



Root Cause Analysis Course



- Course Objectives
- What is Root Cause?
- Benefits
- Problem Solving Process
- Examples
- Root Cause “Hints”
- Review
- Additional Resources

Upon completion of this course, participants should be able to:

- Understand the importance of performing root cause analysis
- Identify the root cause of a problem using the problem solving process
- Understand the application of basic quality tools in the problem solving process

ROOT CAUSE =

- The causal or contributing factors that, if corrected, would prevent recurrence of the identified problem
- The “factor” that caused a a problem or defect and should be permanently eliminated through process improvement
- The factor that sets in motion the cause and effect chain that creates a problem
- The “true” reason that contributed to the creation of a problem, defect or nonconformance

- A standard process of:
 - ❖ identifying a problem
 - ❖ containing and analyzing the problem
 - ❖ defining the root cause
 - ❖ defining and implementing the actions required to eliminate the root cause
 - ❖ validating that the corrective action prevented recurrence of problem

By eliminating the root cause...

You save time and money!

- Problems are not repeated
 - Reduce rework, retest, re-inspect, poor quality costs, etc...
- Problems are prevented in other areas
- Communication improves between groups and
- Process cycle times improve (no rework loops)
- Secure long term company performance and profits

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Less rework = Increased profits!

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When should root cause analysis be performed?

When PROBLEMS occur !!

Excess Inventory
Supplier Defects
Out of Control Process
Computer Issues
Scrap Problems
Human Error
Audit Finding
medical errors
Missed Deliveries
Machine Defects
Safety Issues
Workmanship Defects
Overspending Budget

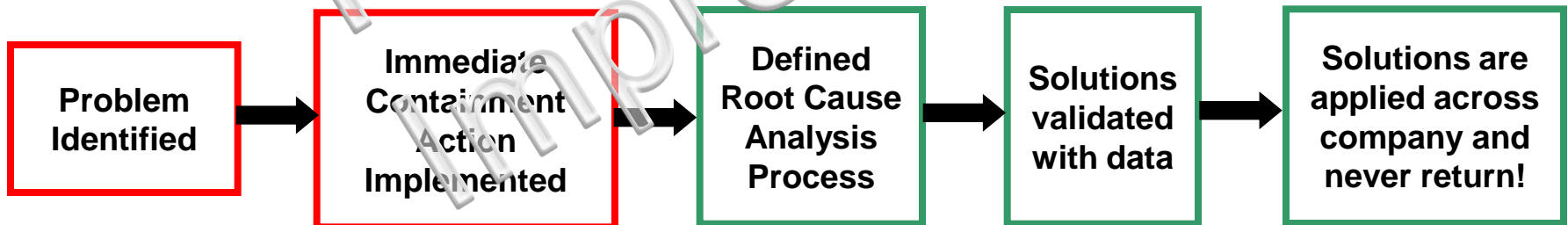


How does it differ from what we do now?

USUAL APPROACH

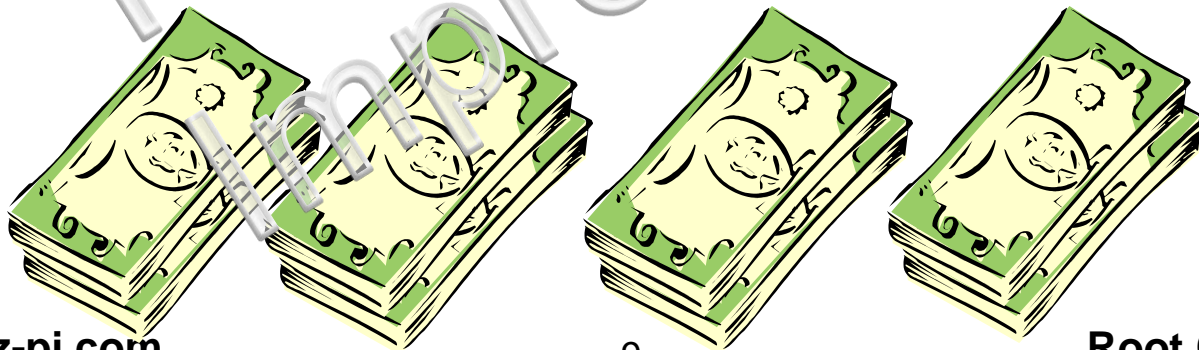


PREFERRED APPROACH



State the problem in terms of dollars!

- Determine how much each occurrence of the problem costs the company
- \$\$\$ speaks the language of management
- Justifies any spending on root cause analysis and corrective actions
- Prioritizes financial impact of problems



Defect found at “Customer” ...

