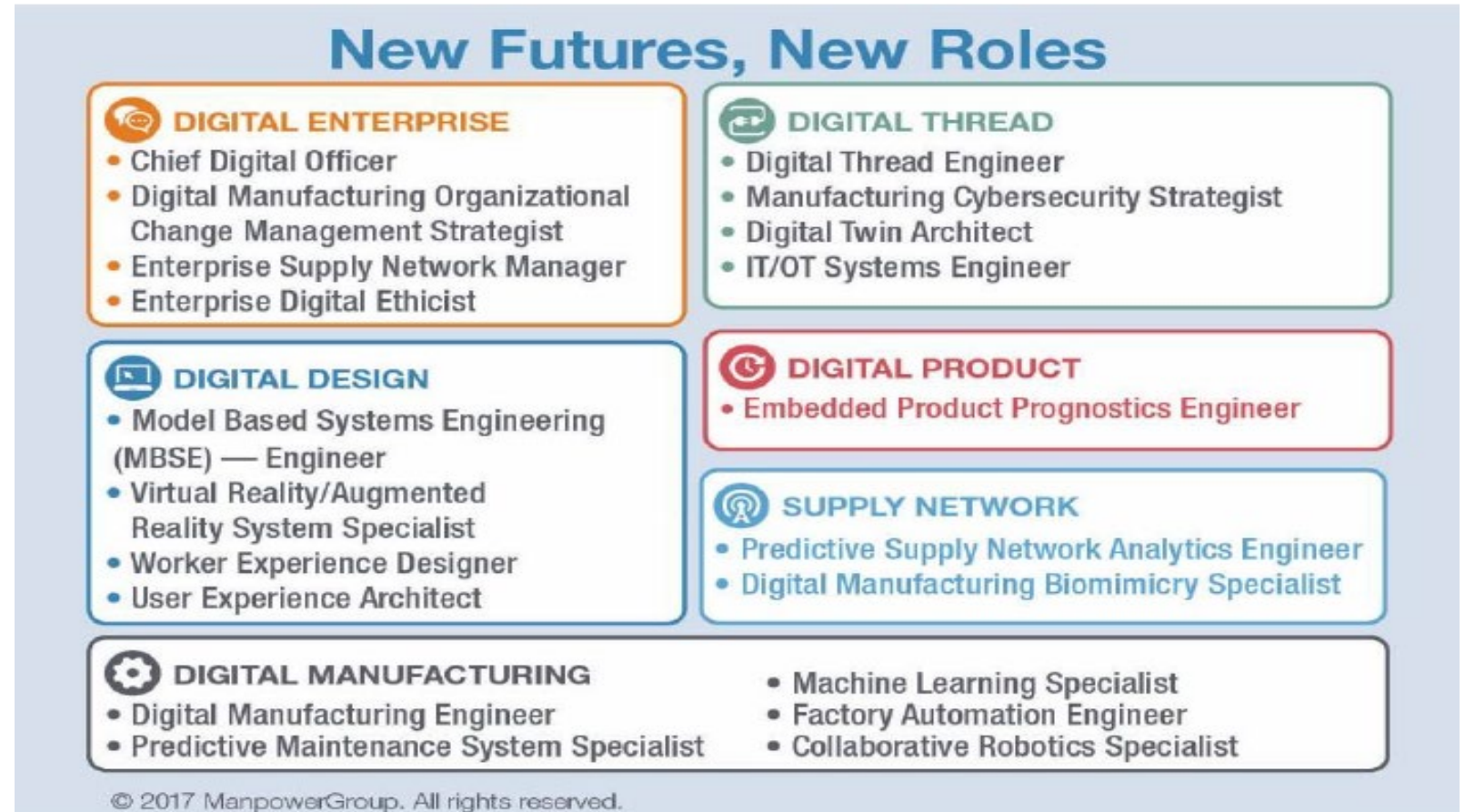
International Journal of Manpower. Vol. 43 No. 2, 2022. pp. 310-333



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Why focus on people for Industry 4.0?

“For today and tomorrow, we see a highly connected and cross-discipline digitally enabling and digitally opportunistic community of work roles that bring together many disciplines. Newer and legacy work capabilities- design, engineering, production, supply network and more.”



Three sources of talent for I4.0

External additions – hiring the talent needed to do the new work

Internal upskilling – helping people retool and reskill to do the new work

Hybrid – a combination of the two

The ongoing need to access the ever increasing levels of talent will likely be a factor for manufacturers from now on.

Key Workforce Challenges in I4.0

- Systems thinking abilities.
- Culture.
- Acceptance of longer learning times for digitization.
- Analytical thinking and dealing with complexity.
- Lack of understanding of the interplay between human and machine, and related exchange of knowledge.
- Employee resistance to change.

International Journal of Manpower. Vol. 43 No. 2, 2022. pp. 310-333



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Many moving parts

- Digitalization (define)
- Robotics
- Sensors
- Data (collection, analysis, managing)
- Even new ways of performing tasks
 - Augmented reality
 - Virtual reality
 - Artificial Intelligence

New ways of thinking

- About where to apply I4.0 technologies.
- What is good data? Where does it come from? What do we do with it?
- How might I4.0 applications impact the existing organizational systems?
- And many, many other considerations...

Steps in the Journey

- Commit to changing the culture
- Assess the team's current state regarding digital literacy and automation
- Communicate
- Invest

Foster a Culture of Learning

- Systems thinking
- Problem solving
- Adaptiveness
- Innovation

Current Capacities

- Assess the team's current state regarding digital literacy and automation
- Identify potential candidates for more training
- Continuous Improvement = Continuous innovation
 - Preparing for continuous change
 - Adaptivity
 - Creativity
- Data driven enterprise

Communication

- Involve the team in conversations and explorations around automation and I4.0
- Control the narrative early on. Build excitement
- The messaging is important
- Be transparent and honest

The messaging is important

- Must remain competitive (or get left behind)
- I4.0 is a game changer, but people still need to be in the game
- Represent the changes as a new opportunity to grow, learn, and earn

Invest in training & continue to build engagement

- Identify future skills needed.
- Conduct skills assessments.
- When will these skills be needed?
- Begin assembling development pathways.
- Who can be upskilled?
- How the upskilling will be done.

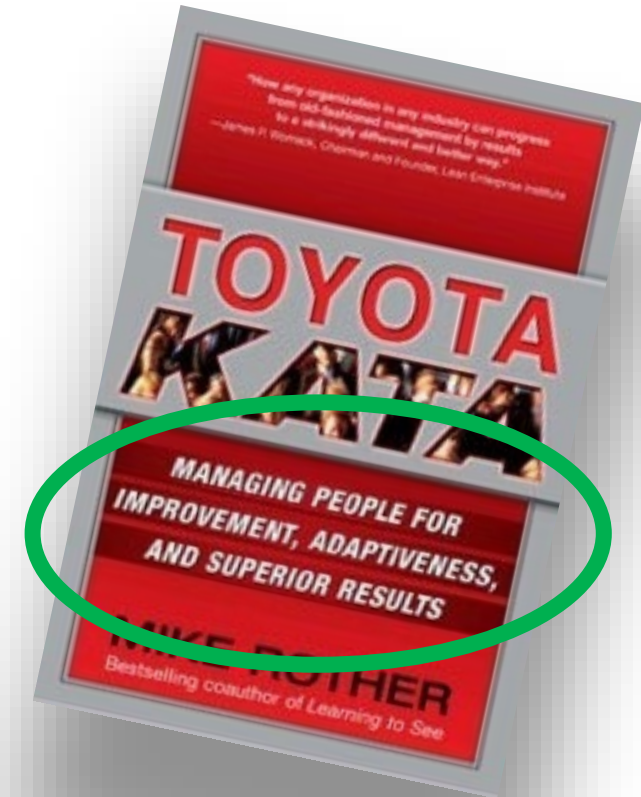
Other opportunities

- There will be a need for people that can maintain robots.
- There will be a need for people that can program and code.
- There will be a great need for data handlers.
- There will be a great need for people who can identify opportunities, ask the right questions...

- The way forward is along a path that...

BUILDING PROBLEM SOLVERS

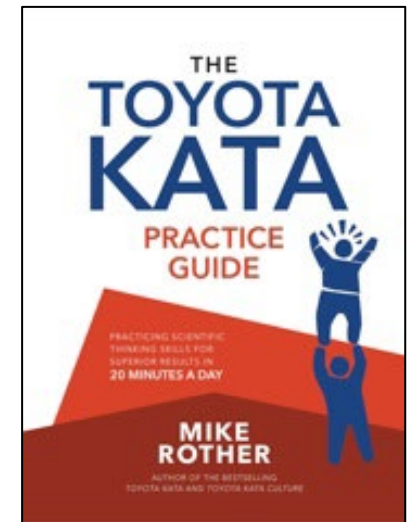
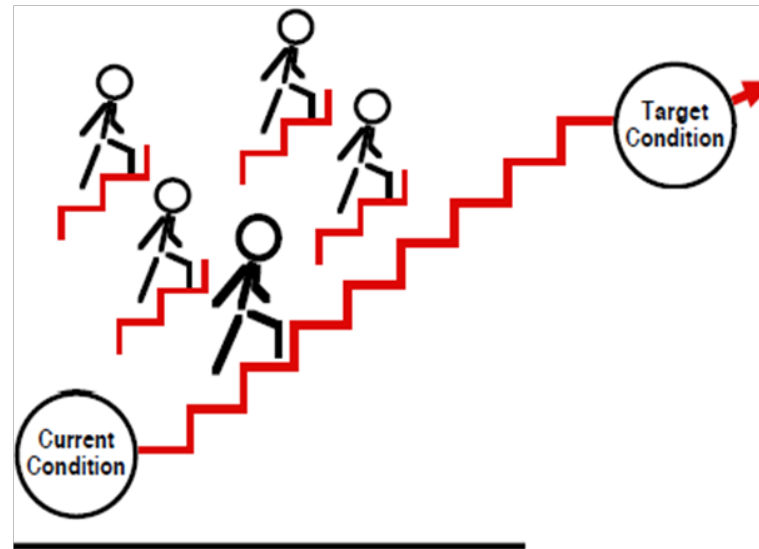
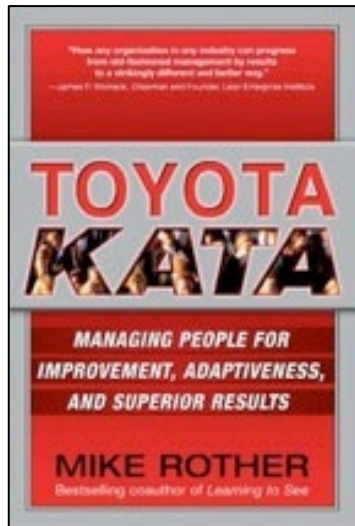
Improvement Kata Coaching Kata



The University of Tennessee Center for Industrial Services has permission to use all Toyota Kata slides, notes, and simulations created and copyrighted by Mike Rother.
For more information visit the Toyota Kata website at
<http://www-personal.umich.edu/~mrother/Homepage.html>

Toyota Kata Mindset

Develop a Sustaining Culture of Continuous Improvement In your Organization

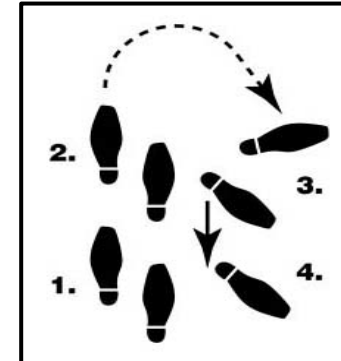


WHAT ARE KATA?

Structured routines to practice deliberately, especially at the beginning, so their pattern becomes a habit and leaves you with new abilities.



“Let’s begin by practicing it this way for a while”



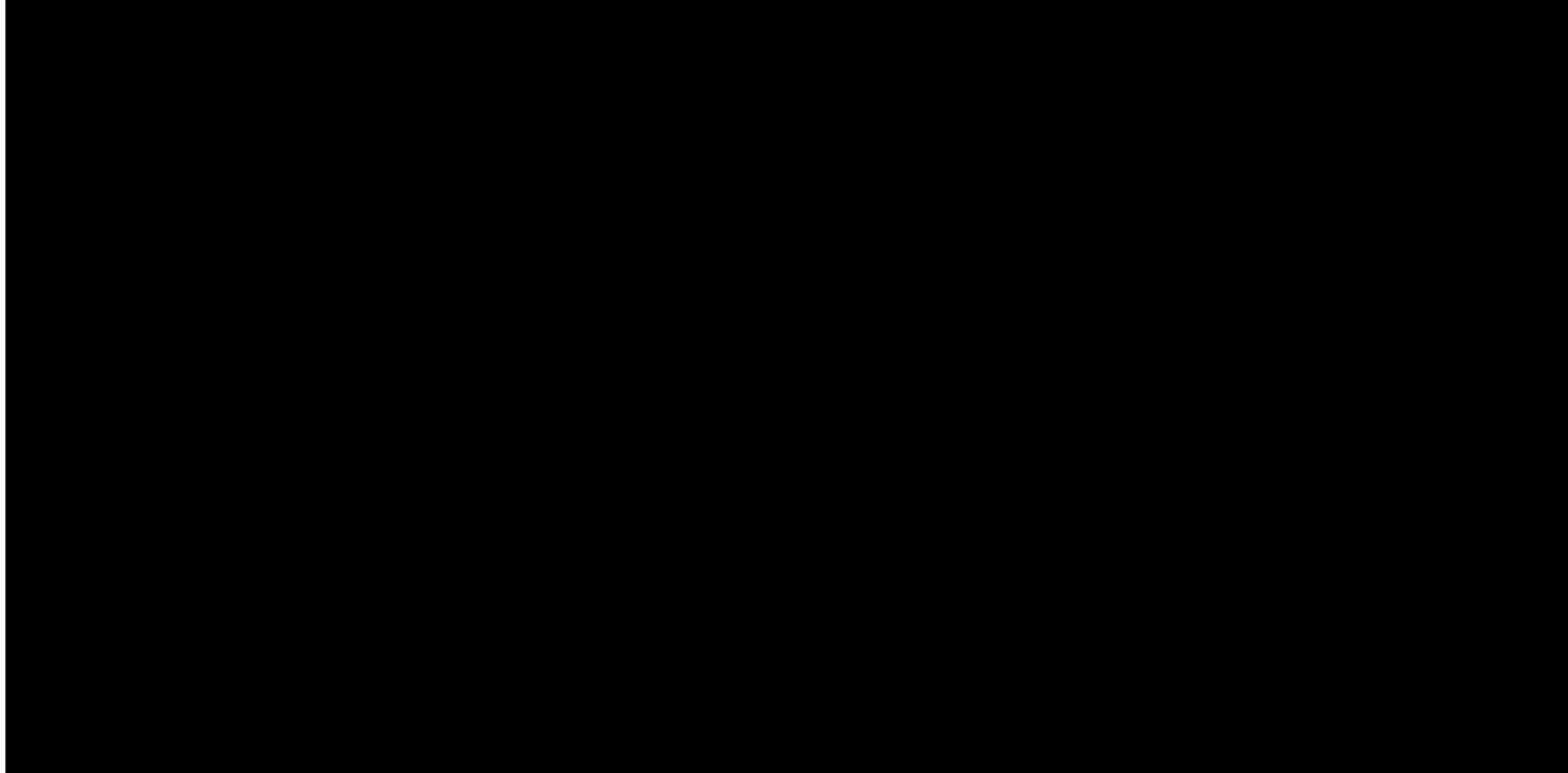
Combining a scientific pattern of thinking with structured practice routines develops effective problem solvers

WHAT IS THE IMPROVEMENT KATA?

