The People Element in Successful Ergonomic Programs

Karen Cooper, M.S., MBA, CSP, CPA

Senior Manager Environmental Healthy & Safety

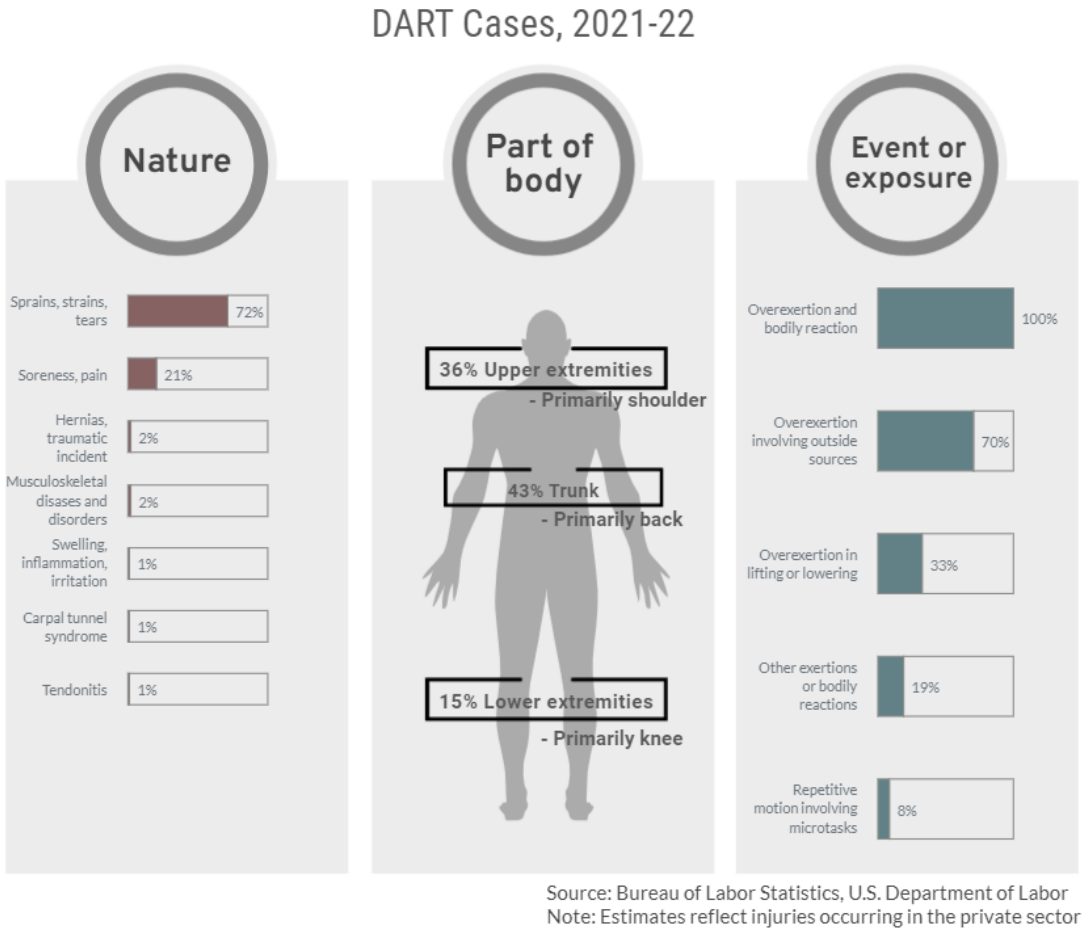
L3Harris Technologies

Outline

- Injury Trends
- Ergonomics definitions
- Ergonomic programs
  - The Roadmap
  - Tools for evaluating risk
  - Plan-Do-Check-Act
  - Prioritization
  - Training, at all levels
- People & Leadership
  - Nemawashi
  - Build Trust, Always Deliver for Engagement
  - Fail Fast
- Resources
  - Training
  - Evaluation tools

Injury Trends

- Overexertion - top work related injury resulting in DART and 2nd DAFW



Reference: NSC https://injuryfacts.nsc.org/work/safety-topics/musculoskeletal-injuries/

Define: Ergonomics

- What is Ergonomics?

- "The study of the physical interaction of workers with their tools, machines, and materials so as to enhance the worker's performance while minimizing the risk of musculoskeletal disorders."