PROCESS
A



PROCESS
B



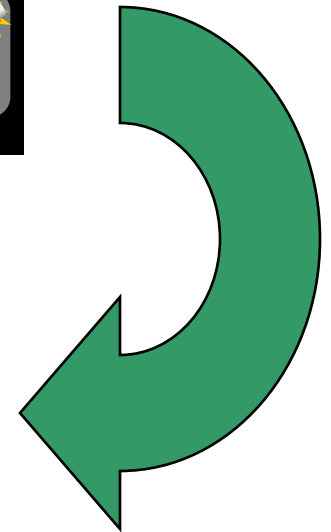
PROCESS
C



PROCESS
D

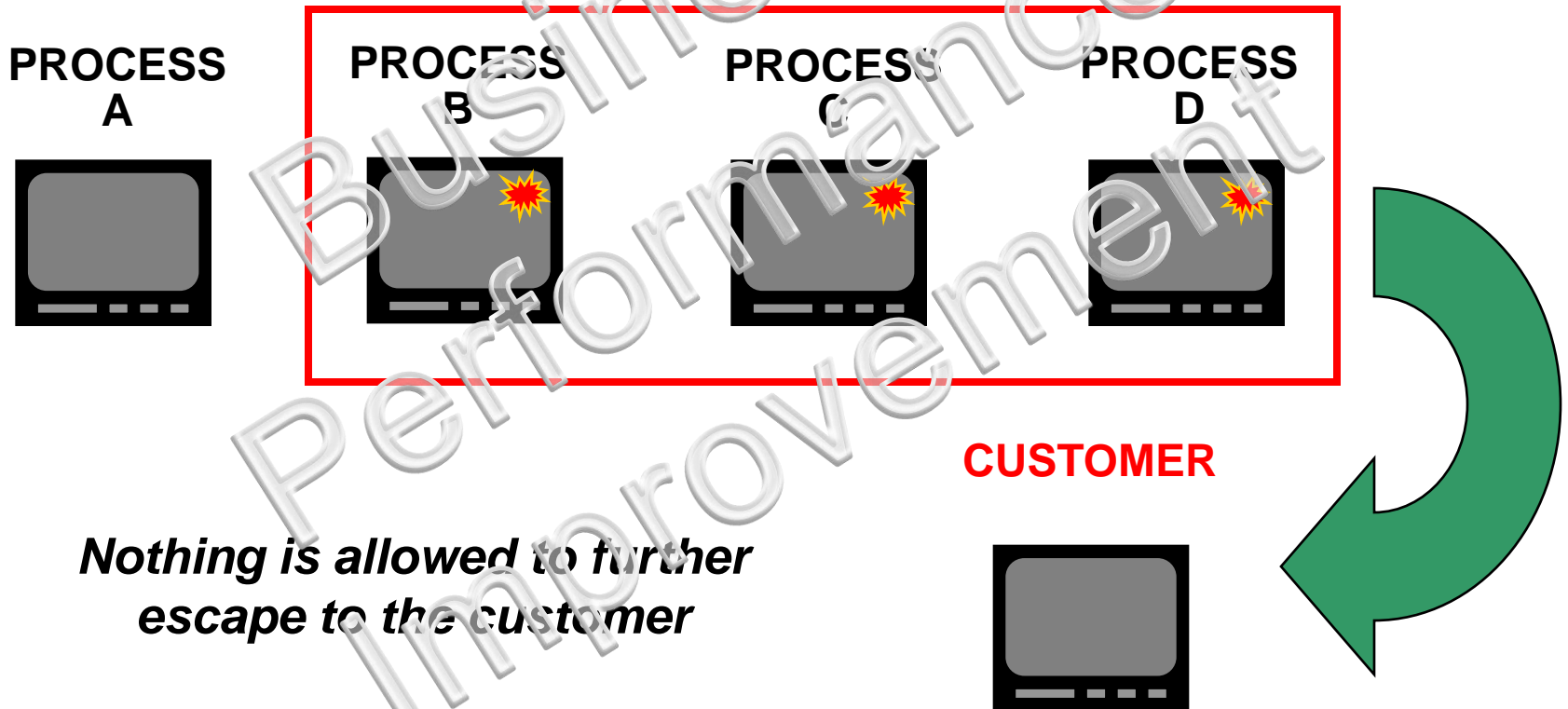


CUSTOMER

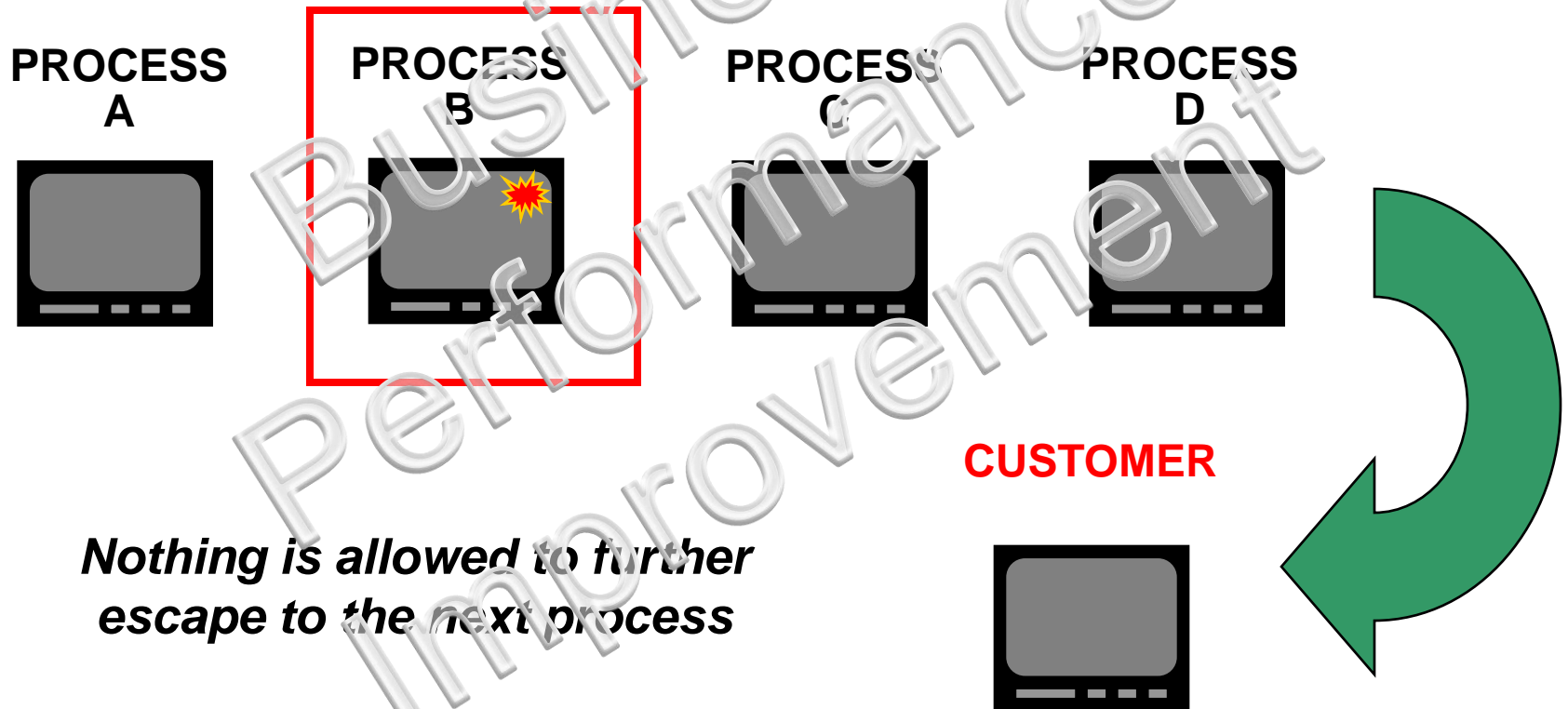


*“Customer” can be
Internal or External*

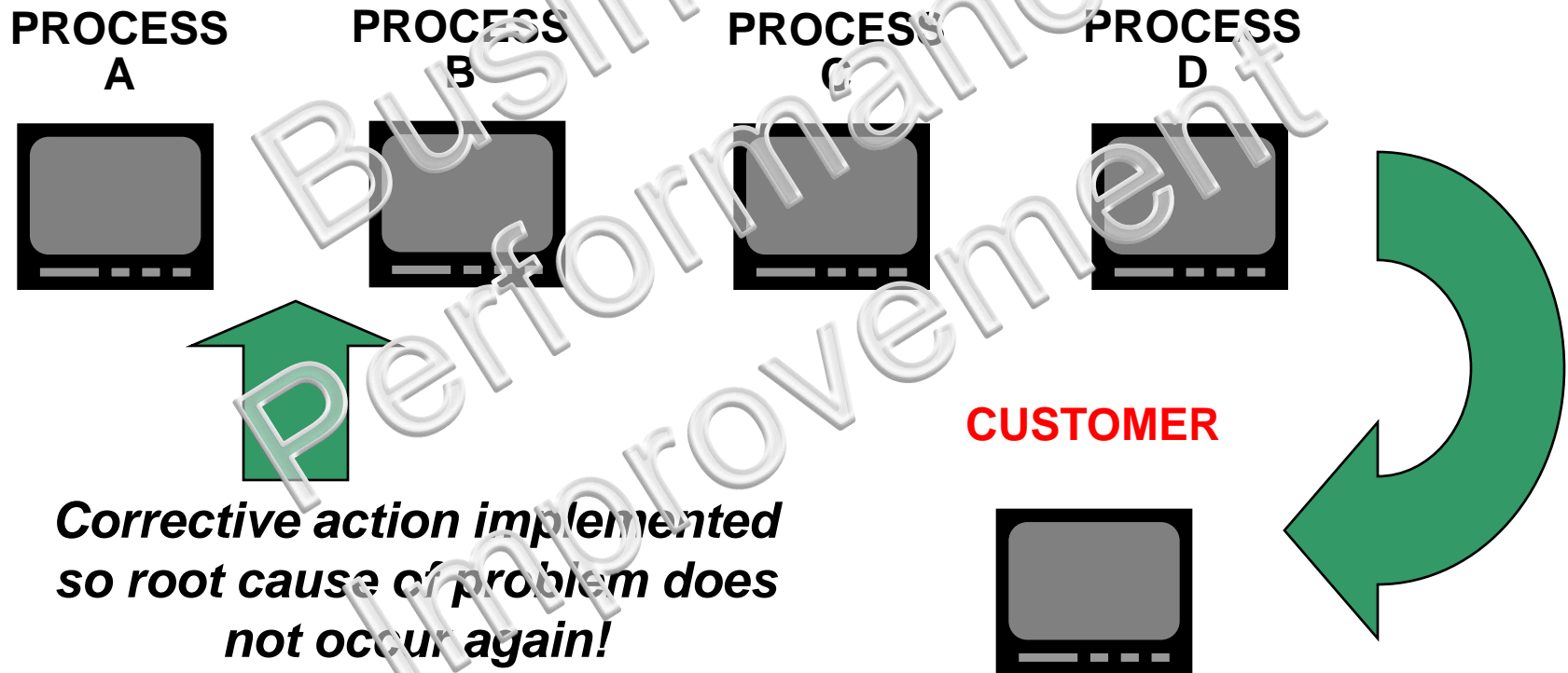
Contain the problem...