A way of transferring skills and developing shared abilities and mindset in a team or organization.

- *It's a systematic approach to:*
 - A. Generating **Continuous Improvement**
 - B. Developing **Strong Problem Solvers**
- *It combines a **scientific pattern of thinking** with techniques of **deliberate practice***
- *It's doing small things on a DAILY basis to improve a process by pursuing a next 'target condition'*

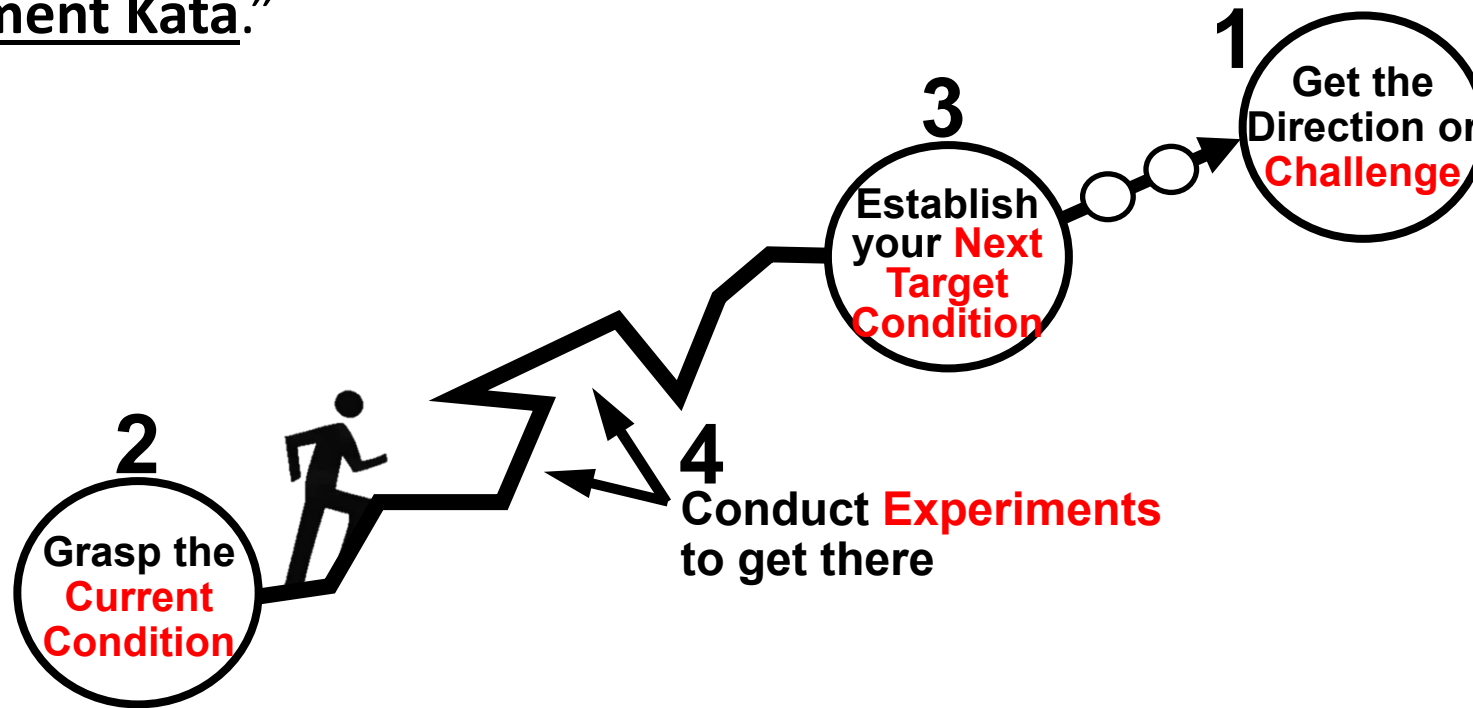
What We Know About How People Learn



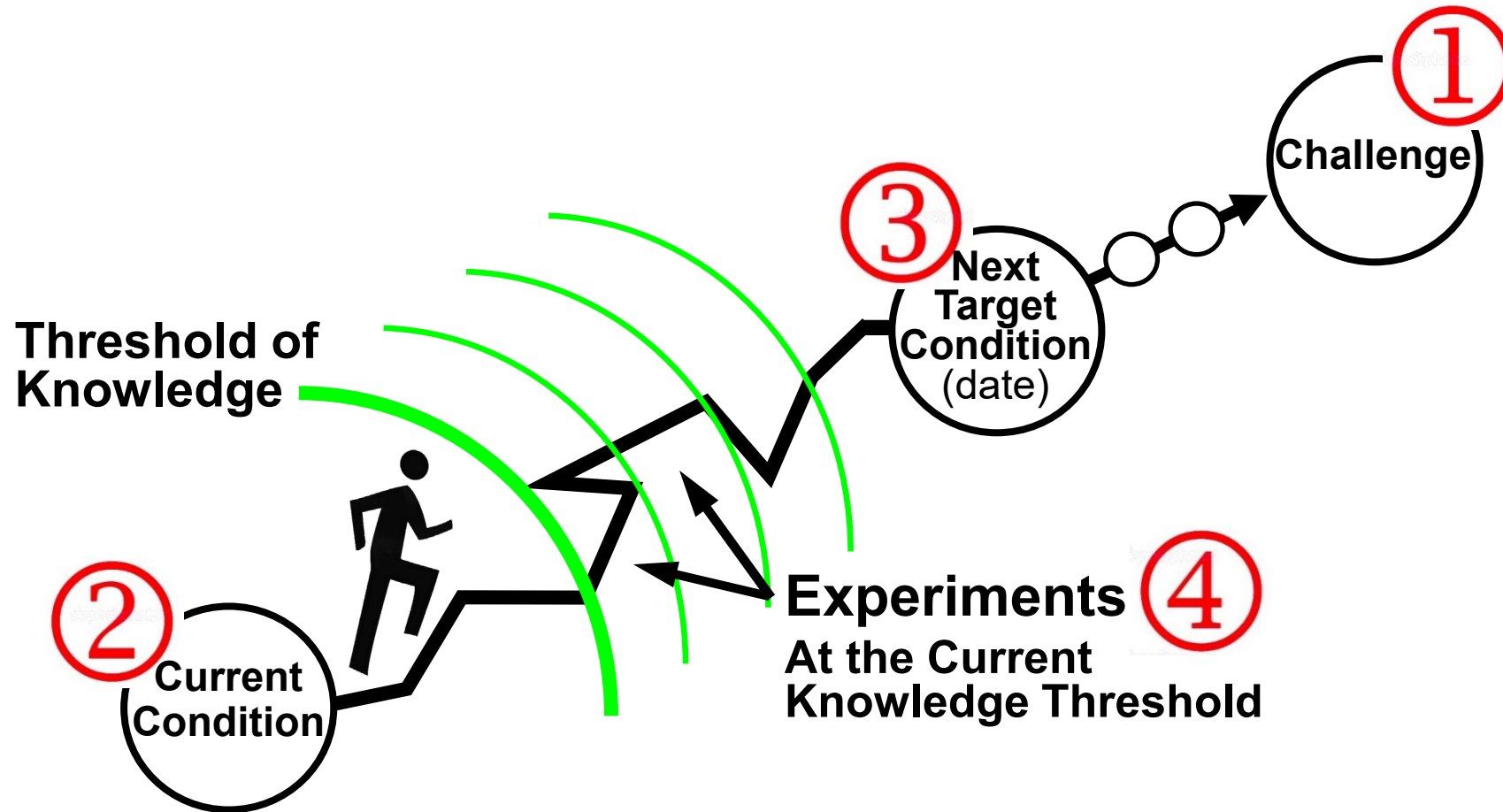
THE IMPROVEMENT KATA MODEL

Kata¹ (方) – Suffix Meaning "*Way of Doing*"

We found a common, scientific pattern of thinking and behavior in Toyota managers' approach -- their 'Way of Improving' -- and depicted it with a four-step model we named the "Improvement Kata."



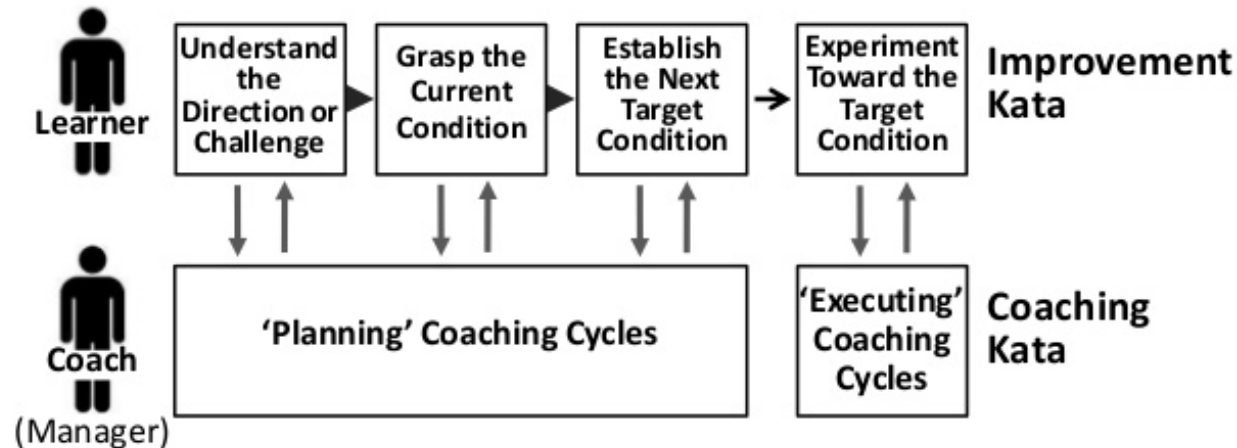
WHAT IT REALLY LOOKS LIKE



COACHING AND IMPROVEMENT

THE IMPROVEMENT KATA + THE COACHING KATA

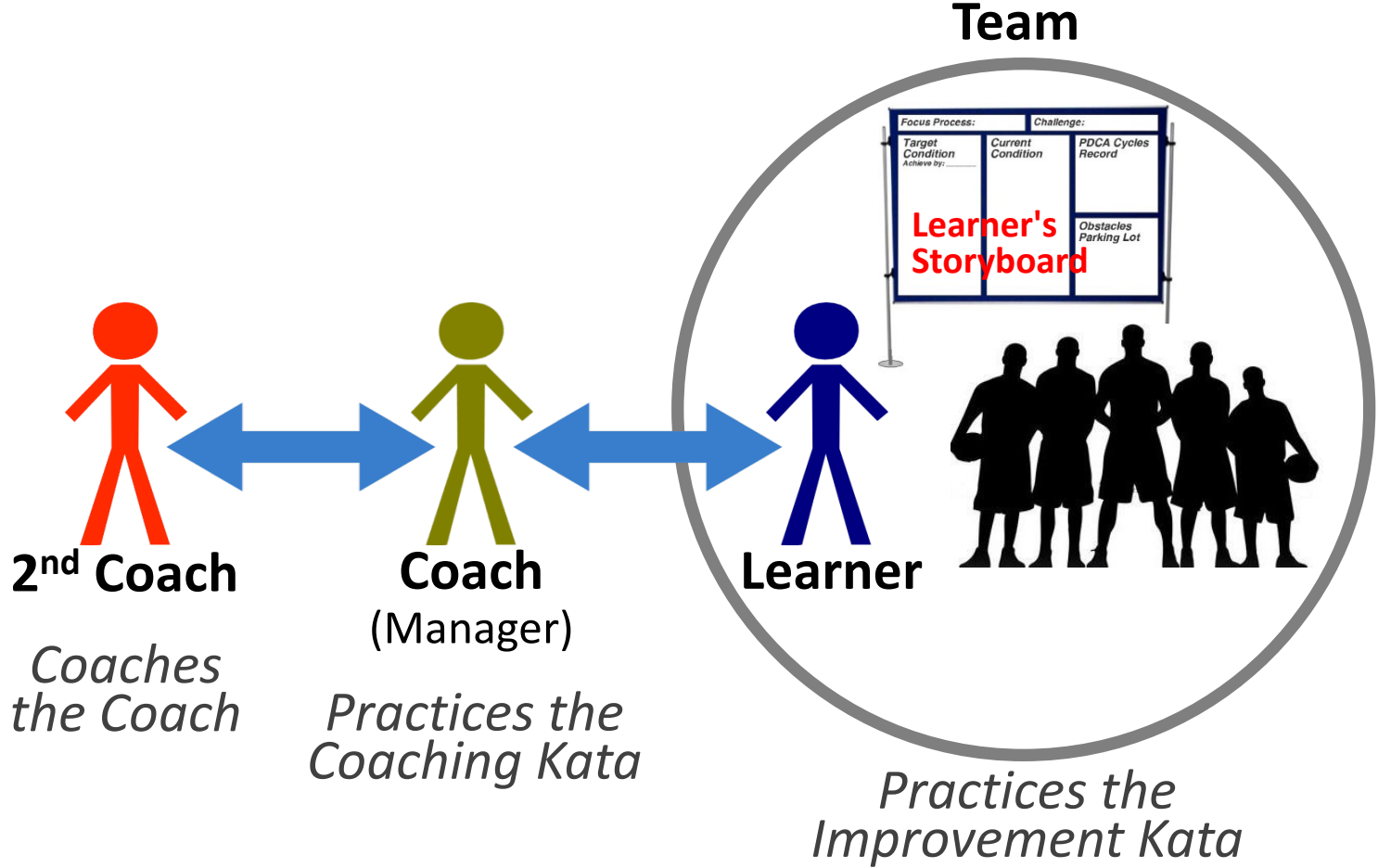
It's a methodology for developing people
to meet challenges



Inescapable Principle of Coaching

To help others develop their capability to think and solve problems you must:
Let them THINK -- **-NOT** Tell Them What To Think

ROLES/ORG. STRUCTURE FOR PRACTICING



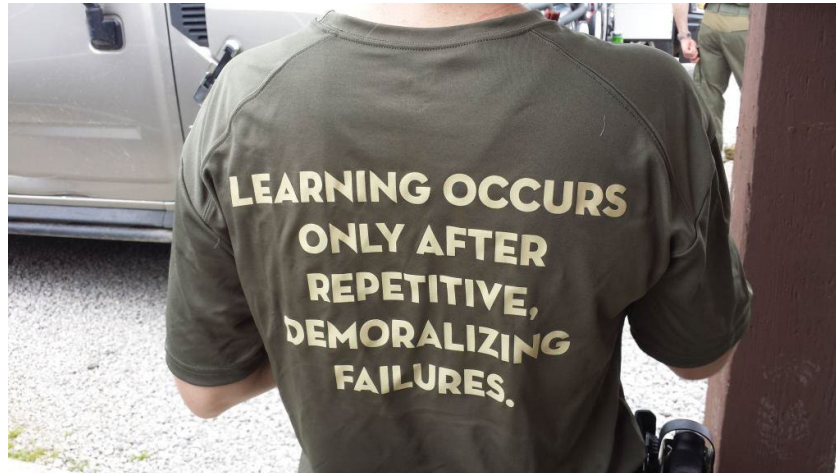
FREEDOM TO TRY (AND FAIL)

We learn through “**failed**” experiments, so coaches must create an environment for experimentation

Fail Fast...