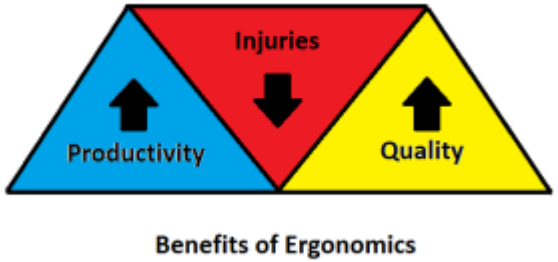
- I like "Fitting the task to the person"

Source: https://align1solutions.com/2018/02/09/ergonomics-far-evolved/
Source: Chaffin, D.B., Anderson, G.B.J., (1991). *Occupational Biomechanics* (2nd ed.). New York: Wiley.

Why Ergonomics?

- By systematically reducing ergonomic risk factors, you can risk of injury is reduced of costly MSDs.

- Benefits of Ergonomics

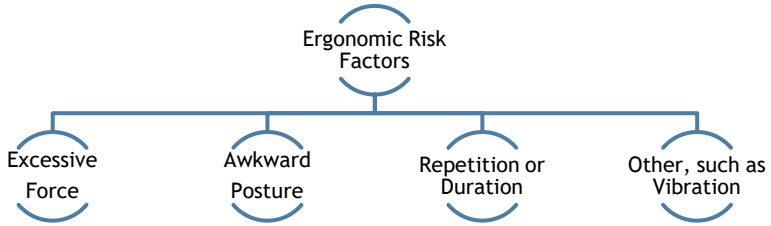


Benefits of Ergonomics

Ergonomics = easier to do =
faster
for longer
with less mistakes

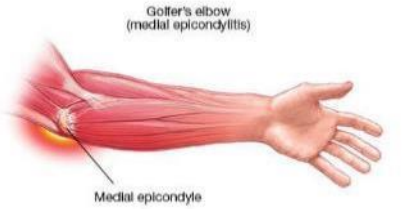
Ergonomic: Risk factors and injuries

- Some tasks may expose workers to physical risk factors. If these tasks are performed repeatedly or over long periods of time, they can lead to fatigue and injury. The main risk factors, or conditions, associated with the development of injuries in industrial tasks include:

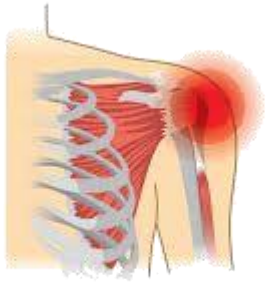


- Injuries may include damage to muscles, tendons, ligaments, nerves, and blood vessels. Injuries of this type are known as (Musculoskeletal Disorders), or MSDs. Some examples are:

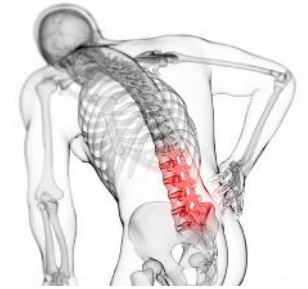
- Carpal Tunnel



- Golfer's Elbow



- Rotator cuff



- Back Strains

Source: FY08 Susan Harwood Grantee Materials. Ergonomics in Foundries. https://cybercemetery.unt.edu/archive/oilspill/20121017135623/http:/www.osha.gov/dte/grant_materials/fy08/sh-17807-08.html

Ergonomics Risk Factors

Excessive Force – exerting energy or strength to move (push, pull, lift or carry) an object