Contain the root process...



Prevent the problem...



3 types of Corrective Action:

Immediate action

- The action taken to quickly fix the impact of the problem so the "customer" is not further impacted

Permanent root cause corrective action

- The action taken to eliminate the error on the affected process or product

Preventive (Systemic) root cause corrective action

- The action taken to Prevent the error from recurring on any process or product



Examples of Corrective Actions

Immediate (step #3)

All current batch of paperwork re-inspected by another worker for same type of problem

Permanent (step #5)

Form changed to mandate completion of certain fields

Preventive (step #5)

Similar forms with same fields used all over in company are changed to "mandatory"

If preventive not addressed, problem will return!!



Examples of Corrective Actions

Immediate (step #3)

Part removed and replaced in product, retested

Permanent (step #5)

Product redesigned to account for part variability

Preventive (step #5)

Design process changed to require variation analysis testing on similar supplier parts

If preventive not addressed, problem will return!!



The Difference between Permanent vs. Preventive Corrective Actions

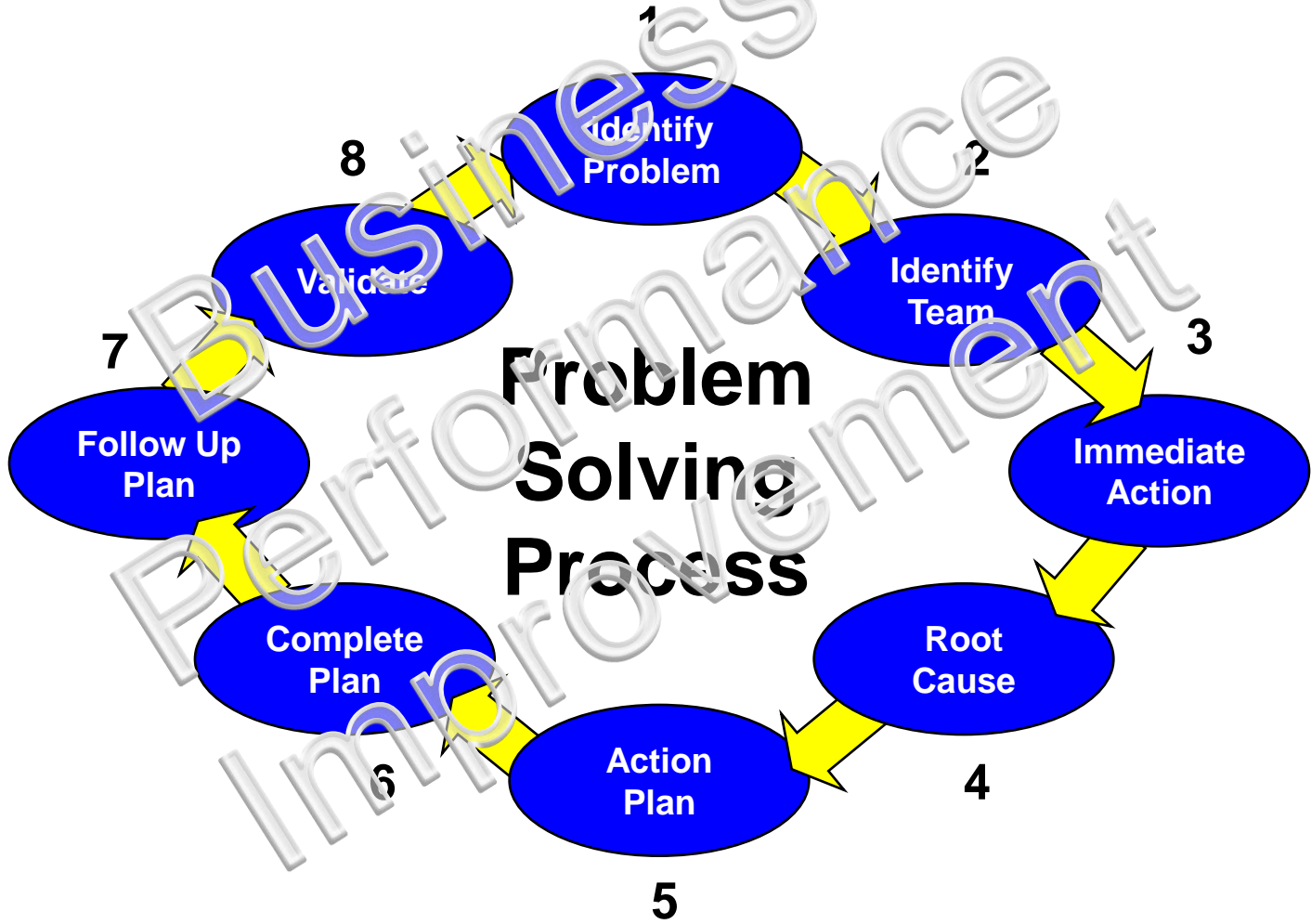
Permanent

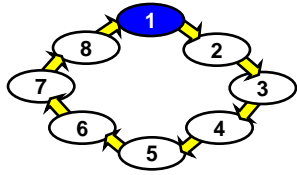
- Trained employee on proper machine use
- Changed product design to make parts easier to assemble manually
- Specific customer document critical to project is identified with red folder
- Update all customers with latest software revision to fix problem
- Fallen patient given full-time assistant to provide help moving around hospital
- Employee fired for ethical violation

Preventive

- Made training a requirement to new employees working in that area
- Changed design guidelines to not allow for use of part in full scale production
- All documents that are critical to project are identified with red folders
- Check for those software bugs added to checklist and performed prior to release of software
- Process developed to identify "at risk" patients for falls who require assistant
- Ethics training developed and provided to all employees

Problem Solving Process

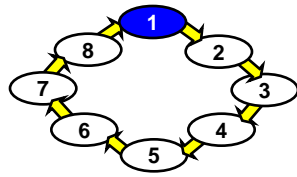




Identify the Problem

Very important!

- Clearly state the problem the team is to solve
 - Teams should refer back to problem statement to avoid getting off track
- Use 5W2H approach
 - Who? What? Why? When? Where? How? How Many?



5W2H

Who? Individuals/customers associated with problem

What? The problem statement or definition

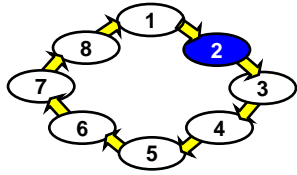
When? Date and time problem was identified

Where? Location of complaints (area, facilities, customers)

Why? Any previously known explanations

How? How did the problem happen (root cause) and how will the problem be corrected (corrective action)?

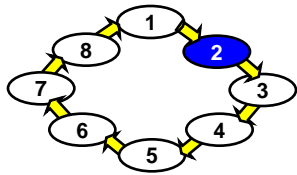
How Many? Size and frequency of problem



Identify Team

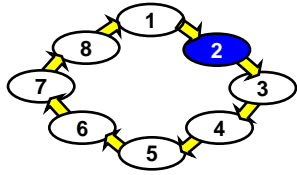
When a problem cannot be solved quickly by an individual, use a team!

