



# Human Factors & Root Cause Analysis

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# Learning Objectives

- In this session you will:
  - Learn how to classify human errors
  - Be able to create an Ishikawa diagram for human errors
  - Describe the Swiss cheese model for human errors

# Introduction to Human Error

- Quality failures happen
  - Human error may cause failure
    - Examples of human error:
      - Data entry errors
      - Skipped assembly operation



# Error Investigations

- Consider human factors:
  - Biomedical considerations
  - Psychosocial considerations
  - Personnel selection
  - Training
  - Evaluation
  - Job aids

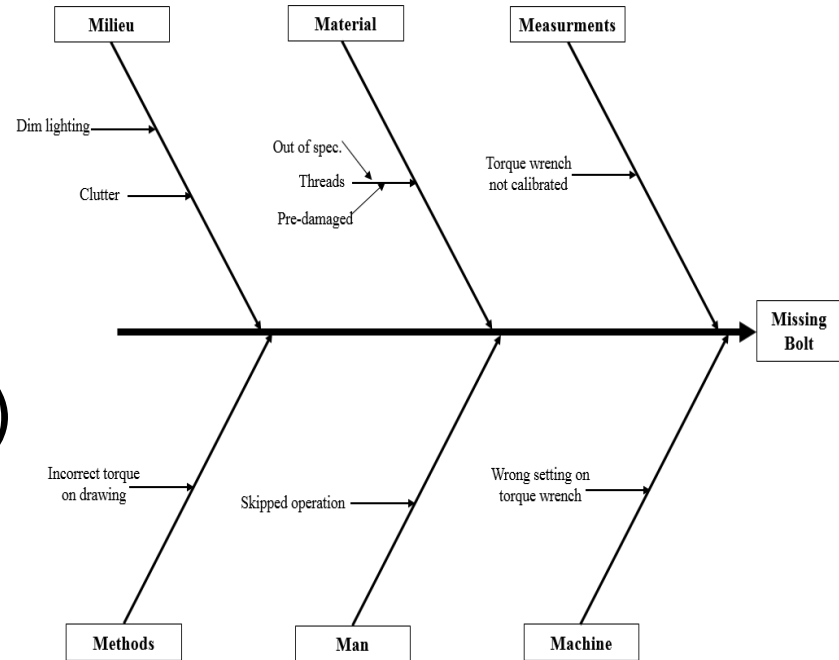


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# Traditional Ishikawa Diagrams

- Considers the 6Ms:

- Man (people)
- Measurements
- Material
- Milieu (environment)
- Methods
- Machine