Fail Safe...

Fail Cheap...



Expect and allow the learner to make small mistakes.
These are important moments, from which the learner learns.

SCIENTIFIC PATTERN OF THINKING



Theory



Evidence



To Practice The LK/CK is To Practice Scientific Thinking.

To Unlock...

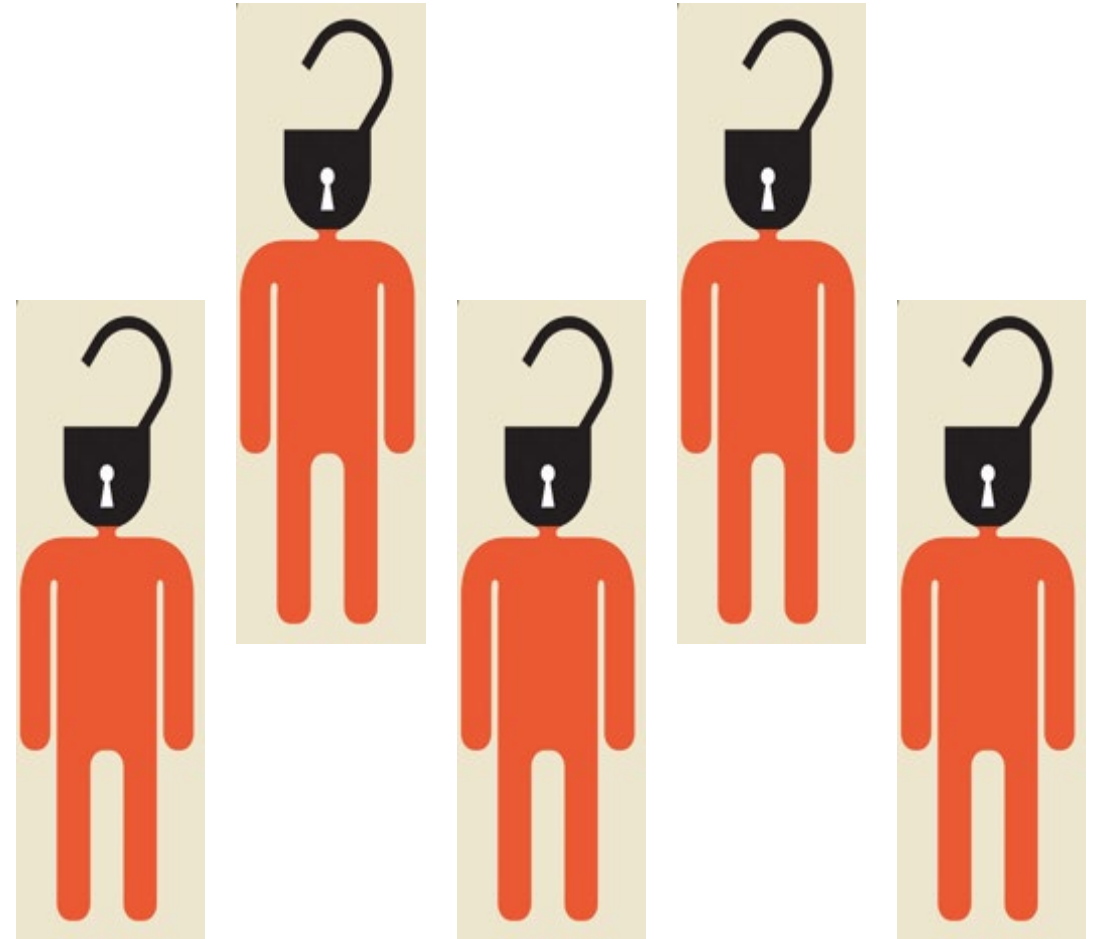
Continuous improvement

Problem Solving/ingenuity

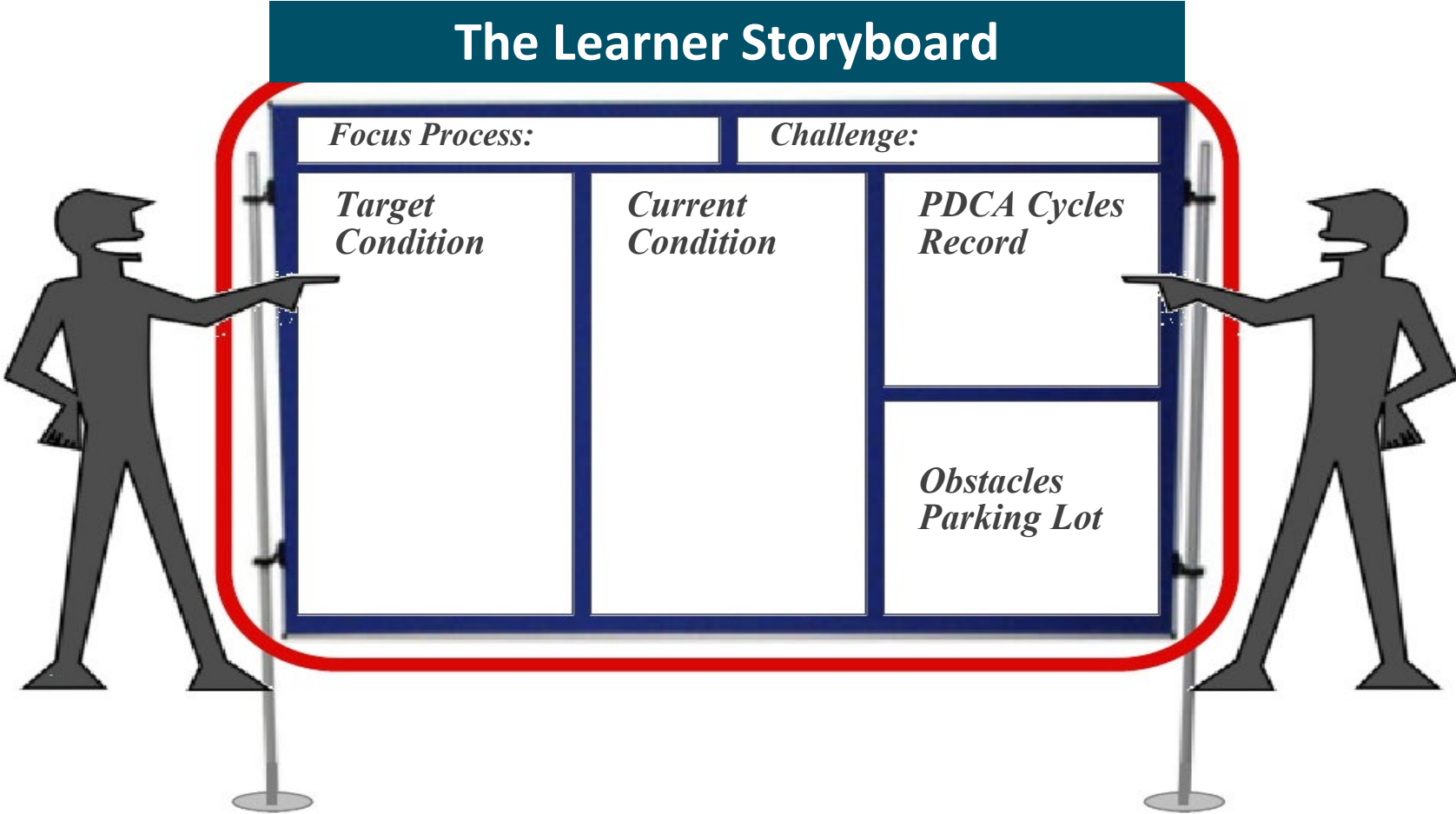
Innovation/creativity

Culture change

Engagement



The Improvement Kata in Action



PDCA CYCLES RECORD

ONE LINE = ONE EXPERIMENT (IDEALLY, ONE EVERY DAY...)

PDCA CYCLES RECORD					
Date:			Process Metric		
Process:					
<u>Step</u>	<u>What do you Expect</u>	Coaching Cycle EXPERIMENT		<u>Result:</u> <small>Observe closely</small>	<u>What We Learned</u>
<p>1</p> <p>Before you get started, propose the 1st Step and what you Expect, on this Left Side of the form</p>				<p>2</p> <p>Once a step or experiment is completed, fill in Result and What We Learned, on this Right Side of the form</p>	
<p>3</p> <p>Based on what was learned in the last Step, propose the Next Step and describe what you Expect from the next step, on this Left Side of the form</p>					

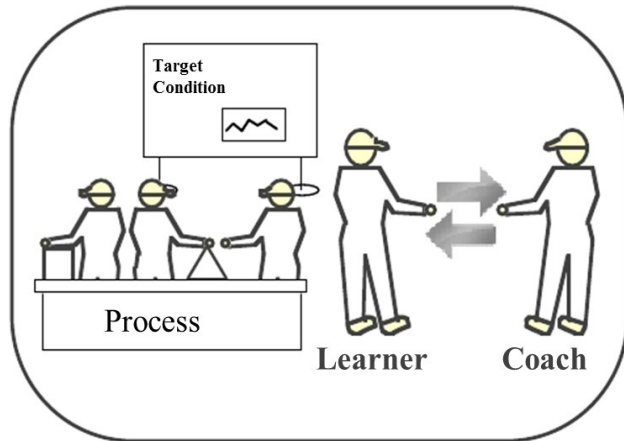
PDCA CYCLES RECORD

BENEFITS OF USING THE PDCA CYCLES RECORD

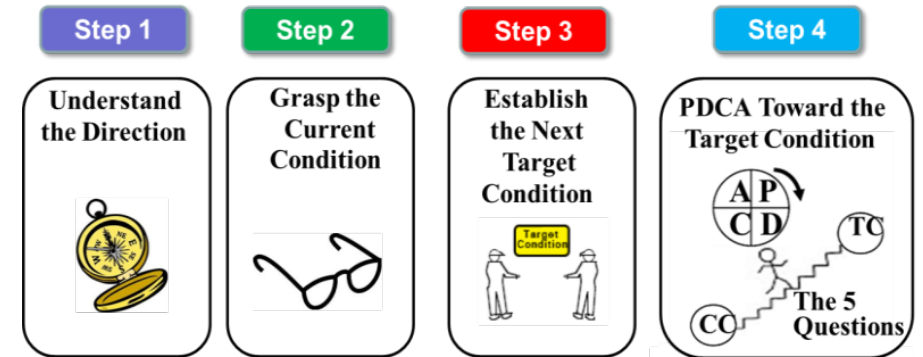
- It forces the Learner to document in writing (and teaches the Learner that s/he owns the form and is responsible for having it up to date).
- It forces the Learner to think independently about what would be a good next step to take.
- It encourages the Learner to think scientifically in terms of what they expect to learn or to happen as a result of the next step.
- It has the Learner prepared for the next coaching cycle, with information that has been thought through. During the Five-Question coaching cycle the Learner knows what s/he is going to present, instead of making things up or trying to recall from memory.
- It helps the Coach focus on PDCA instead of just on the Five Questions.

Remember: Two Sides of a Coin

People Development



Process Improvement



The Coaching Kata

Pattern for Teaching the Improvement Kata

Standardized approach to facilitate Improvement Kata skill development in daily work

The Improvement Kata

Where do you want to go - Then Iterate to get there

Advancing toward something beyond your threshold of knowledge in a systematic, scientific way

Managing People For Success



Improvement

- Idea generation
- Problem solving
- Driving efficiency
- Quality



Adaptiveness

- To changes
- To technology
- To situations
- To ideas



Superior Results

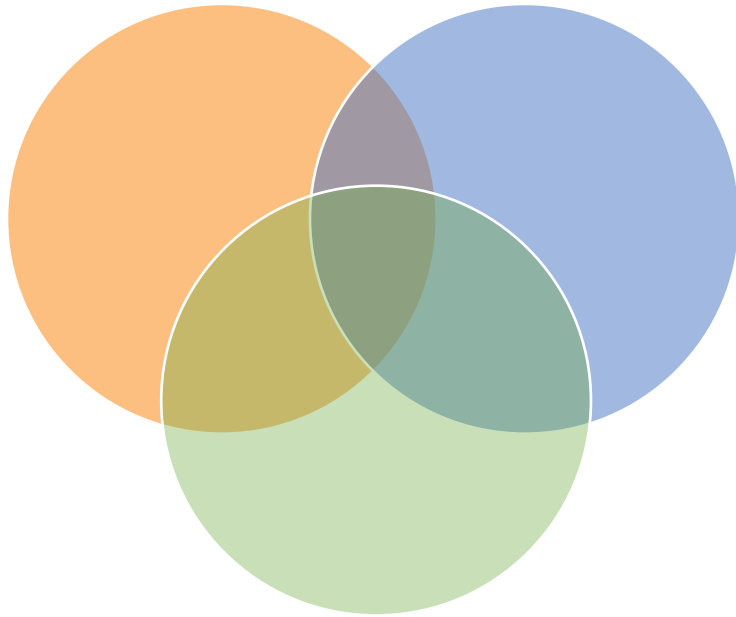
- In production
- In quality
- In performance
- In development



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Defining Lean Manufacturing

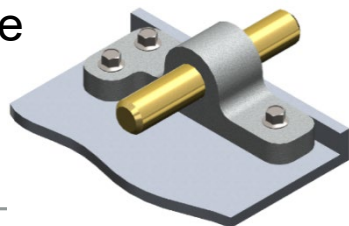
- Lean manufacturing is a systematic approach to identifying and eliminating waste (non-value-added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection.

- MEP Lean Network

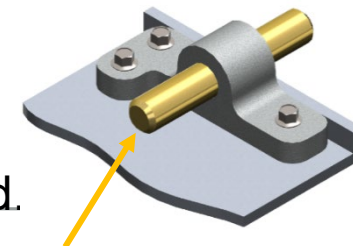
Term: Value-Added

- Value-added:
- Any activity that increases the market form or function of the product or service.
 - These are things the customer is willing to pay for.
- Non-value-added:
- Any activity that does not add market form or function or is not necessary.
 - These activities should be eliminated, simplified, reduced, or integrated.

Example: These parts are put together to form an assembly.



Example: The rod sits in the plant for 4 days before it is used.