- Should consist of domain knowledge experts
- Small group of people (4-10) with process and product knowledge, available time and authority to correct the problem
- Must be empowered to “change the rules”
- Should have a designated Champion
- Membership in team is always changing!



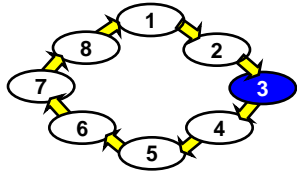
Key Ideas for Team Success

- Define roles and responsibilities
- Identify external customer needs
- Identify internal customer needs
- Appropriate levels of organization present
- Clearly defined objectives and outputs
- Solicit input from everyone!
- Good meeting location
 - near work area for easy access to info
 - quiet for concentration and avoiding distractions



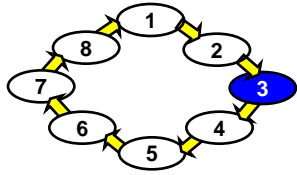
Roles and Responsibilities

- **Champion:** Mentor, guide and direct teams, advocate to upper management
- **Leader:** day-to-day authority, calls meetings, facilitation of team, reports to Champion
- **Record Keeper:** Writes and publishes minutes
- **Participants:** Respect all ideas, keep an open mind, know their role within team



Immediate Action

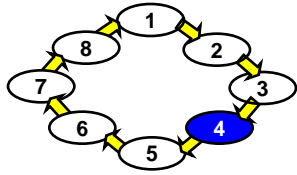
- Must isolate effects of problem from customer
- Usually “Band-aid” fixes
 - 100% sorting of parts
 - Re-inspection before shipping
 - Rework
 - Recall parts/documents from customer or from storage
- Only temporary until corrective action is implemented (very costly, but necessary)
- Must also verify that immediate action is effective



Verify Immediate Action

Immediate action = activity implemented to screen, detect and/or contain the problem

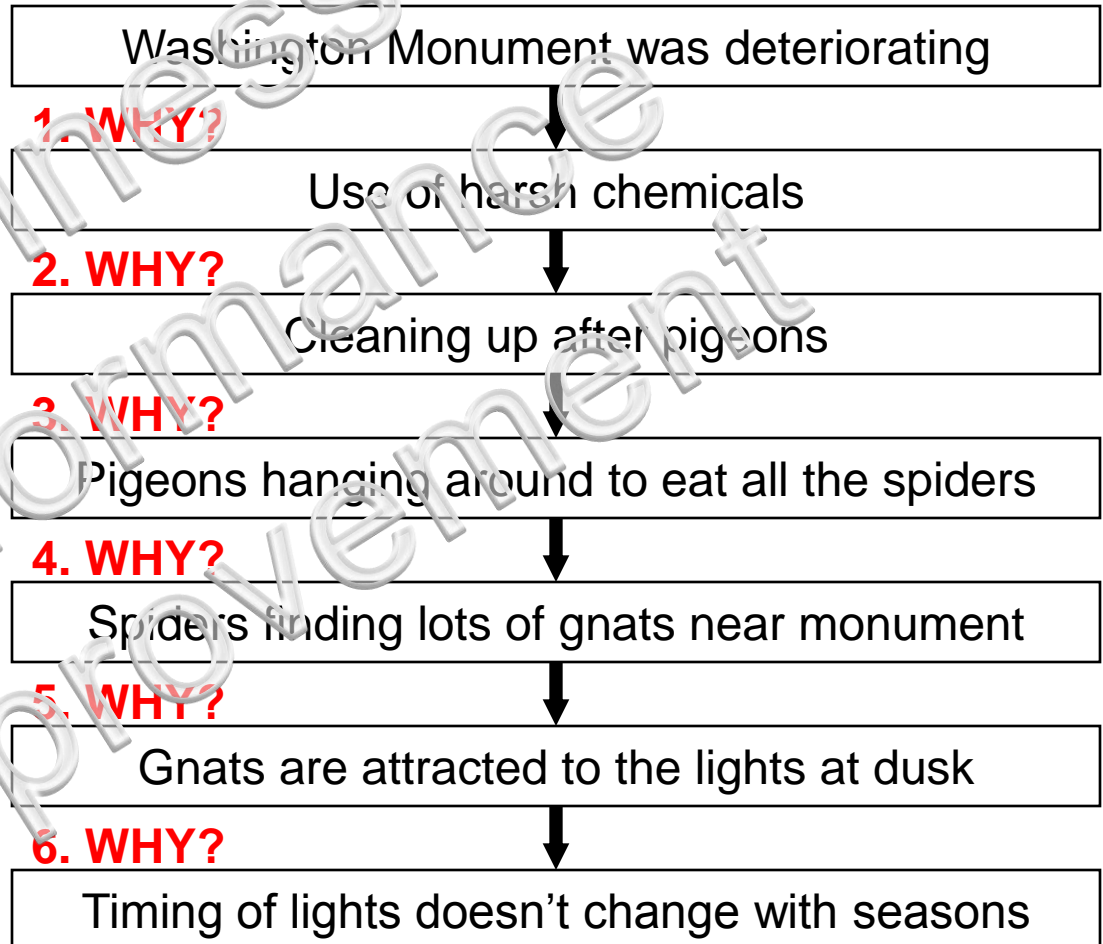
- Must verify that immediate action was effective
 - Run Pilot Tests
 - Make sure another problem does not arise from the temporary solutions
- Ensure effective screens and detections are in place to prevent further impact to customer until permanent solution is implemented.

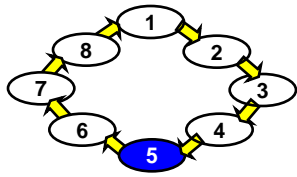


Root Cause

- Brainstorm possible causes of problem with team
- Organize causes with Cause and Effect Diagram
- “Pareto” the causes to identify those most likely or occurring most often
- Use 5 Why? method to further define the root cause of symptoms
 - May involve additional research/analysis/investigation to get to each “Why?”
- Must identify the **process** that caused the problem
 - if root cause is company-wide, elevate these process issues (outside of team control) to upper management to address

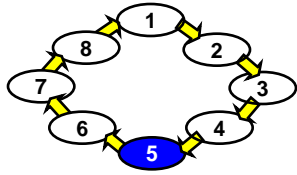
5 Why's Example





Corrective Action Plan

- Must verify the solution will eliminate the problem
 - Verification before implementation whenever possible
- Define exactly...
 - What actions will be taken to eliminate the problem?
 - Who is responsible?
 - When will it be completed?
- Make certain customer is happy with actions
- Define how the effectiveness of the corrective action will be measured.
 - (Pareto charts, Paynter charts, check sheets, etc...)



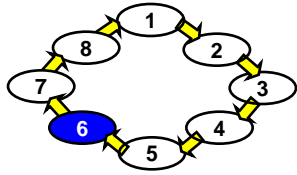
Verification vs. Validation (Before) (After)

- **Verification**

- Assures that at a point in time, the action taken will actually do what is intended without causing another problem

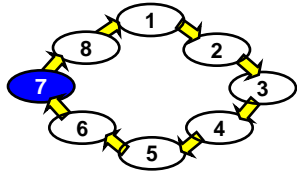
- **Validation**

- Provides measurable evidence over time that the action taken worked properly, and problem has not recurred



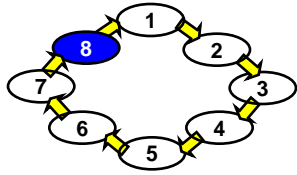
Complete Action Plan

- Make certain all actions that are defined are completed as planned
- If one task is still open, verification and validation is pushed back
- If the plan is compromised, most likely the solution will not be as effective.