- Uses “5 Whys” to investigate problem

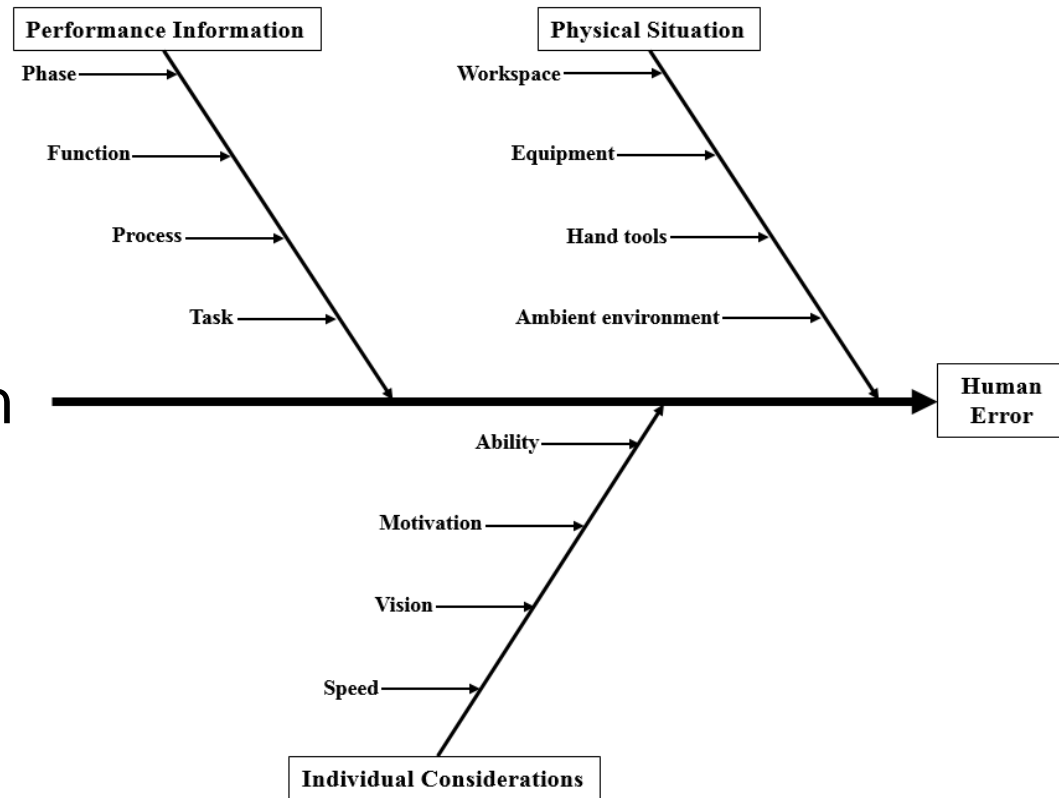


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# Classifications of Human Errors