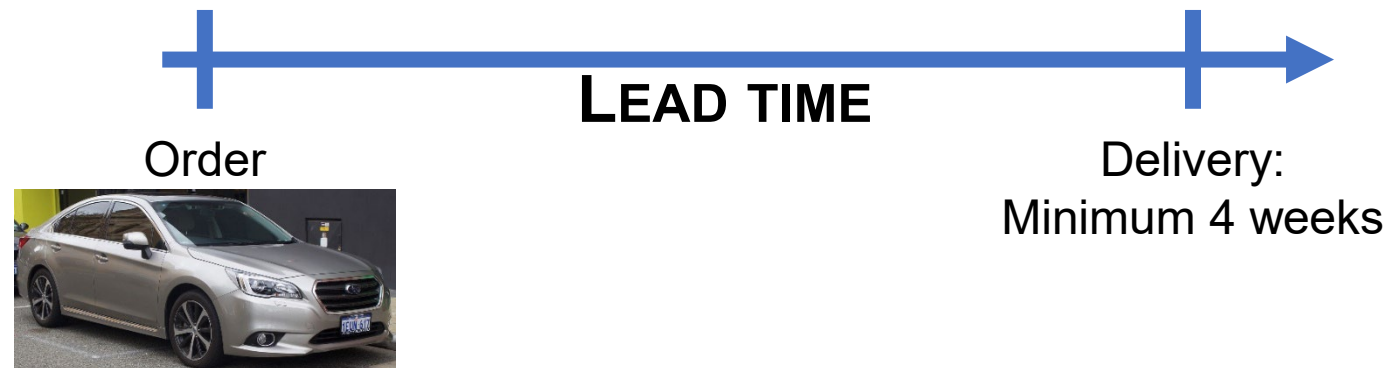


Check Your Knowledge

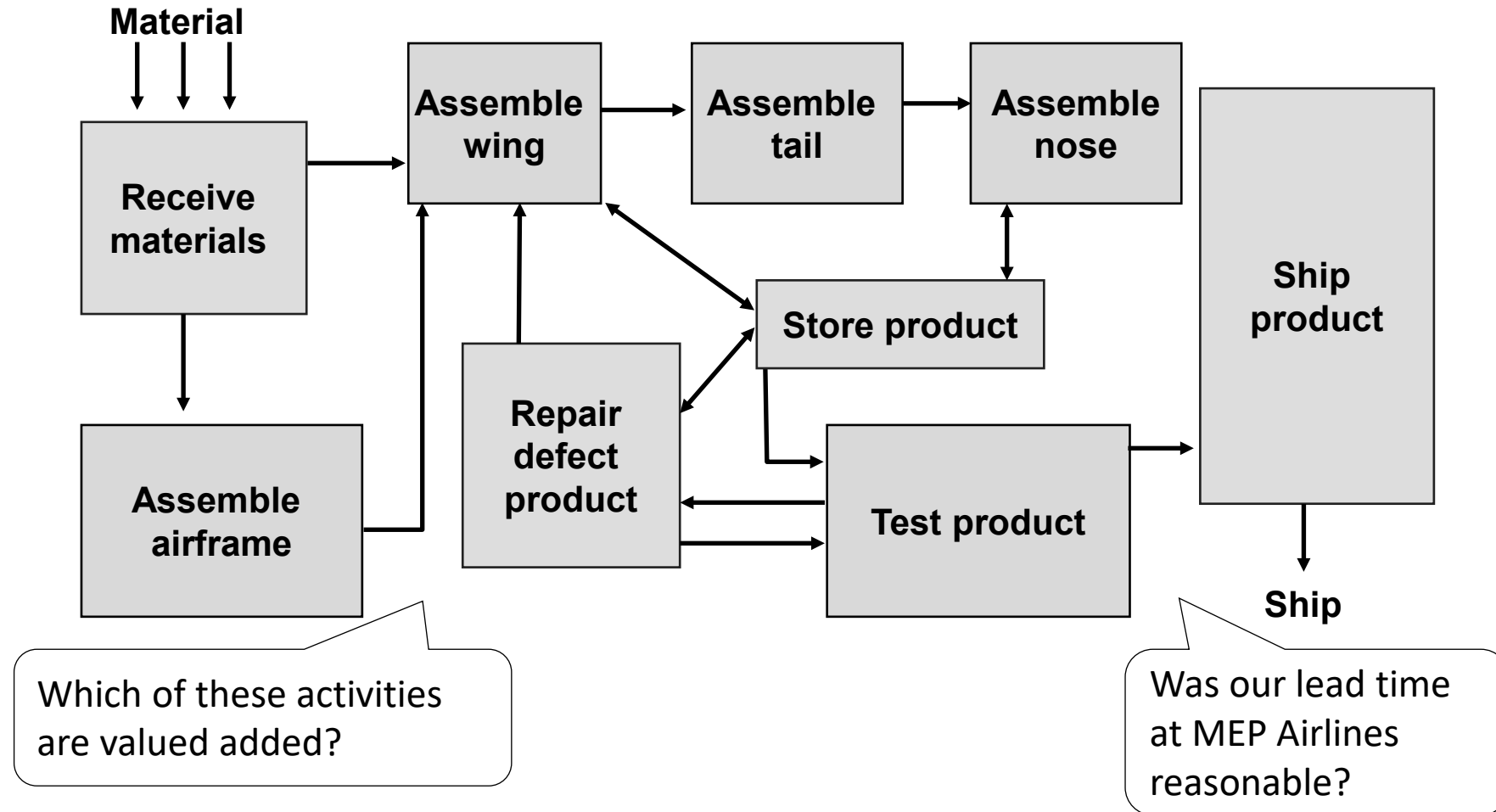
- Are these activities value added or non-valued added?
 - Transporting aluminum sheets from the warehouse to the stamping machine. **Non-value added**
 - Performing an inspection of incoming materials. **Non-value added**
 - Mixing chemicals to create a cleaning product. **Value added**
 - Stamping an expiration date on a food product. **Non-value added**
(but required by regulations)
 - Repacking a product that was packaged incorrectly. **Non-value added**

Term: Lead Time

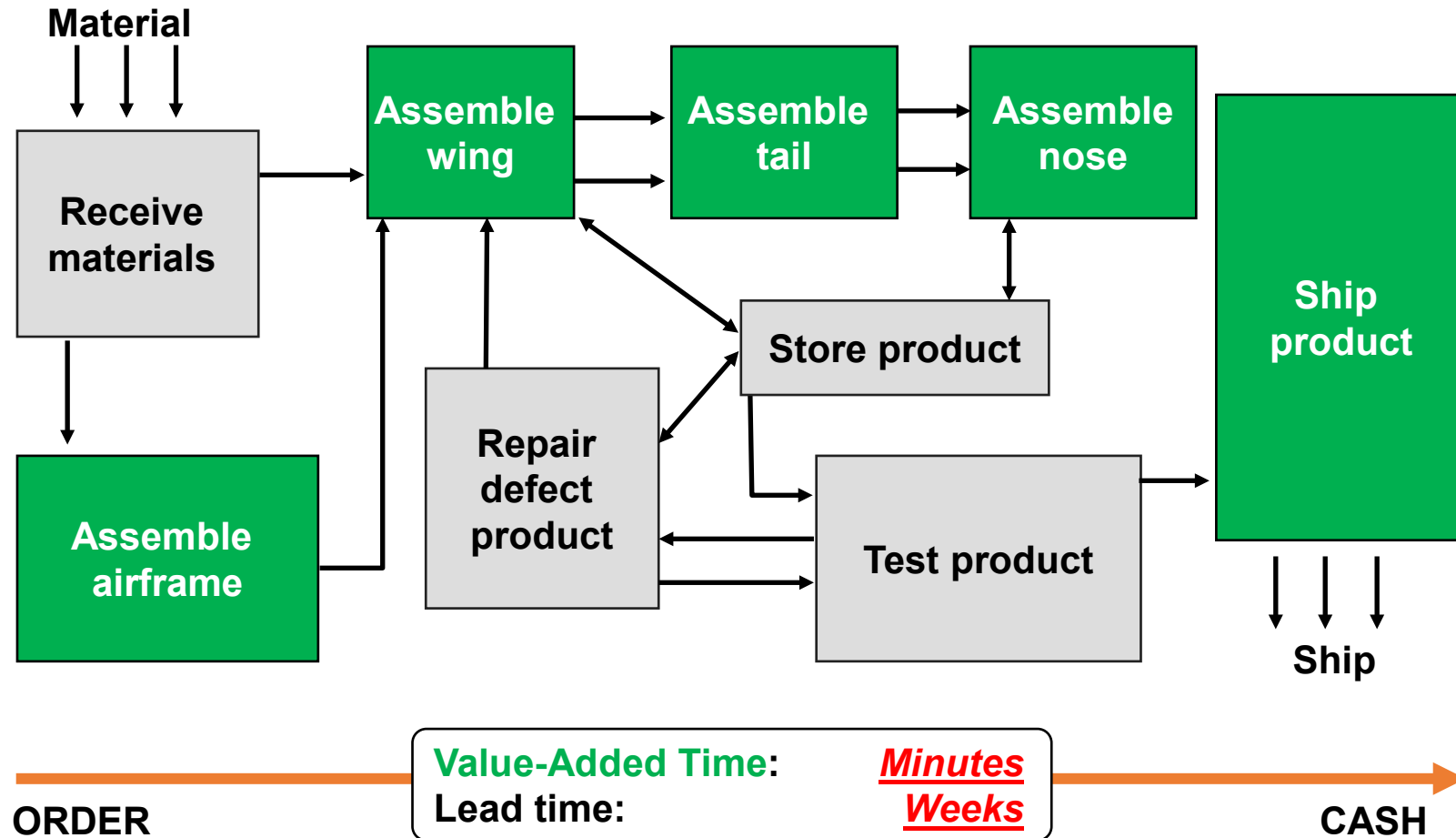
- Lead time: The total time needed to manufacture an item, from order to customer's receipt of the finished goods.
 - Example: You order a Subaru Legacy from the factory in Lafayette, IN.
 - The lead time ranges from 4-12 weeks.



Traditional Production Environment

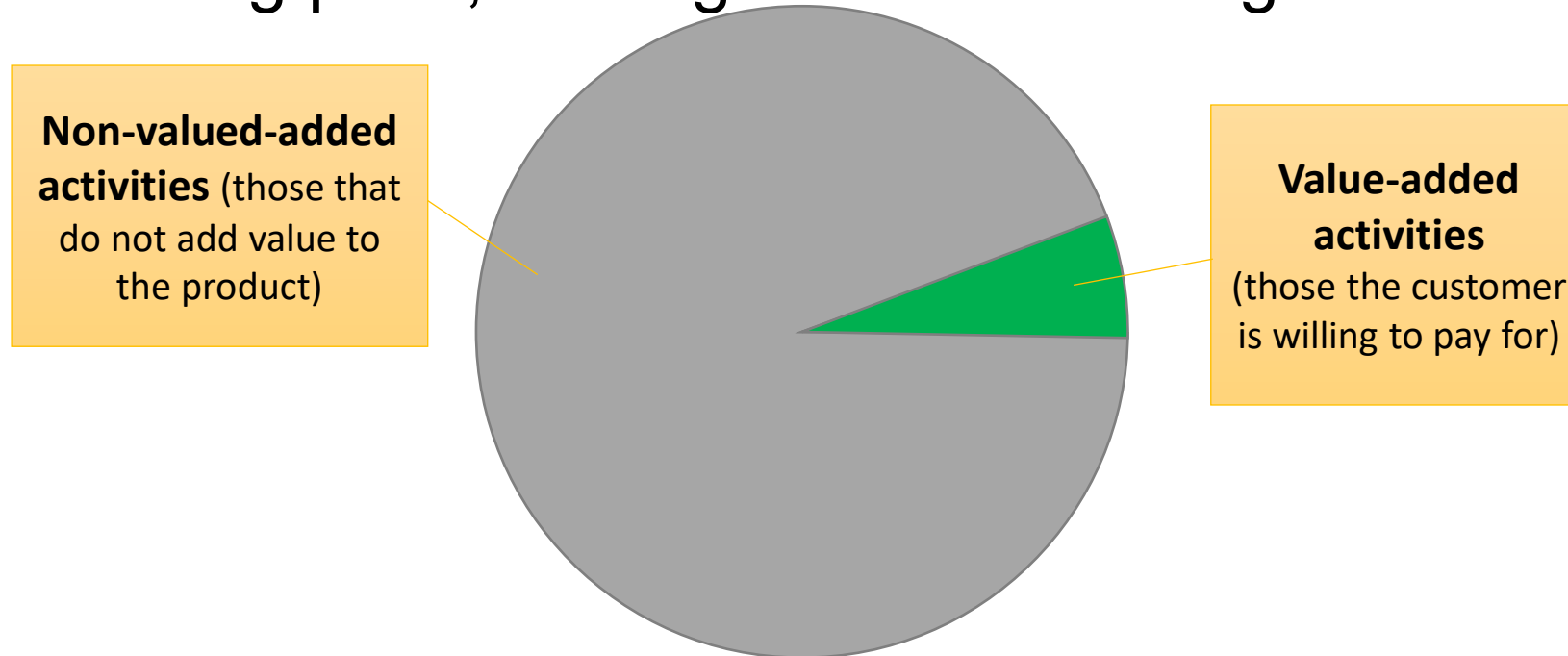


Traditional Production Environment



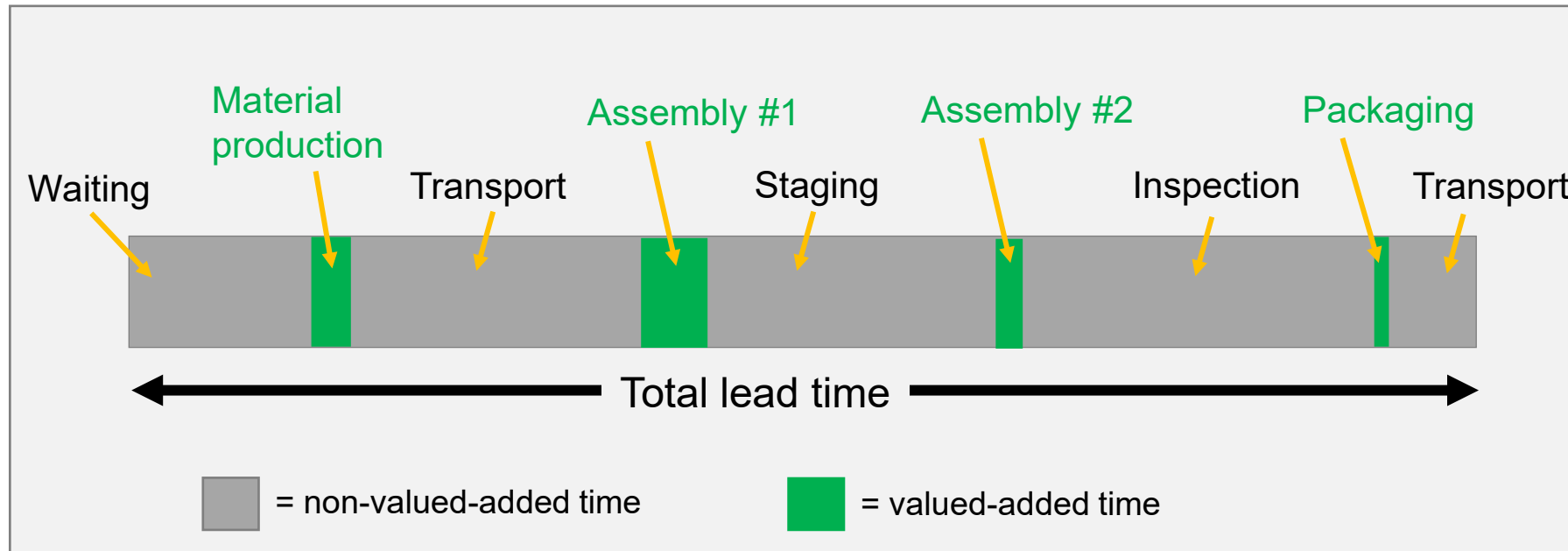
Traditional Elements of Work

- If we categorized the work that takes place in a traditional manufacturing plant, we might see something like this:



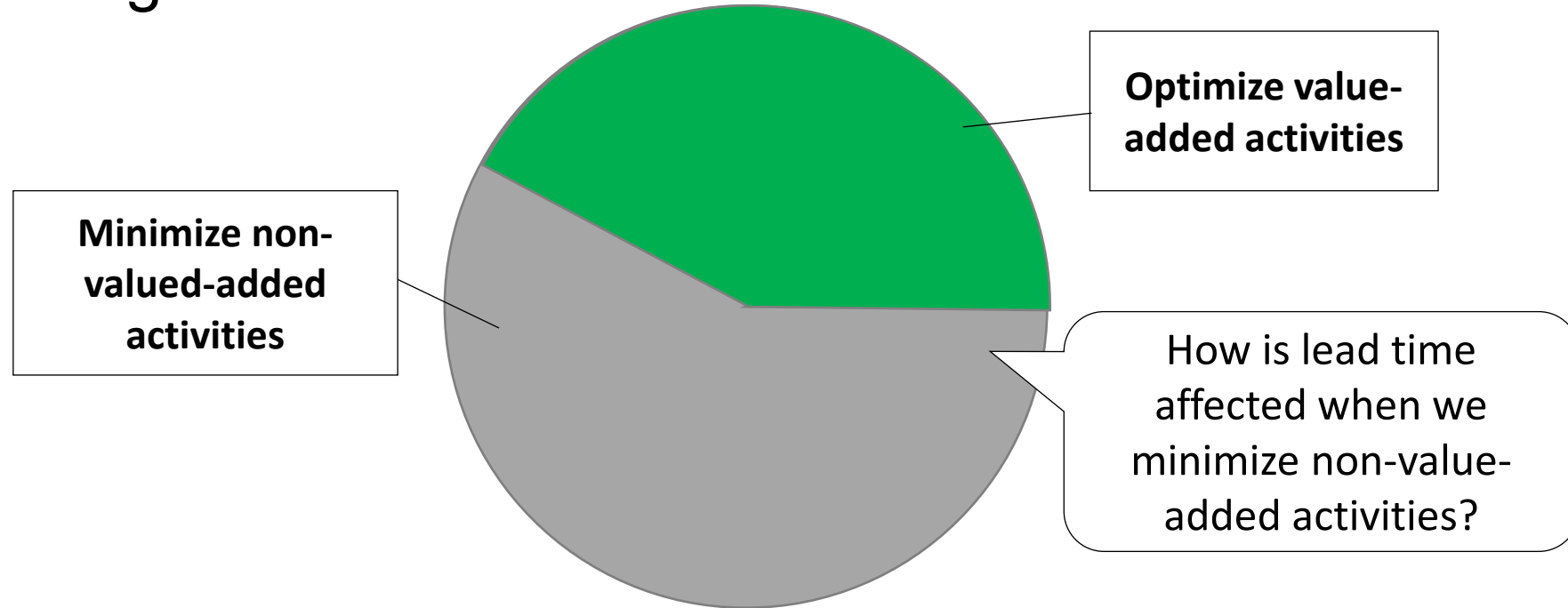
Traditional Lead Time

- Lead time in a traditional manufacturing environment:



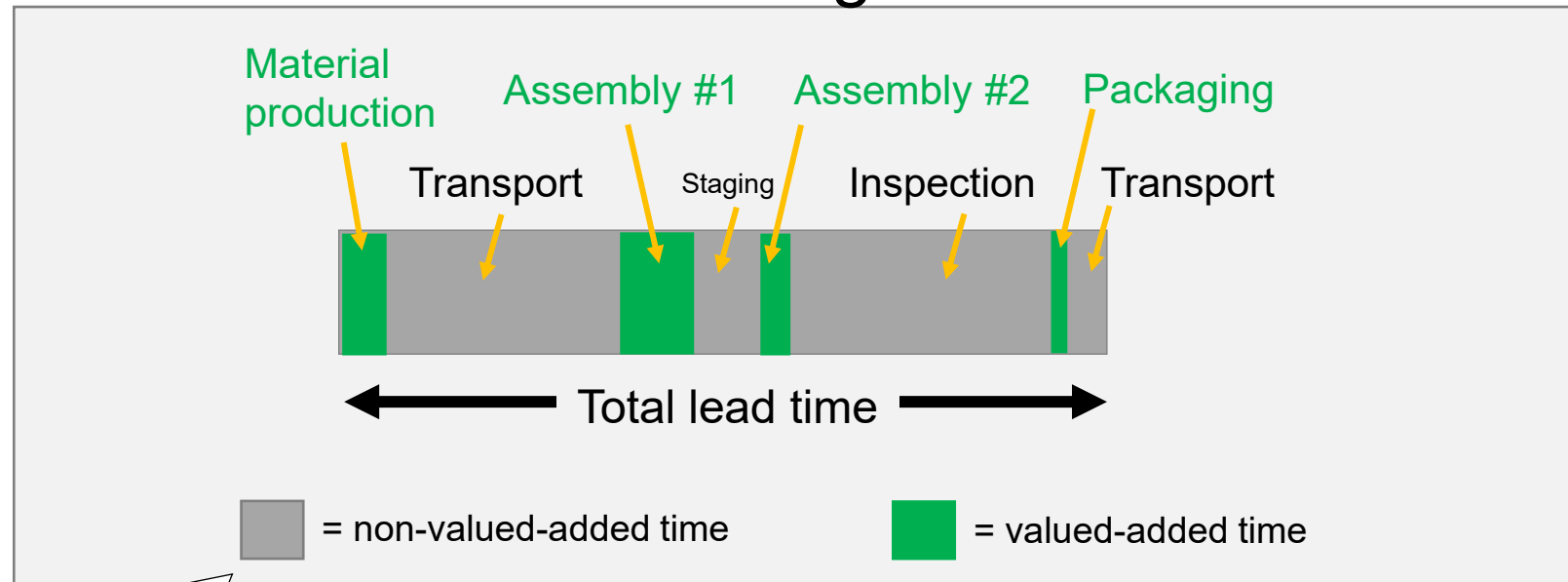
Lean Elements of Work

- The goal of lean is to optimize value-added activities by minimizing non-valued-added activities:



Lean Lead Time

- Lead time in a lean manufacturing environment:



Is it possible to eliminate all non-valued-added activities?

Why Lean?

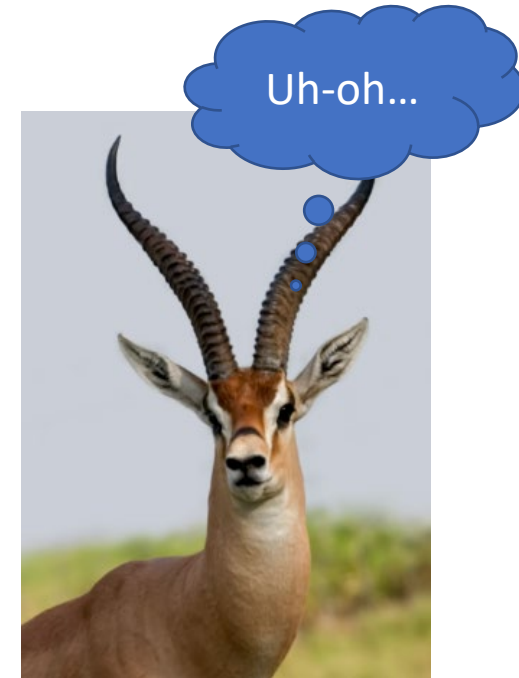
Countries that are currently competitive in manufacturing include China, Germany, Japan, and South Korea.

- The marketplace is changing!
 - The marketplace is now global.
 - We can no longer assume that the world wants our products
 - To remain competitive, companies must:
 - Grow
 - Innovate
 - Become more productive
 - Adopting **lean** can help companies remain competitive!



Lean Is Market Driven

- We can think about competitiveness like this:
 - Every morning in Africa, a gazelle wakes up.
 - It knows it must run faster than the fastest lion or it will be killed.
 - Every morning, a lion wakes up.
 - It knows it must outrun the slowest gazelle or it will starve to death.
 - It doesn't matter whether you are a lion or a gazelle — when the sun comes up, you had better be running.



Key Points

- Non-value-added activities are **waste**.
- Waste in manufacturing uses up **time** and **resources**.
- The goal of lean is to **eliminate** wastes.
- Lean is a powerful system for **reducing costs, improving quality, and reducing lead time**.



Wastes in Manufacturing

- Eight wastes commonly exist in manufacturing:

Notice
“DOWNTIME”!

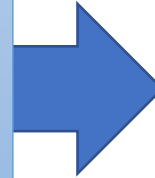
D	Defects
O	Overproduction
W	Waiting
N	Non-utilized talent
T	Transportation
I	Inventory
M	Motion
E	Excess processing

The goal of lean is to **eliminate** these wastes.

Defects

What is it?

Defects are when the product produced or service provided doesn't match specifications or what the customer wants.



What happens as a result?

- Parts have to be reworked, repaired, replaced, or scrapped.
- Information has to be corrected.

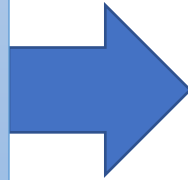
- Some causes of defects:
 - Product not designed well.
 - Employees not trained well or not provided work instructions.
 - Equipment or tools not maintained.
 - Poor or nonexistent quality control.
 - Customer needs not understood.

Overproduction

What is it?

Overproduction is

- Producing **more** parts than can be sold or have been already requested by the customer.
- Making more than is required by the next process (or **earlier** or **faster** than).



What happens as a result?

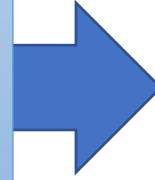
- The organization has capital tied up in stock, raw materials, and work in process (WIP).
- These items need to be stored or moved around, tracked, etc.

- Some causes of overproduction:
 - Process setup takes a long time.
 - Scheduling is not level (we are not exactly sure when we will need items).
 - Workload is unbalanced; some processes are faster than others.

Waiting Waste

What is it?

Waiting for parts, instructions, approval, information, setup, etc.



What happens as a result?

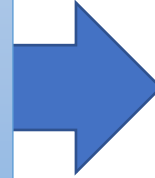
People or machines are idle.

- Some causes of waiting:
 - Production rates are mismatched.
 - Equipment breakdowns, including upstream or downstream.
 - Process setup takes a long time.
 - Quality problems exist upstream.

Non-Utilized Talent

What is it?

Non-utilized talent is the waste of not using people's **knowledge, skills, or abilities.**



What happens as a result?

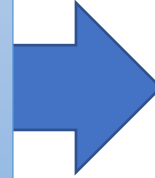
- Problem solving is slow or nonexistent.
- Needed improvements aren't made.
- Employees have poor morale.

- Some causes of non-utilized talent:
 - Company culture doesn't value employees.
 - Low or no investment in training.
 - The company has a low-pay, high-turnover strategy.

Transportation Waste

What is it?

Transportation waste is moving parts and materials from one location to another.



What happens as a result?

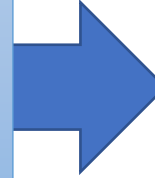
- You have to pay for material handling (people, equipment, etc.).
- Damage or losses can occur in transport.

- Some causes of transportation waste:
 - Overproduction.
 - Plant layout is poor.
 - Large batch sizes/high quantities of work in progress.

Inventory Waste

What is it?

Inventory waste includes raw materials, work in progress (WIP), or finished goods on hand.



What happens as a result?

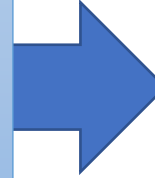
- Capital is tied up in inventory.
- Inventory needs to be stored or moved around, tracked, etc.

- Some causes of excess inventory:
 - A buffer is needed against inefficiencies and unexpected problems.
 - Batch size is large.
 - Scheduling is not level/workload is unbalanced.
 - Shipments by suppliers are unreliable.

Motion Waste

What is it?

Motion waste is any movement of people or machines that does not add value to the product or service.



What happens as a result?

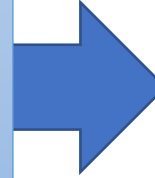
- Employees are doing things other than producing, such as lifting, moving, searching, etc.
- In people, injuries that can lead to absenteeism; in equipment, additional wear or premature breakdowns.

- Some causes of motion waste:
 - The workplace or work areas are poorly laid out.
 - The workplace is not organized.
 - Work methods involve lifting, turning, or rearranging the product being worked on.

Excess Processing

What is it?

Excess processing is efforts that add no value to the product or service from the customers' viewpoint.



What happens as a result?

- Staff time is wasted. (What else could they be doing?)
- Equipment and materials are used unnecessarily.

- Some causes of excess processing:
 - True customer requirements not clearly defined.
 - Over-processing to accommodate downtime.
 - Lack of communication.
 - Product changes without process changes.

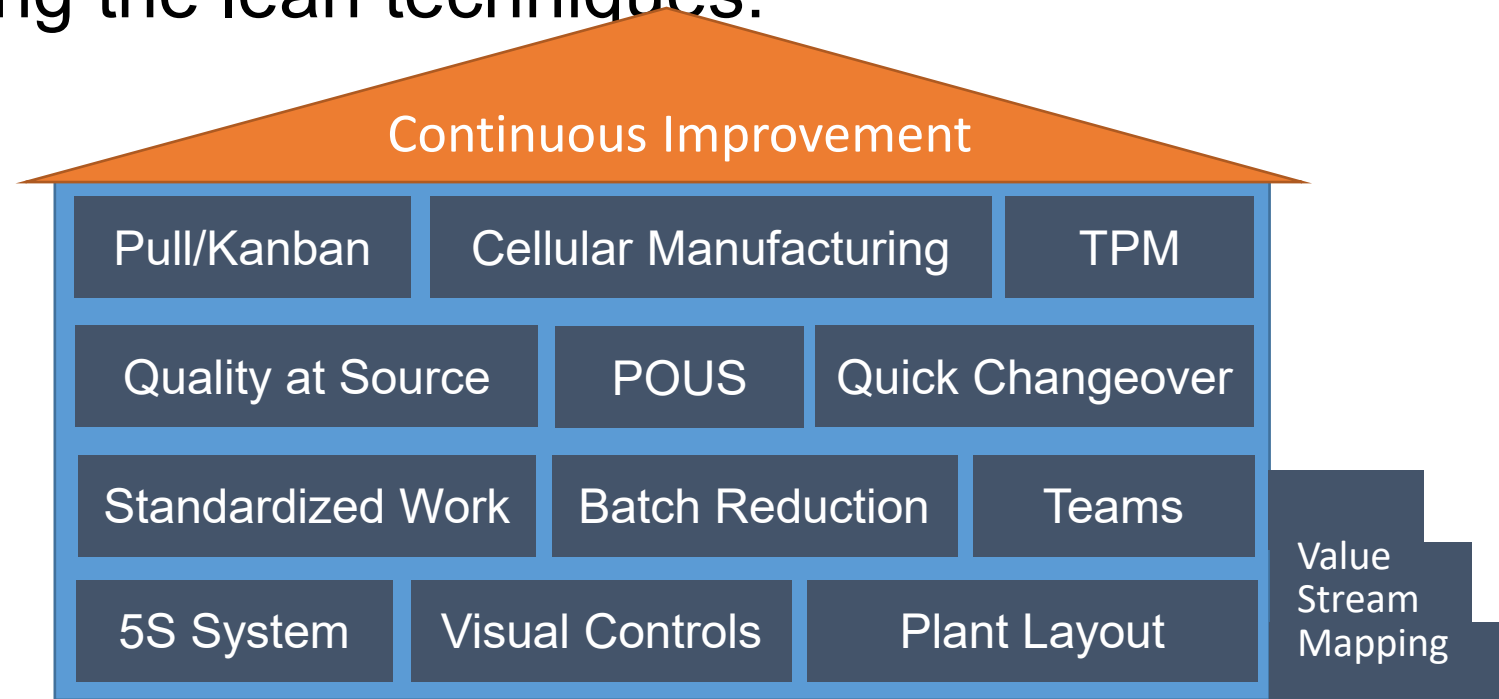
What's Next?