Follow Up Plan

- What actions will be completed in the future to ensure that the root cause has been eliminated by this corrective action?
- **Who** will look at what data?
- **How long** after the action plan will this be done?
- **What criteria** in the data results will determine that the problem has not recurred?

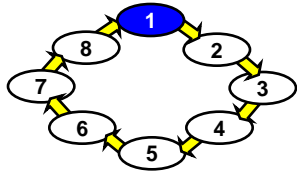


Validate and Celebrate

- What were the results of the follow up?
- If problem did reoccur, go back to Step #4 and re-evaluate root cause, then re-evaluate corrective action in Step #5
- If problem did not reoccur, celebrate team success!
- Document savings to publicize team effort, obtain customer satisfaction and continued management support of teams



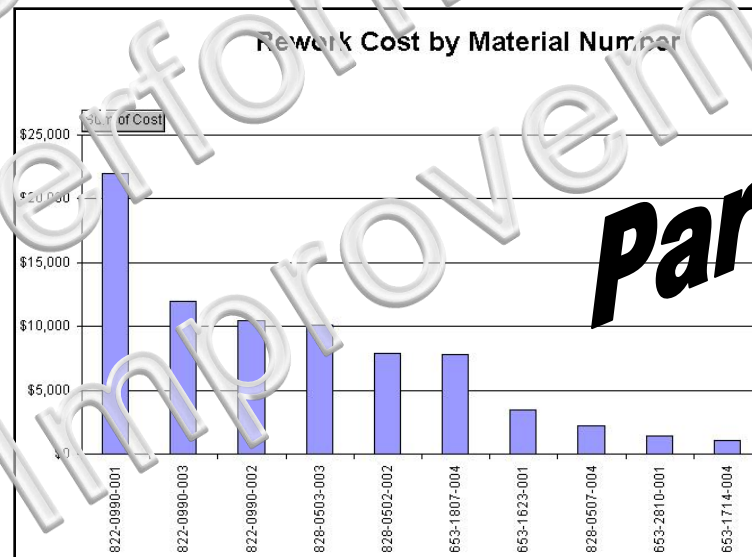
Root Cause Analysis Example #1



Example #1

Identify Problem

Part polarity reversed on circuit board



Pareto



Determine Team

Team members:

Team Leader – Terry

Inspector – Jane

Worker – Tammy

Worker - Joe

Quality Eng – Rob

Engineer – Sally

- Additional inspection added after this assembly process step to check for reversed part defects
- Last 10 lots of printed circuit boards were re-inspected to check for similar errors

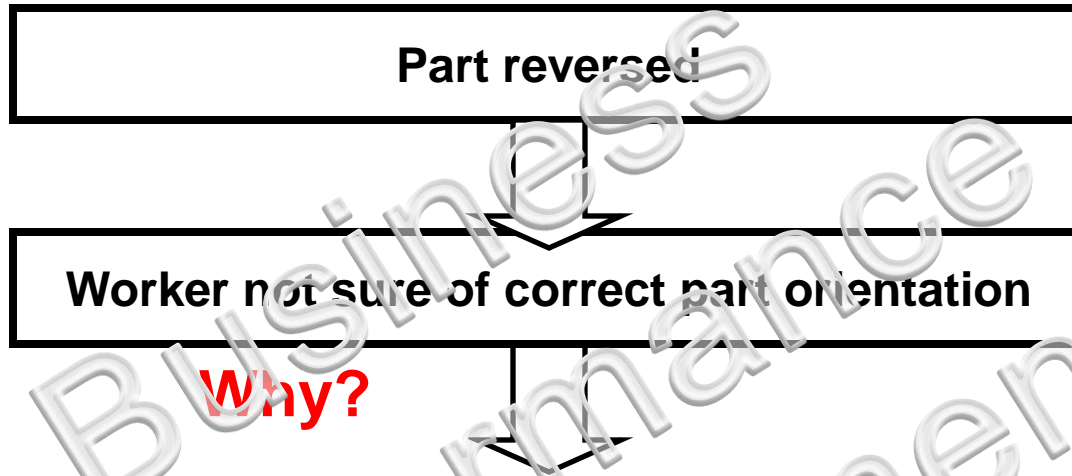
5 Why's

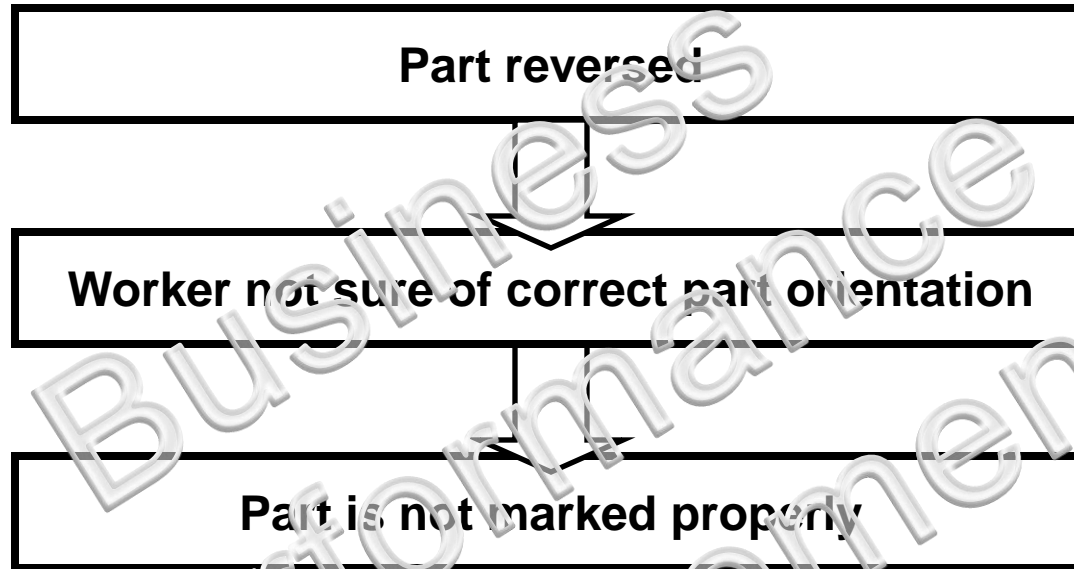
Part reversed

Why?