1. Performance information
2. Individual considerations
3. Physical situation
4. Error impact
5. Corrective action

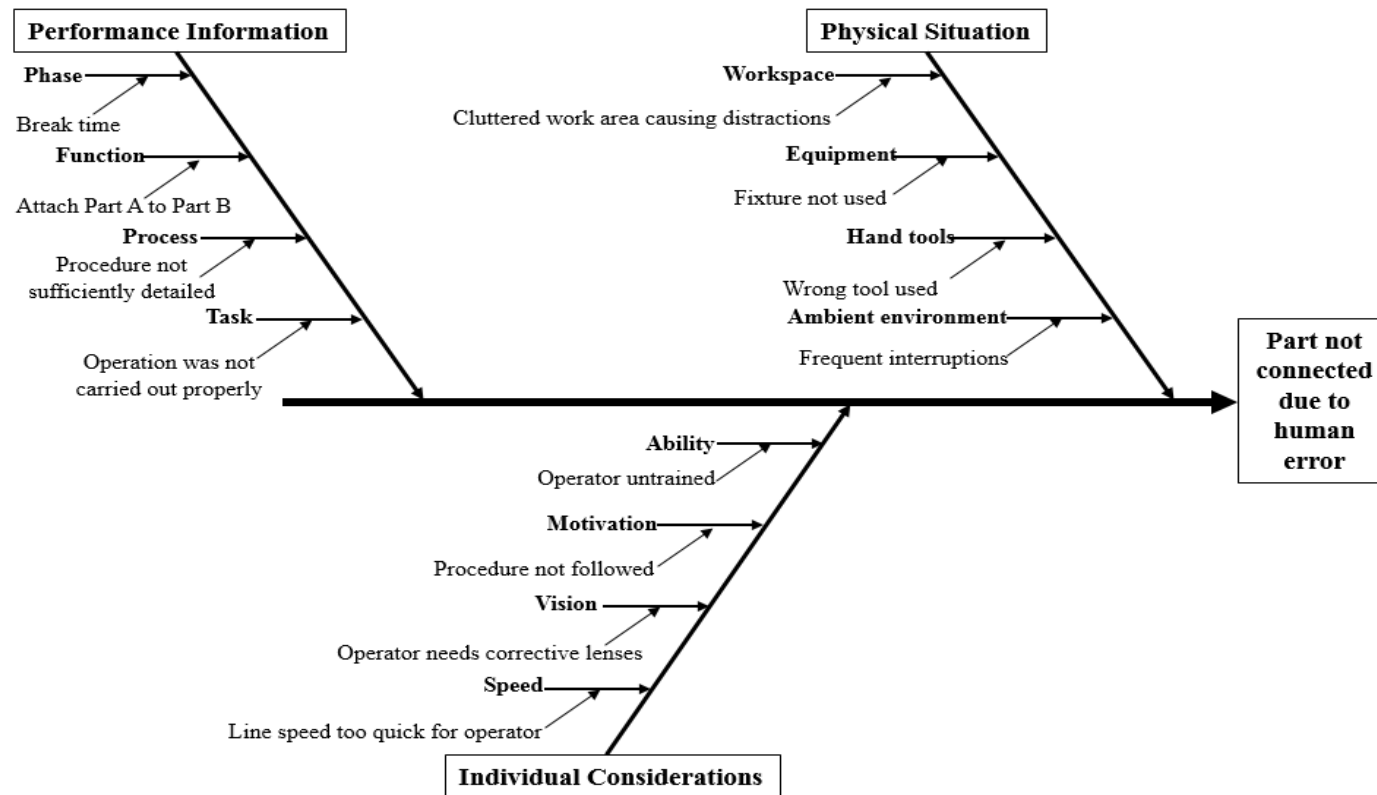
Human Factors Based Ishikawa Diagram



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# Human Factors Based Diagram

- Use “5 Whys” to investigate problem



# Subsequent Action Plan

- Prioritize actions to investigate
- Track status of assigning actions
- Example:

Category	Branch	Hypothesis	Action	Responsible	Due Date	Results
Performance Information	Phase	Failures occur around break time	Plot occurrences versus time of day	M.K. Hernandez	12 Nov.	
Performance Information	Function	Poke Yoke for attaching Part A to Part B not used	Determine if operation could have been skipped if Poke Yoke is not used	D.P. Payton	15 Nov.	
Performance Information	Process	Procedure not sufficiently detailed	Assemble one unit exactly per instructions in the procedure	M.V. Bridgedes	14Nov.	



# Swiss Cheese Model for Human Error

- Aircraft accidents
  - Failures happen at multiple levels
  - Comparable to the holes in Swiss cheese lining up
- Medical error categories
  - Situation task – errors & violations
  - Local climate – producing conditions
  - Corporate - management decisions & organizational processes



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# Swiss Cheese Model for Human Error

Level	Investigative Questions
Failure-proofing	What could have prevented the possibility of failure? How could the failure have been immediately detected?
Operational	Is a procedure available? Yes: Was it followed? No: Was violation intentional? Yes: Was procedure adequate for the situation? No: Could a procedure have prevented the failure? Was the failure due to lack of knowledge, inattention, inability, or distraction?
Local conditions	What, if any, factors (e.g., work area too hot, cold, loud, cluttered) contributed to the failure?
Management	What, if any, organizational decisions or expectations contributed to the failure?



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# Human Error Example

- Problem: Customer received wrong part
- 5 Whys investigation:
  - Why did customer receive wrong part?
    - Parts were mixed up on the production machine
  - Why were parts mixed up on the production machine?
    - The divider was not being used
  - Why was the divider not being used?
    - The machine operator removed the divider
  - Why did the machine operator remove the divider?
    - Because it slowed them down & there was a piece rate bonus
  - Why was there a piece rate bonus?
    - To increase the quantity of parts shipped



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# Human Error Example

- Contributing factors at multiple levels:
  - Divider removed
  - Operator ignored requirement to use a divider
  - Management used a piece rate bonus to motivate operators
  - Operator found the quickest way to work



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# Human Error Example

- Corrective action:
  - Piece rate bonus not discontinued
  - Permanent dividers were installed
  - Optimal divider height determined with operators' input
- Result: Parts no longer mixed up & divider does not slow down operator



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# Typical Corrective Actions for Human Errors

- Retraining
- Updating procedures/work instructions
- Implementing checklists
- Poke Yoke



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# Typical Corrective Actions

Action	Description/Issue
Retraining	Operators may forget & new operators may not receive training; failure conditions will still exist
Updating procedures	Documents lessons learned & supports implementation elsewhere
Implementing checklists	Ensures and/or verifies each step is/was taken
Poke Yoke	Prevents failure from occurring and/or moving to the next operation



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# Key Take-aways

- Considering human factors during root cause analysis can help finding the cause of the problem
  - Create an Ishikawa diagram based on human factors
  - Transfer Ishikawa diagram to a tracking list
  - Consider the Swiss cheese model



# Summary

- In this session you should have learned how to:
  - Classify human errors
  - Create an Ishikawa diagram for human errors
  - Describe the Swiss cheese model for human errors

# References

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Questions?