- We've defined lean.
- We've talked about the benefits of lean.
- We've identified eight wastes commonly found in manufacturing.

How do we achieve lean manufacturing?

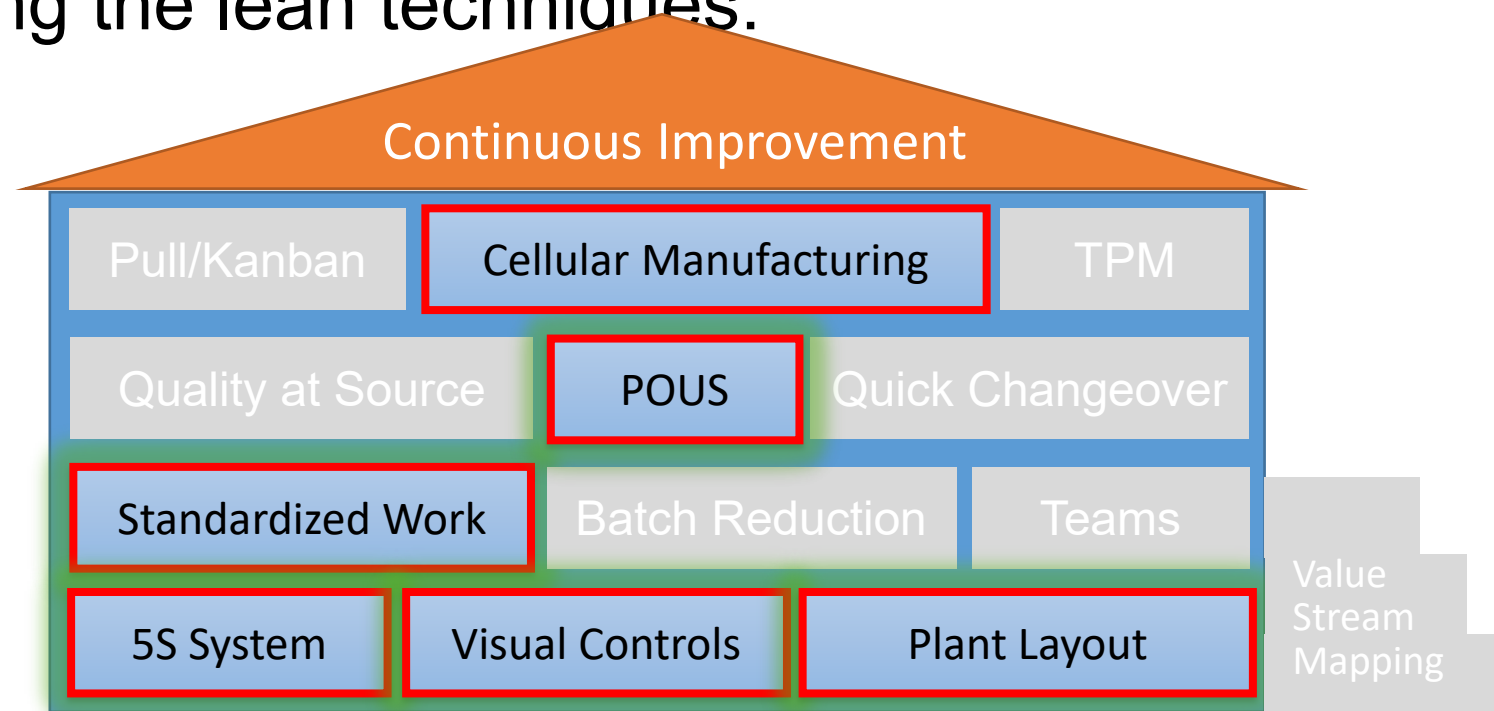
Lean Techniques

- We eliminate waste and achieve lean manufacturing by implementing the lean techniques:



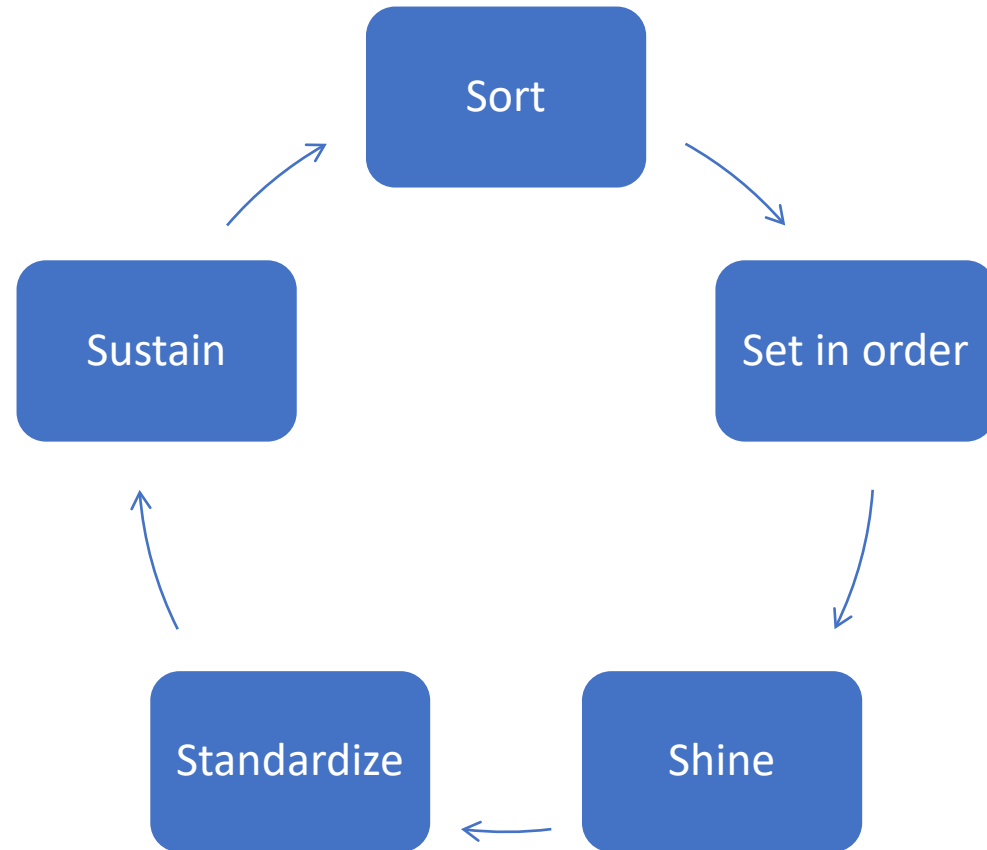
Lean Techniques

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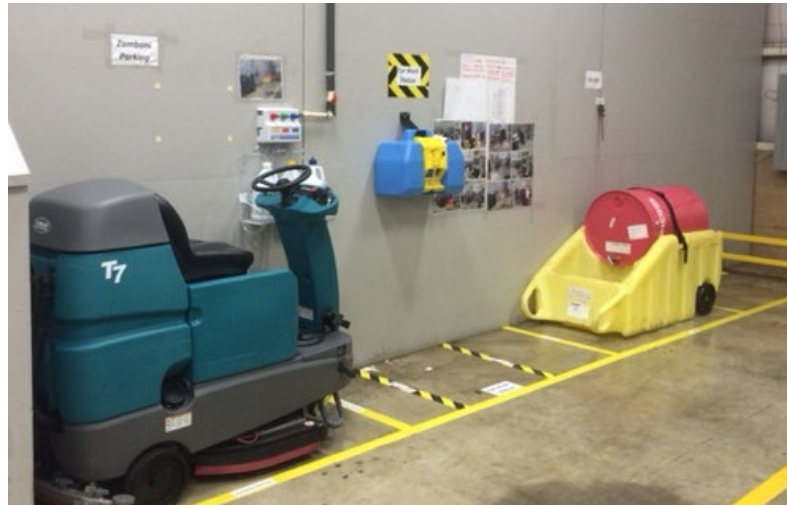


5S: Workplace Organization

- What is it?
 - 5S is a system designed to organize and standardize the workplace.
 - Consists of five parts:



5S in Practice



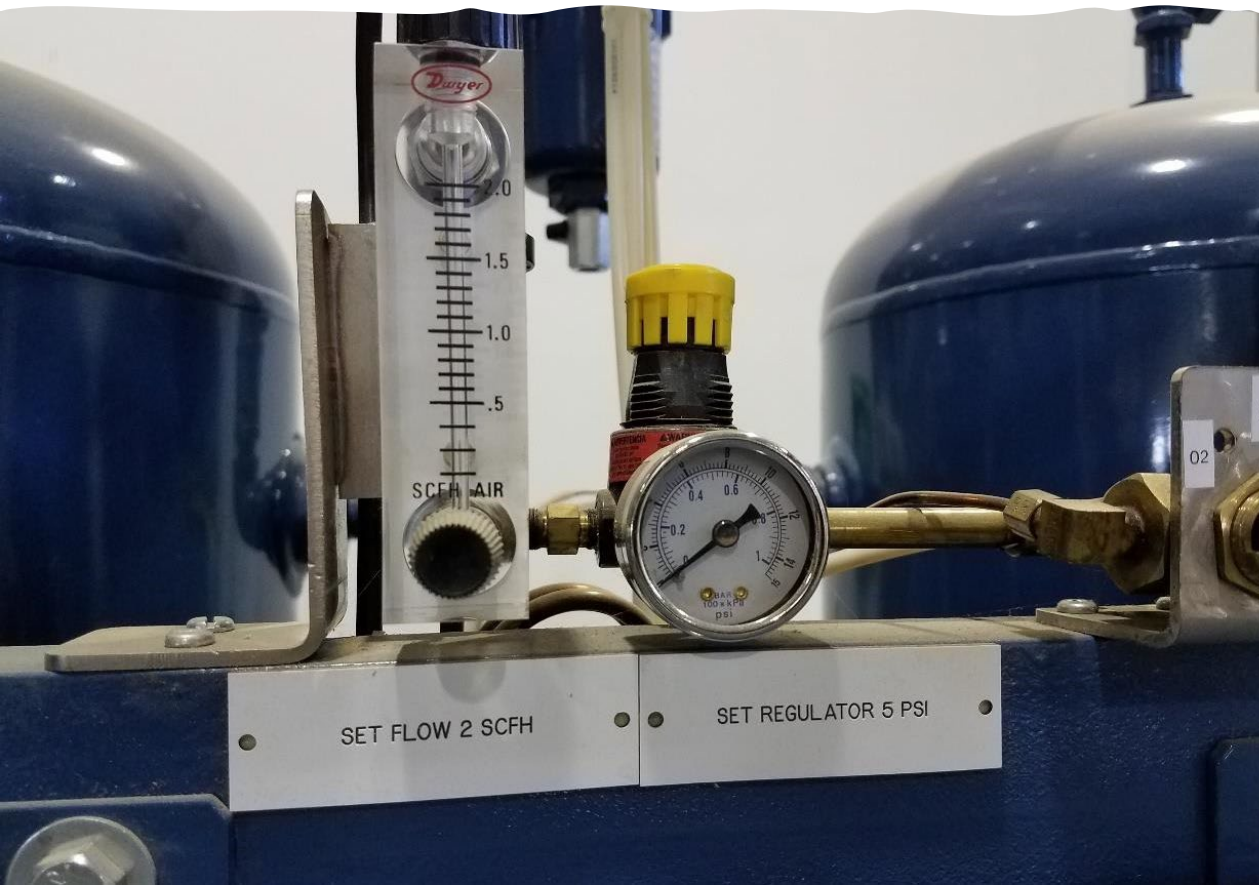
5S: Workplace Organization

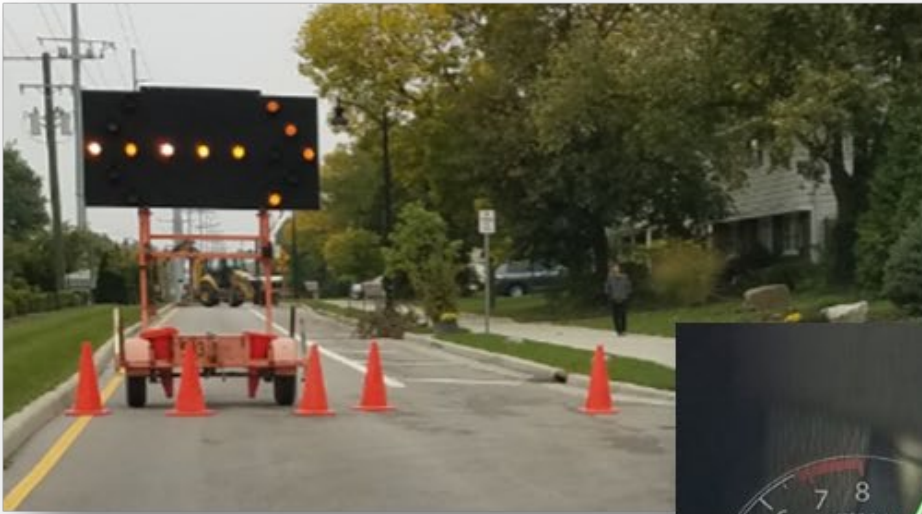
- In everyday life....
 - You need a screwdriver to change some batteries. Which workbench would you prefer? Why?



Visual Controls

- What is it?
 - Visual controls are simple signals that provide an immediate understanding of a situation or condition.
 - Can include signs, labels, digital readouts, colors, shapes, arrows, charts, etc.





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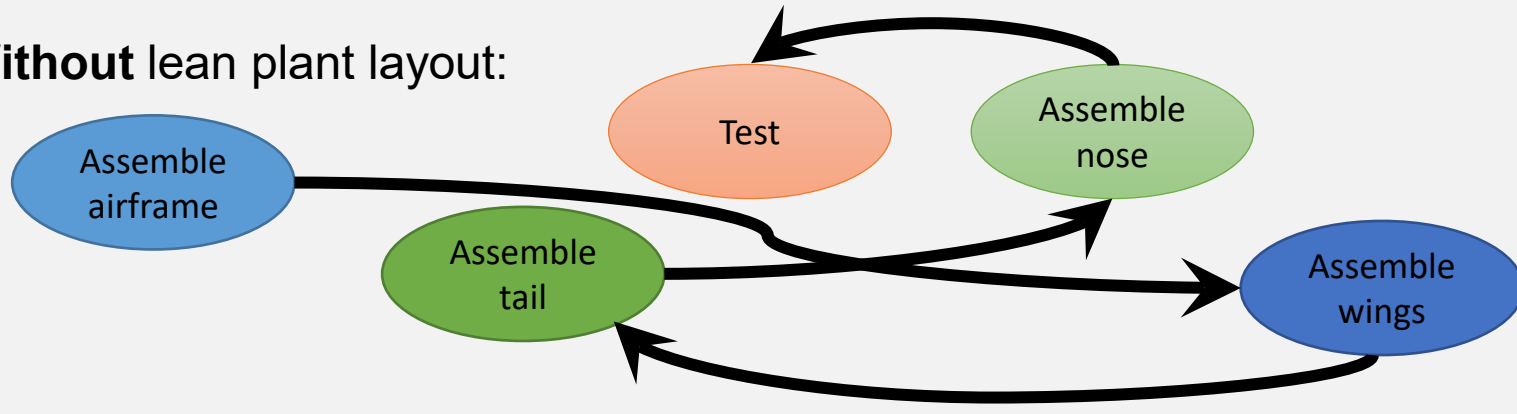
Plant Layout

- What is it?
 - Lean plant layout is the idea of arranging people, workplaces, and equipment to optimize flow, minimize waste, and boost productivity.