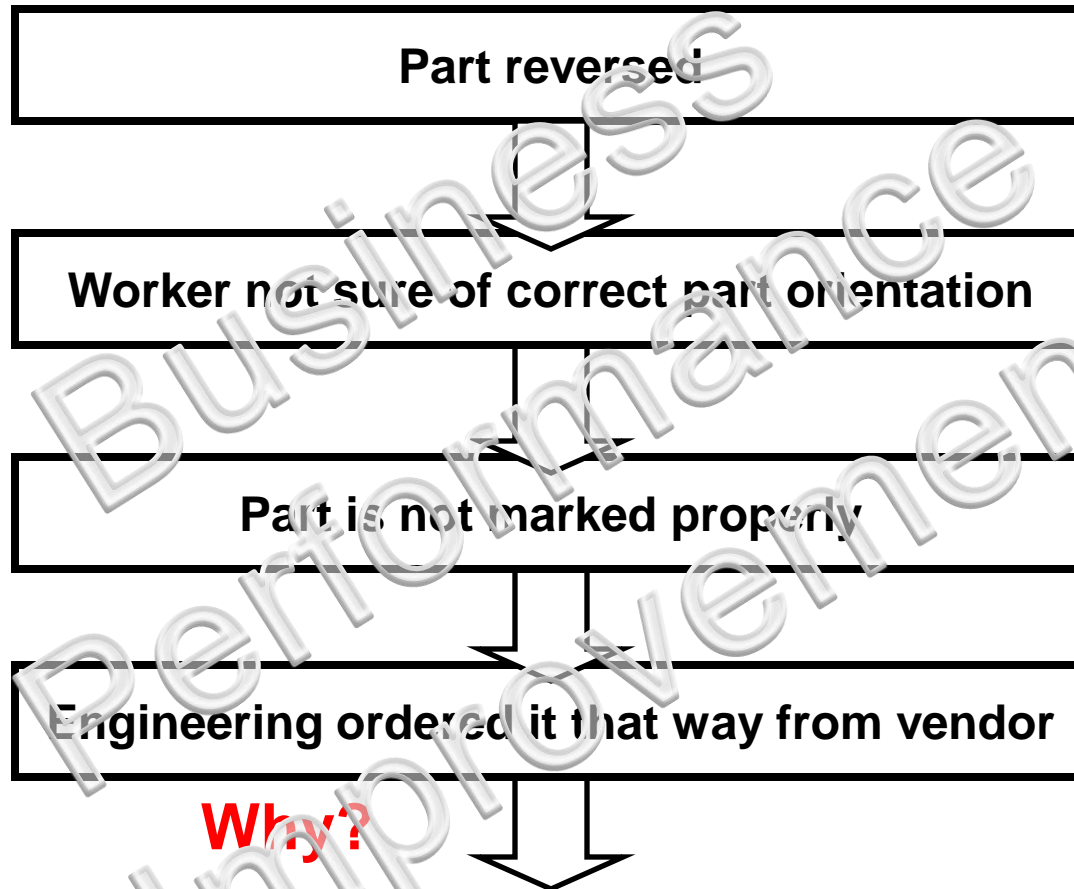


Business
Performance
Improvement



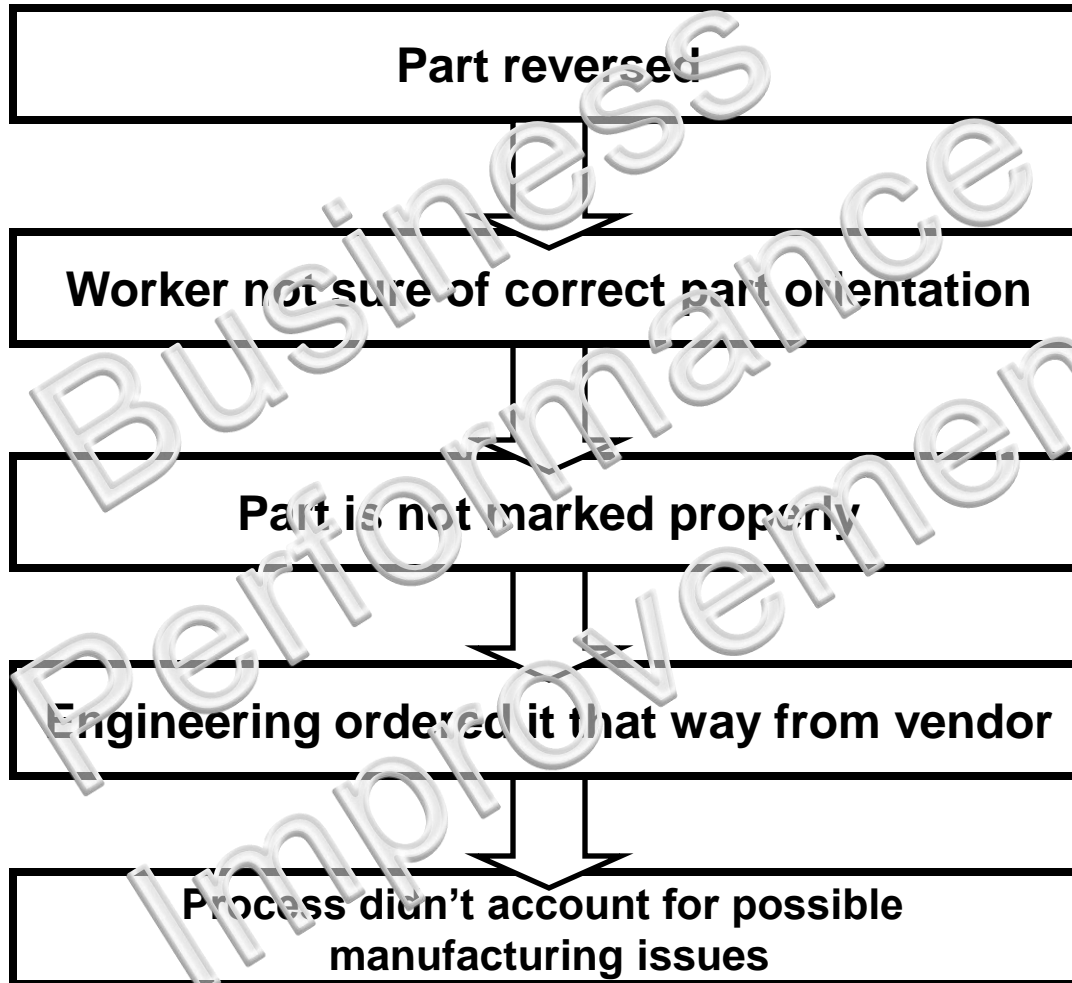


Why?





Root Cause



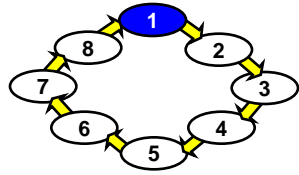
Root Cause

Permanent – Changed part to one that can only be placed in correct direction (Mistake proofed). Found other products with similar problem and made same changes.

Preventive – Required that any new parts selected must have orientation marks on them.



Root Cause Analysis Example #2

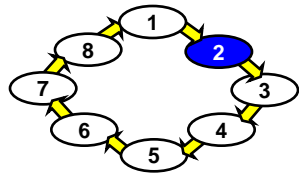


Example #2

Identify Problem

Department didn't complete their project
on time

Business
Performance
Improvement



Determine Team

Team members:

Boss – Jim

Worker – Tom

Worker – Karen

Project Mgr – Bob

Admin – Sally



Immediate Action

- Additional resources applied to help get the project team back on schedule
- No new projects started until Root Cause Analysis completed