- *Lifting or carrying objects, pushing, pulling, gripping, pinching*

Awkward Posture – position of the body at any given time

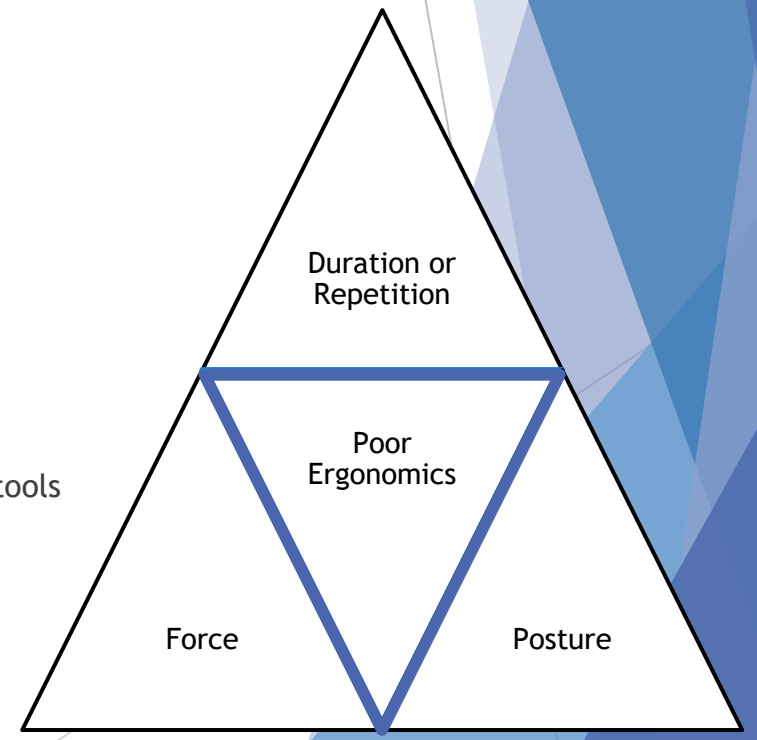
- *Hands above head, elbows above shoulders, wrists twisted, bent, gripping, pinching, knees squatting, kneeling, backs leaning, bending*

Duration – length of the exposure throughout the day

- *2 or more hours a day any at risk posture or forceful exertion*

Repetition – number of times or how often task repeats

- *2 or more times per minute any awkward posture or with forceful exertion*



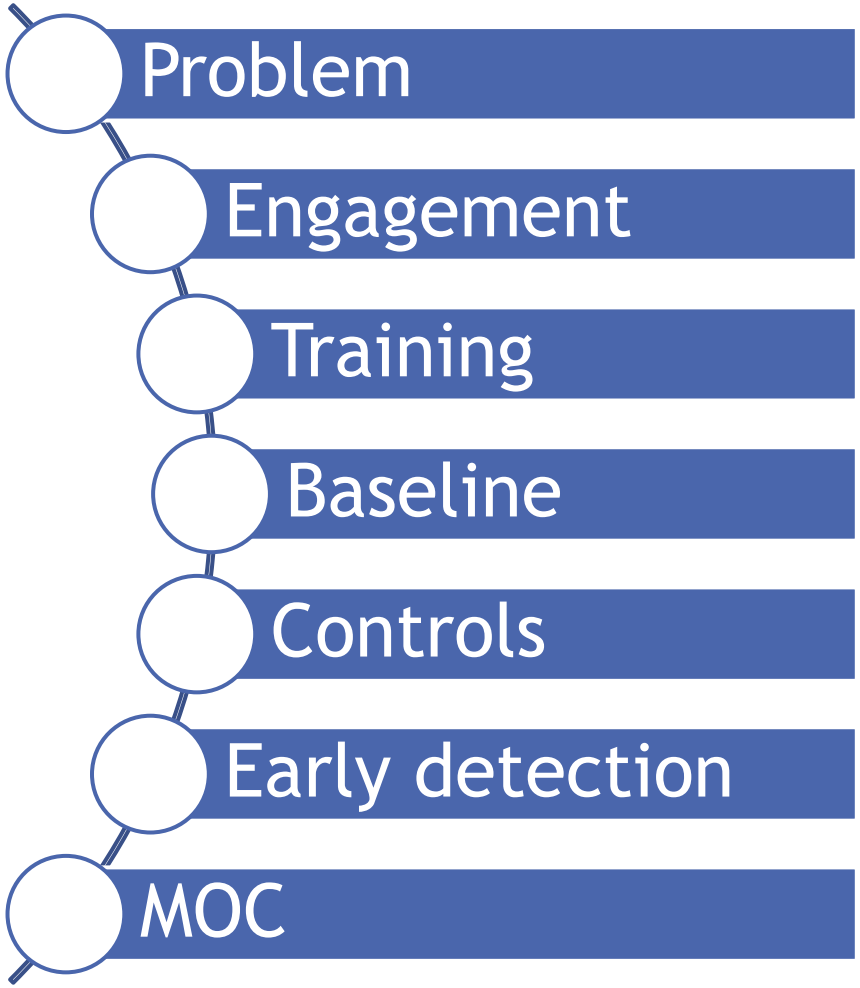
Others

- *Vibration* – motion in 3 directions, back-and-forth or side-to-side motion of body/tool, from powered tools
- *High/low lighting* - a dim area make it difficult to complete an inspection task
- *Noise*- a unwanted sound, as an environmental stressor