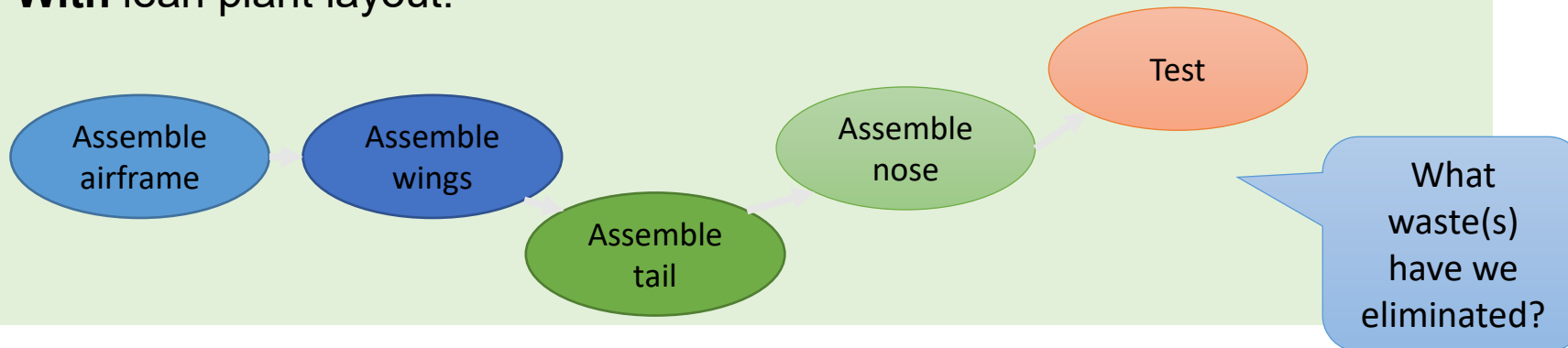


Plant Layout in Practice

Without lean plant layout:

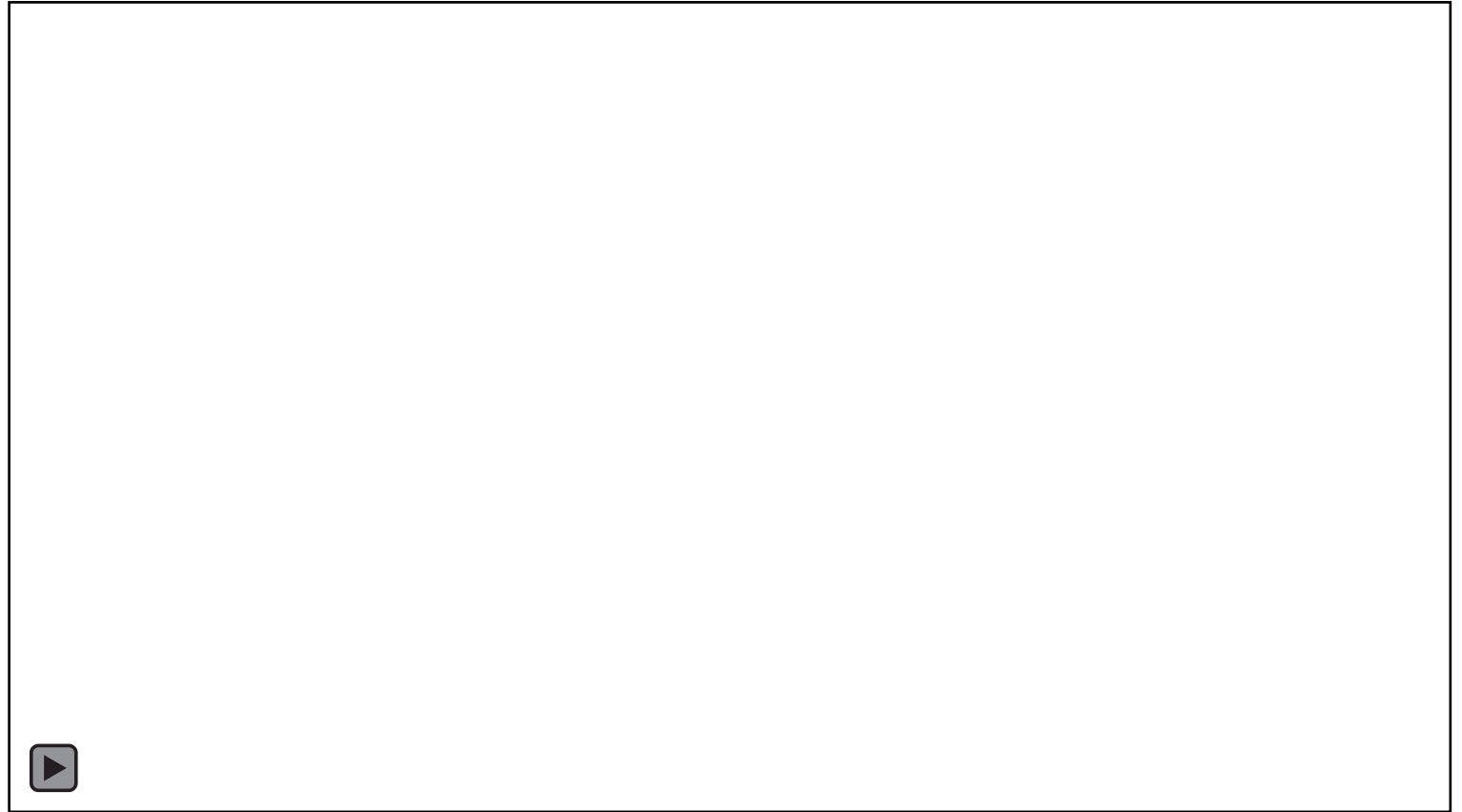


With lean plant layout:



Video







Lean Plant Layout at McDonald's



Standardized Work

- What is it?
 - Standardized work is the safest, easiest, and most efficient and effective way of doing a job.
 - Everyone performs the work the same way – the best agreed-upon way, for now.
 - It uses the most effective combination of:
 - People
 - Machines
 - Methods
 - Materials

Standardized Work in Practice

WORK INSTRUCTION SHEET				
Task name: Changing LPG tank on Nissan Model 20-B Forklift  Safety  Quality			Job element sheet 0015	
			Sheet 1 of 2	
			Date prepared: 11/28/20XX	
	Sym.	No.	Major step	Key point(s)
		1	Turn the red discharge valve slowly clockwise to fully close the valve.	<ul style="list-style-type: none"> Wear gloves to protect hands from propane vapor. DO NOT touch the refuel valve (green or gray) on the LPG cylinder.
		2	Allow the engine to run until it stops naturally.	<ul style="list-style-type: none"> At this point, the fuel tank is empty.
		3	Turn the key switch to the OFF position.	
		4	Turn the high-pressure valve removal screw handle to the left to disconnect the high-pressure hose.	<ul style="list-style-type: none"> Take care not to damage the packing around the tip of the hose.

Standardize d Work



- In everyday life....
 - How do fast-food restaurants ensure every burger looks and tastes the same?
 - What would happen if they didn't have standardized work for preparing food?

Point-of-Use Storage (POUS)

Ford assembly line, 1913

- What is it?
 - Point-of-use storage (POUS) is the practice of storing materials at the workstation where they are used.



How is POUS implemented here?

Point-of-Use Storage

- In everyday life.....
 - What examples of POUS do you encounter in everyday life?

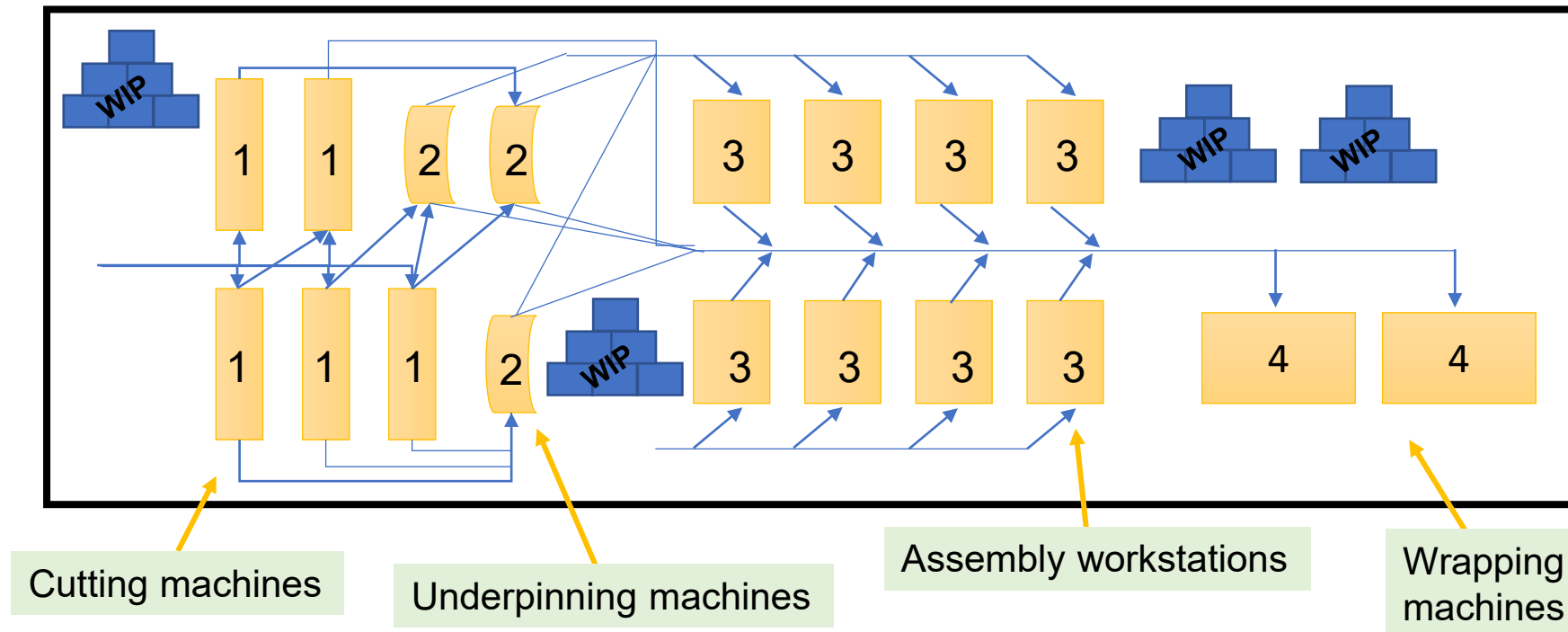


Cellular Manufacturing

- What is it?
 - Cellular manufacturing is organizing the entire process for a particular product or similar products into a group (or “cell”), including all the necessary machines, equipment and operators.
 - Cellular manufacturing allows companies to:
 - Achieve one-piece flow.
 - Build a variety of products with as little waste as possible.

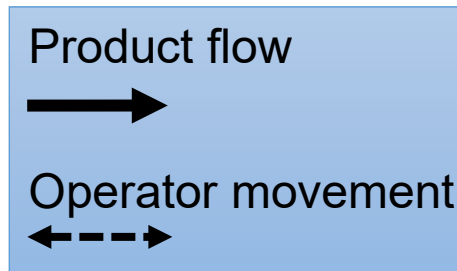
Traditional Manufacturing

- Traditional layout in a factory that produces wooden picture frames and wooden-framed mirrors:

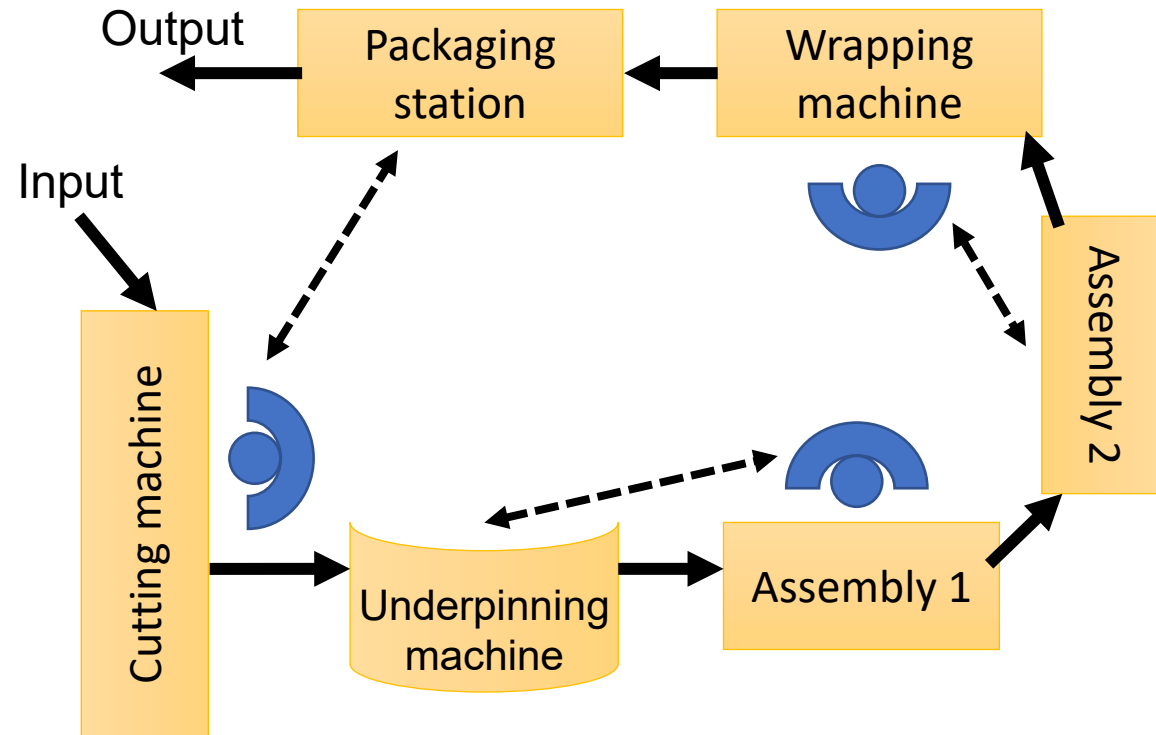


Cellular Manufacturing in Practice

Cellular layout:



In a **manufacturing cell**, the equipment and workstations are arranged close together in the sequence of the processing steps.



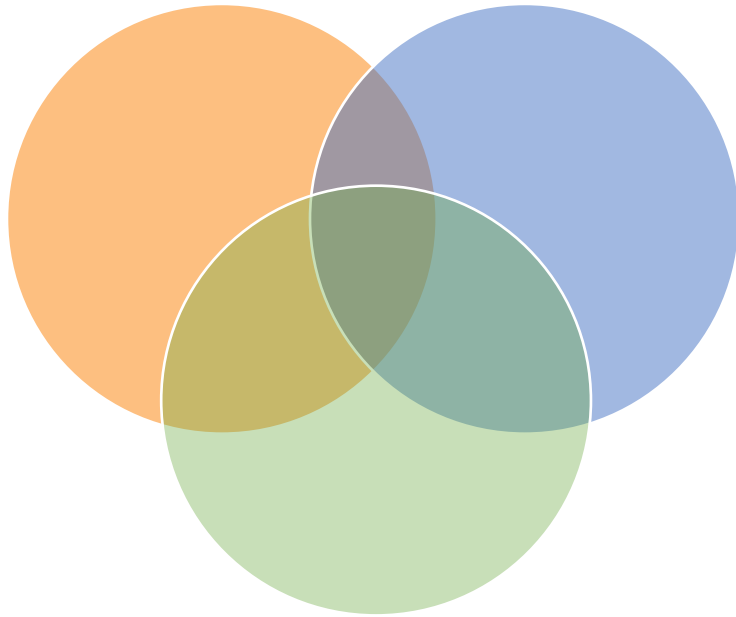
Source: Dinis-Carvalho, J., Alves, A., & Sousa, R. (2014). Moving from job-shop to production cells without losing flexibility: A case study from the wooden frames industry. *South African Journal of Industrial Engineering*, 25(3), 212-225.