Business Performance Improvement

5 Why's

Didn't complete project on time

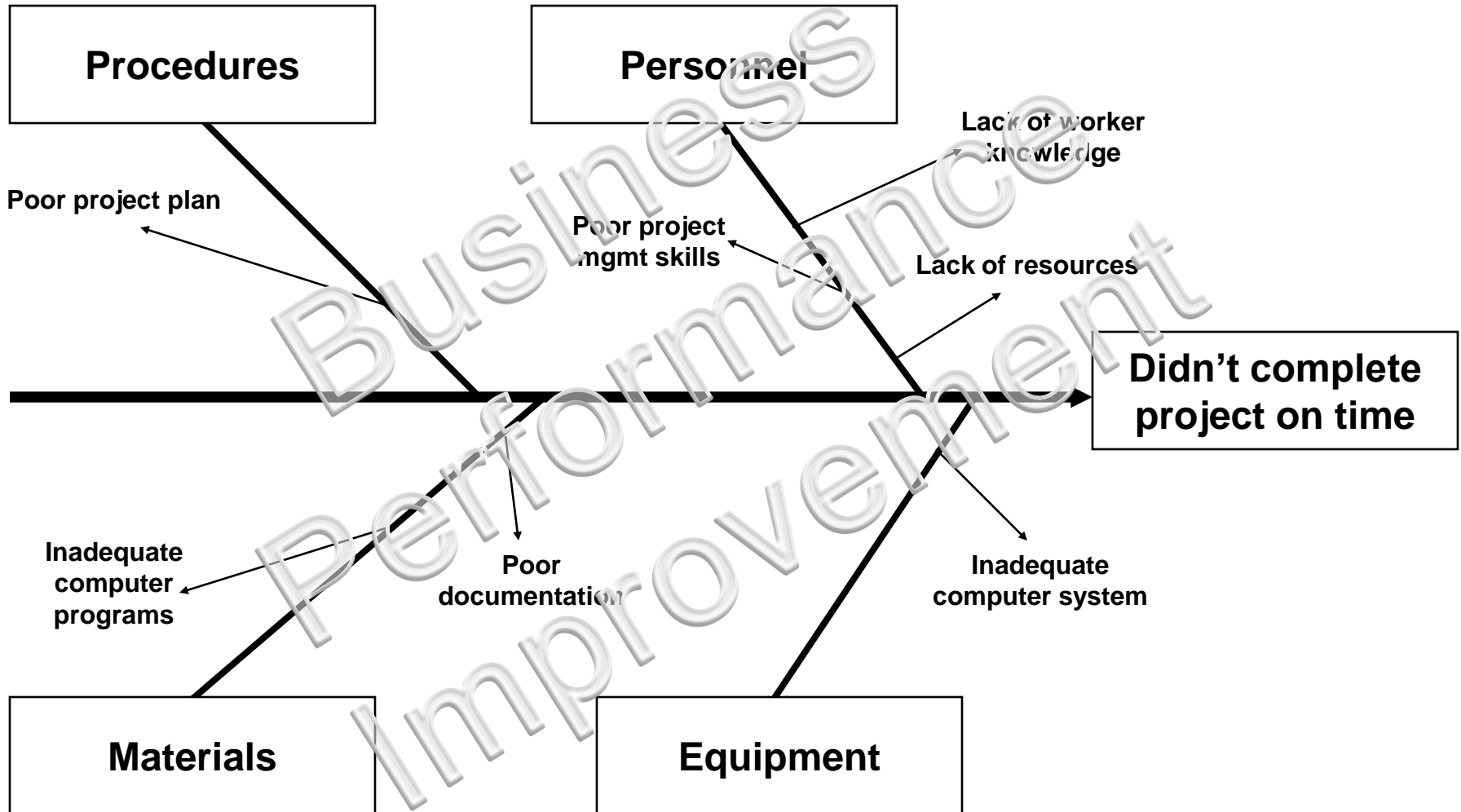
Why?



Business Performance Improvement

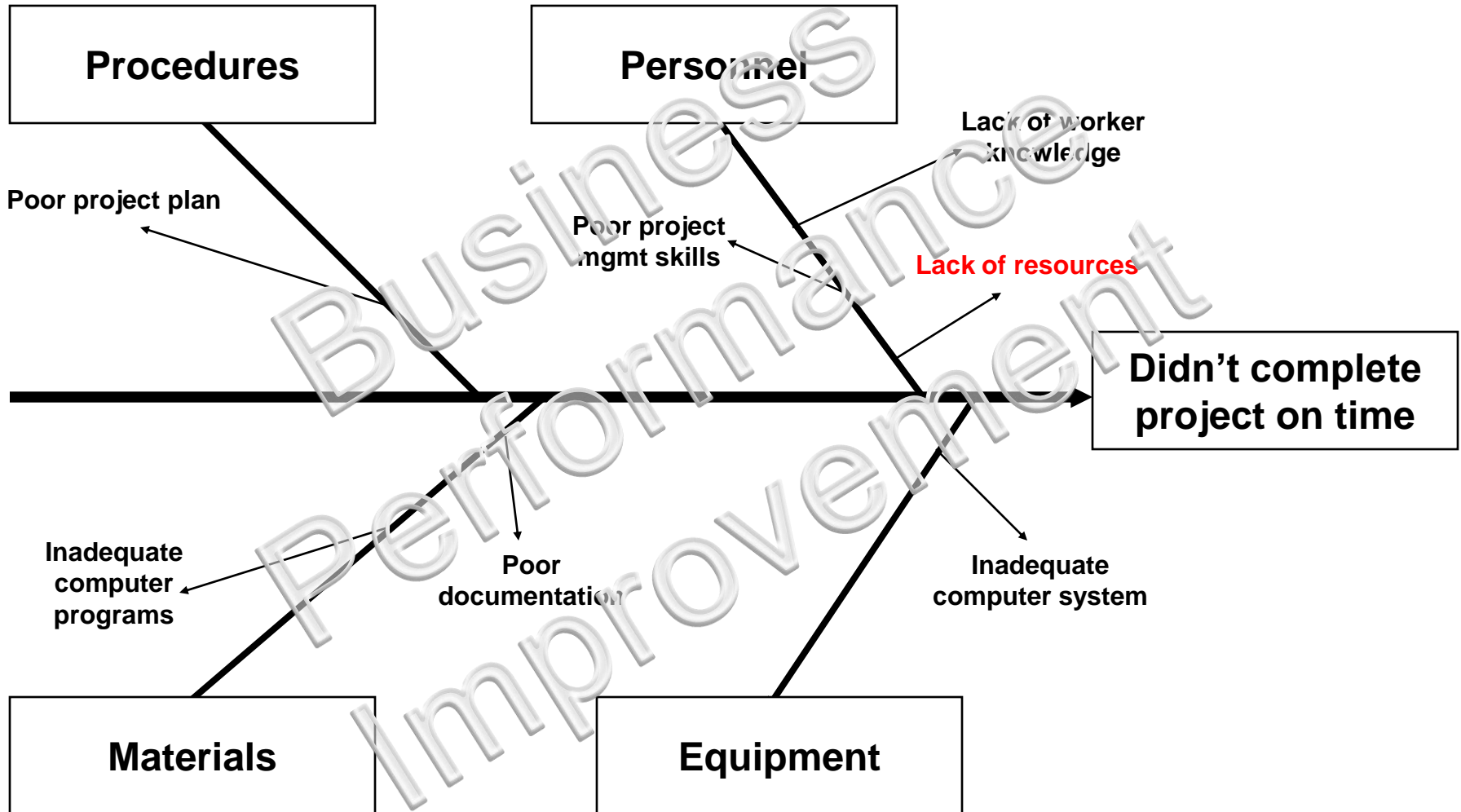


Cause and Effect





Cause and Effect



Didn't complete project on time

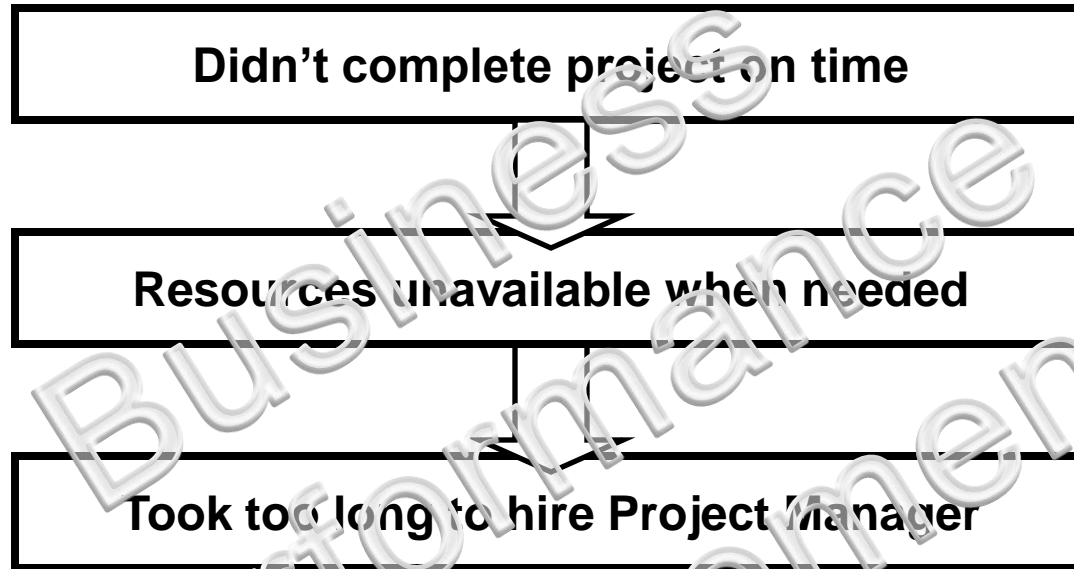


Resources unavailable when needed

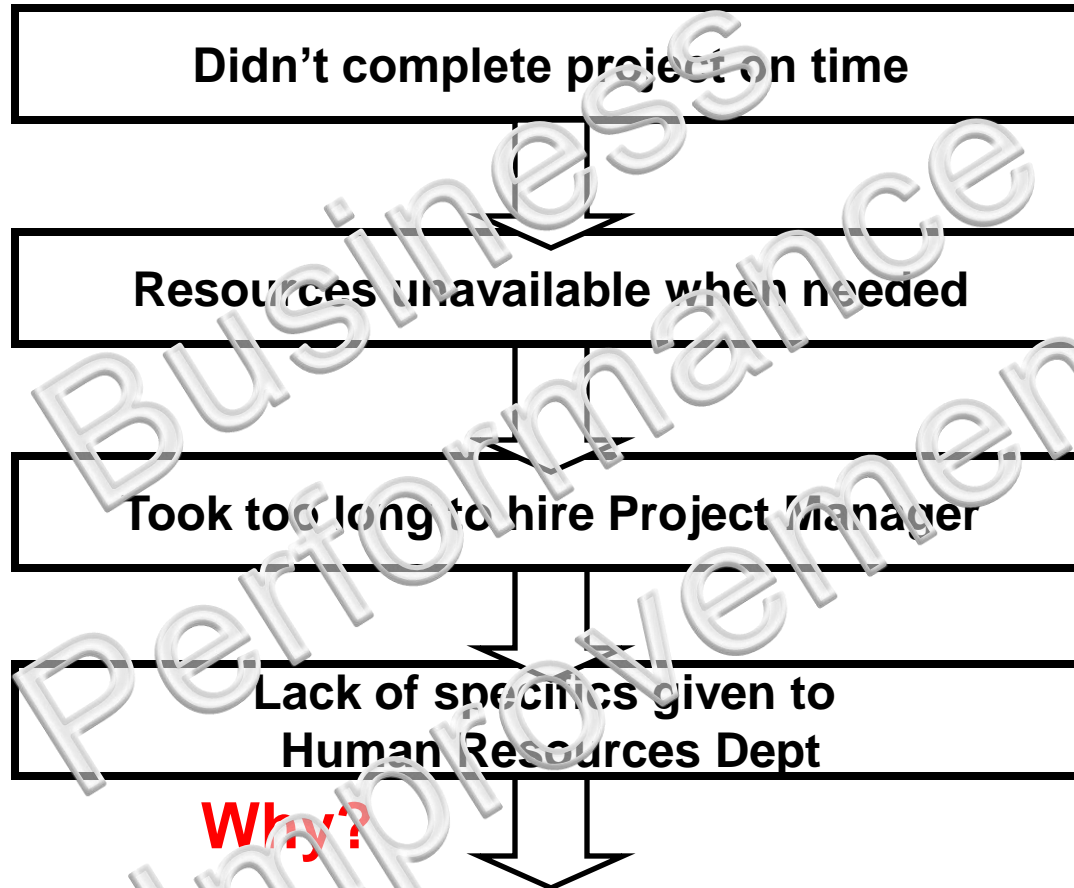
Why?

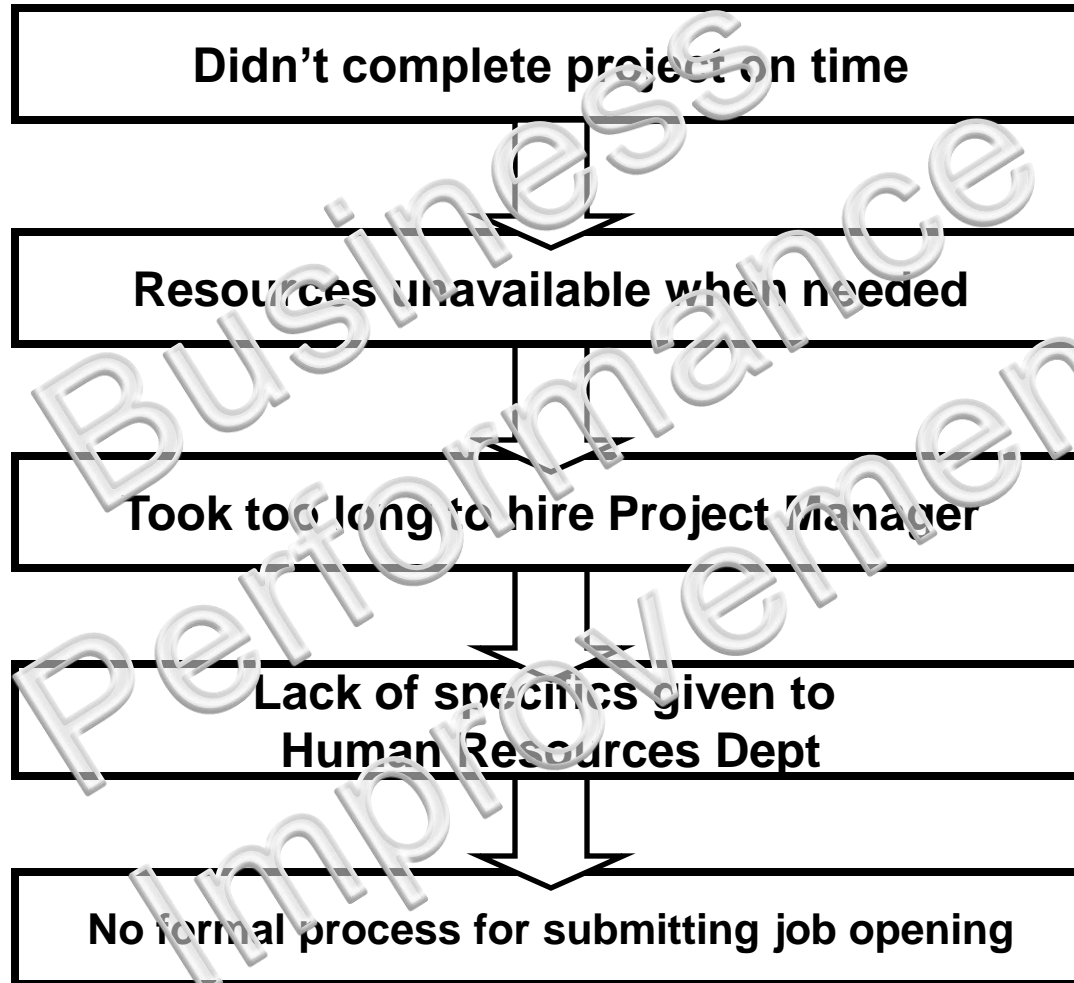


Business Performance Improvement



Why?





Root Cause



Permanent – Hired another worker to meet needs of next project team

Preventive – Developed checklist form with HR for submitting job openings in the future

- One problem may have more than one root cause
- One root cause may be contributing to many problems
- When the root cause is not addressed, expect the problem to reoccur
- Prevention is the key!

You learned:

- How to identify the root cause
- Why it is important
- The process for proper root cause analysis
- How basic quality tools can be applied to examples



Additional Resources

Business Performance Improvement

<http://www.biz-pi.com>