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Workforce

Wholistic, systems thinking for your people

Lean

Preparing for next generation technologies and workforce

Technology

To address a bottleneck or to reinvent a process

KATA for I4.0

All training, consulting and projects are rooted in a
commitment to creating cultures of learning.



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Your Role in Innovation

- Stay Focused on the Benefit
- Top 5 Technologies for Small Manufacturers
- Your Role in Innovation
 - Forget Technology, Find the Pain
 - See the Hidden Factory

Technologies for Small Manufacturers

1. Vision Based Data Collection
2. Off-Line Robot Programming Platforms
3. I4.0 Assessments
4. Robotic Welding

#1 Vision

100% of the data you need and
zero connections to critical equipment



#2 Off-Line Programming

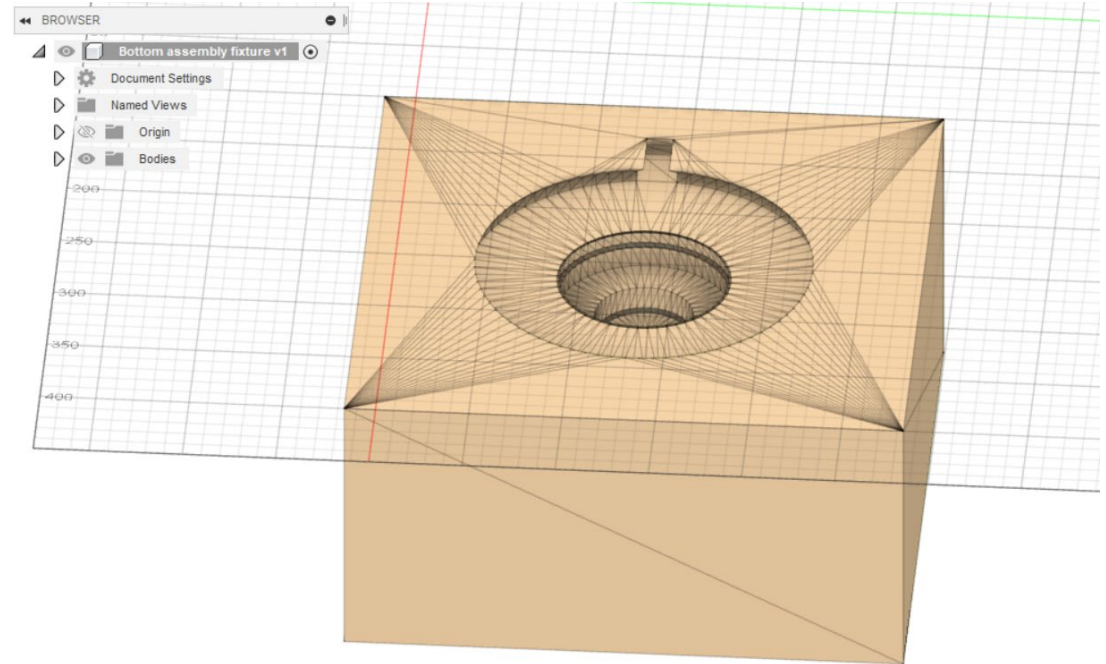
3D Scanning

Octopuz

Ready Robotics



#2 Off-Line Programming



#2 Off-Line Programming

The image shows a screenshot of the Onshape CAD software interface. At the top, the title bar reads "onshape Extruder Main". A "Share" button and a user profile for "Danny Norman" are visible in the top right. The main workspace displays a 3D model of a grey extruder assembly with a yellow handle and a blue inlet cap. On the left, a "Instances (12)" tree lists components: EXTRUDER, Origin, 12" LON..., GASKET 2" <1>, GASKET 2" <2>, REDUCER 2" TO 1" ..., GASKET 1" <1>, DISCHARGE CAP <...>, AIR INLET CAP <1>, PISTON ASSY <1>, Brass Valve <1>, CLAMP 1" <1>, CLAMP 2" <1>, and CLAMP 2" <2>. Below this is a "Mate Features (11)" section with "Fastened 1" and "Fastened 2". A "Following Lee" video feed in the top right shows a 3D coordinate system (X, Y, Z) and a small cube. In the bottom right, a video feed shows a man in a black polo shirt with a logo that reads "REVULO ENGINEERING & CONSULTING". The bottom of the interface shows a tabbed workspace with tabs for "EXTRUDER ASSY", "PISTON ASSY", "PLUNGER", "AIR INLET CAP", "EXTRUDER ASSY DWG", and "EXTRUDER PARTS D".

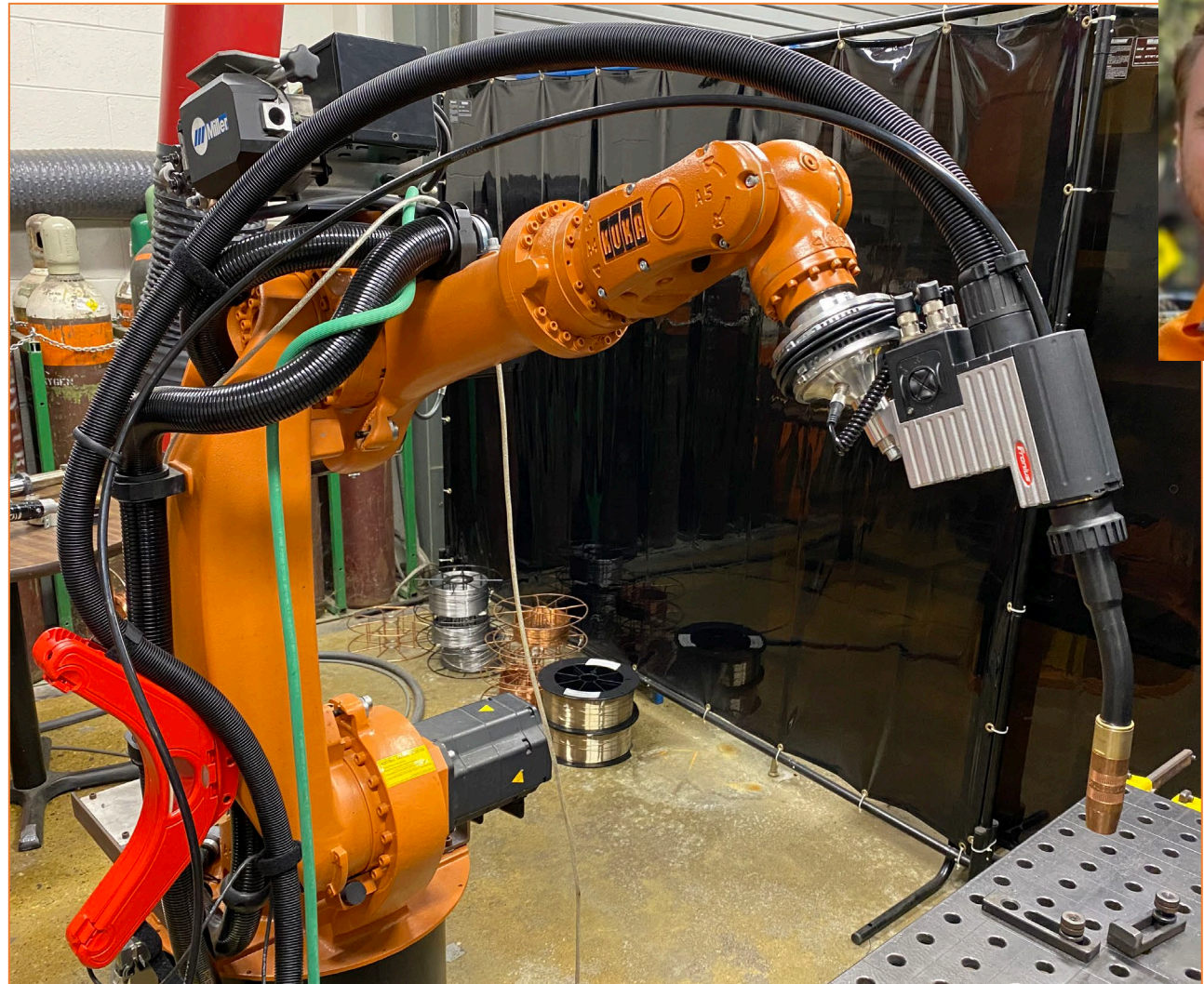
#3 I4.0 Assessments

THE DIGITAL TRANSFORMATION FOR MANUFACTURERS ASSESSMENT WILL EXAMINE DIGITAL PRACTICES AND PERFORMANCES FOR EIGHT CATEGORIES OF SMALL- AND MEDIUM-SIZED MANUFACTURING OPERATIONS:

1. **BUSINESS** – Leadership, strategy deployment, and technologies for digitization.
2. **PRODUCTION** – Best practices to drive digitization within production and manufacturing KPIs.
3. **WAREHOUSE/DISTRIBUTION** – Best practices to drive digitization within warehouses and warehouse KPIs.
4. **SUPPLY CHAIN** – Best practices to drive digitization of suppliers and supplier-management KPIs.
5. **LOGISTICS/TRANSPORTATION** – Best practices to drive digitization with logistics partners and transportation KPIs.
6. **CUSTOMER** – Best practices to support digitization with customers and customer-centric KPIs.
7. **SUPPORT FUNCTIONS** – Practices of support functions to support digitization.
8. **SMART PRODUCTS** – Development of smart products.

#4 Robot Welding

- Dr. Josh Penney, Postdoctoral Researcher
- Industrial Robotics and Automation
- PhD in Mechanical Engineering UTK, May 2022
 - Systems and Controls
 - Control of Robotic Wire Arc Additive Manufacturing Processes
- Certified by KUKA Robotics for Industrial Robotic Programming

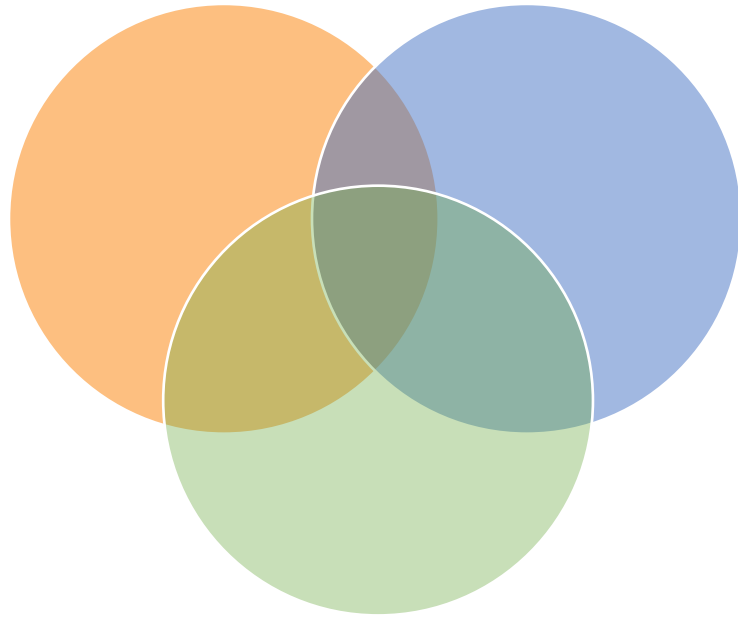




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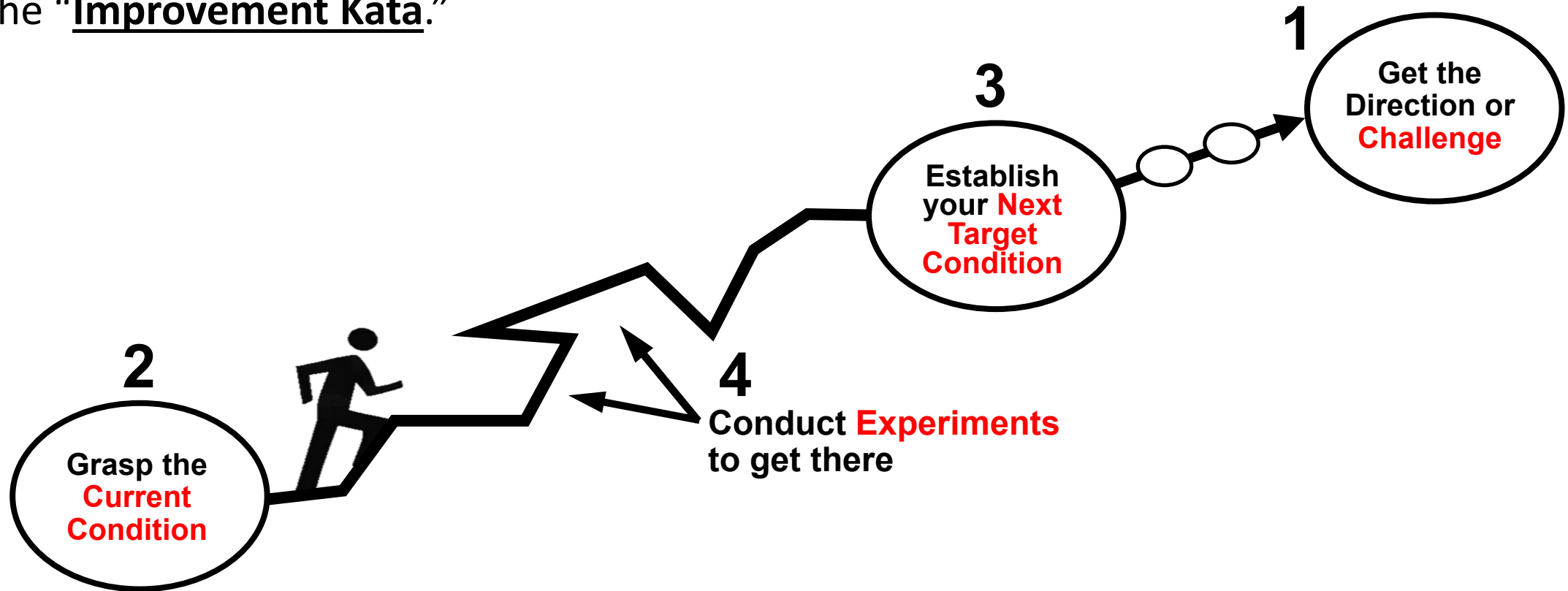
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Target Condition	New Report
Customers	ABC Co, Supervisor
Solution	Tableau Software
Benefit	Save Time, Communicate
Fear	I can't learn new software
Core Competency	Building Relationships
Innovation	Weekly Phone Call

THE IMPROVEMENT KATA MODEL

Kata¹ (方) – Suffix Meaning "*Way of Doing*"

We found a common, scientific pattern of thinking and behavior in Toyota managers' approach -- their 'Way of Improving' -- and depicted it with a four-step model we named the "Improvement Kata."



Thank you!



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Dwaine Raper



Misty DePriest



George Aslinger



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Norma Wilcox



Kenny Smith



Gordon Reed



Kevin Cooper



Bill Hicks