x marks an example risk

Source: FY08 Susan Harwood Grantee Materials. Ergonomics in Foundries. https://cybercemetery.unt.edu/archive/oilspill/20121017135623/http:/www.osha.gov/dte/grant_materials/fy08/sh-17807-08.html

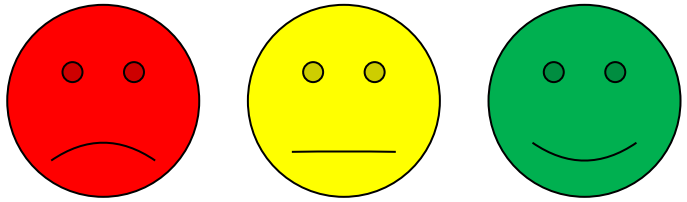
The Roadmap



Reference: NIOSH Publication Elements of Ergonomic Programs 1997

Problem: Where you are today?

- Historical records review
- Tools for evaluation risk, observation
- Interviews
  - If you asked the employee about a job, what would they say and why?



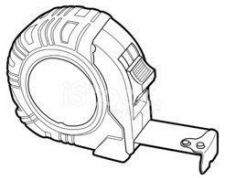
Baseline: Evaluation Tools

- Looking for no-cost tools?

CUERgo: https://ergo.human.cornell.edu/cutools.html

USF Dr. Bernard's site, https://health.usf.edu/publichealth/tbernard/ergotools

- If you are not sure how to Select the Correct Ergonomic Risk Assessment Tool, https://ergo-plus.com/select-ergonomic-risk-assessment-tool/



What gets measured, get's done

Baseline: Evaluation Tools

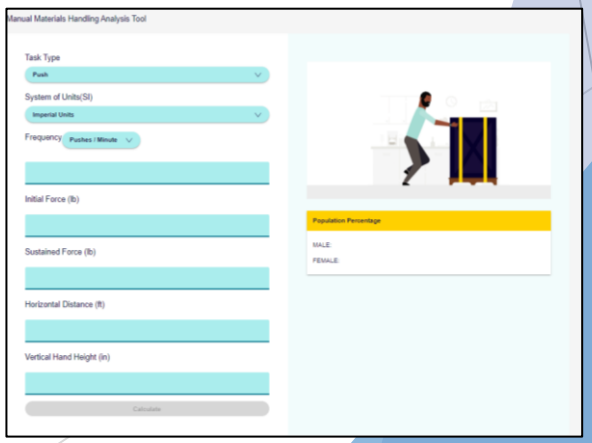
Task type	Tool	Link
Most tasks	WA State Caution and Hazard Zone Checklists	https://lni.wa.gov/safety-health/preventing-injuries-illnesses/sprains-strains/evaluation-tools
Lifting/ Lowering	NIOSH Lifting Equation	https://www.cdc.gov/niosh/topics/ergonomics/nlecalc.html
Pushing/ Pulling	Liberty Mutual Push/Pull Tables	https://libertymmhtables.libertymutual.com/
Posture, entire body	Rapid Entire Body Assessment (REBA)	https://ergo.human.cornell.edu/CUErgoTools/REBA%206.xls
Posture, upper body	Rapid Upper Limb Assessment (RULA)	https://ergo.human.cornell.edu/CUErgoTools/RULAv04%20Revised.xls

Example: Push or Pull Tasks

- Tools: Measuring tape, fish scale or similar device. You may need a connection strap or cord.
- Steps:
  - Position the cart or dolly in the direction of travel. Pull it with the fish scale until it begins to move. Record the highest value. This is the initial force.
  - Reposition the cart or dolly in the direction of travel and pull it again and take at least 1-2 steps. Record the value closest to what was keeping it moving. This is the sustained force.
- Open the Liberty Mutual link, either push or pull, depending on the actual task and enter values.
- Values within the 90% of the population are considered best.

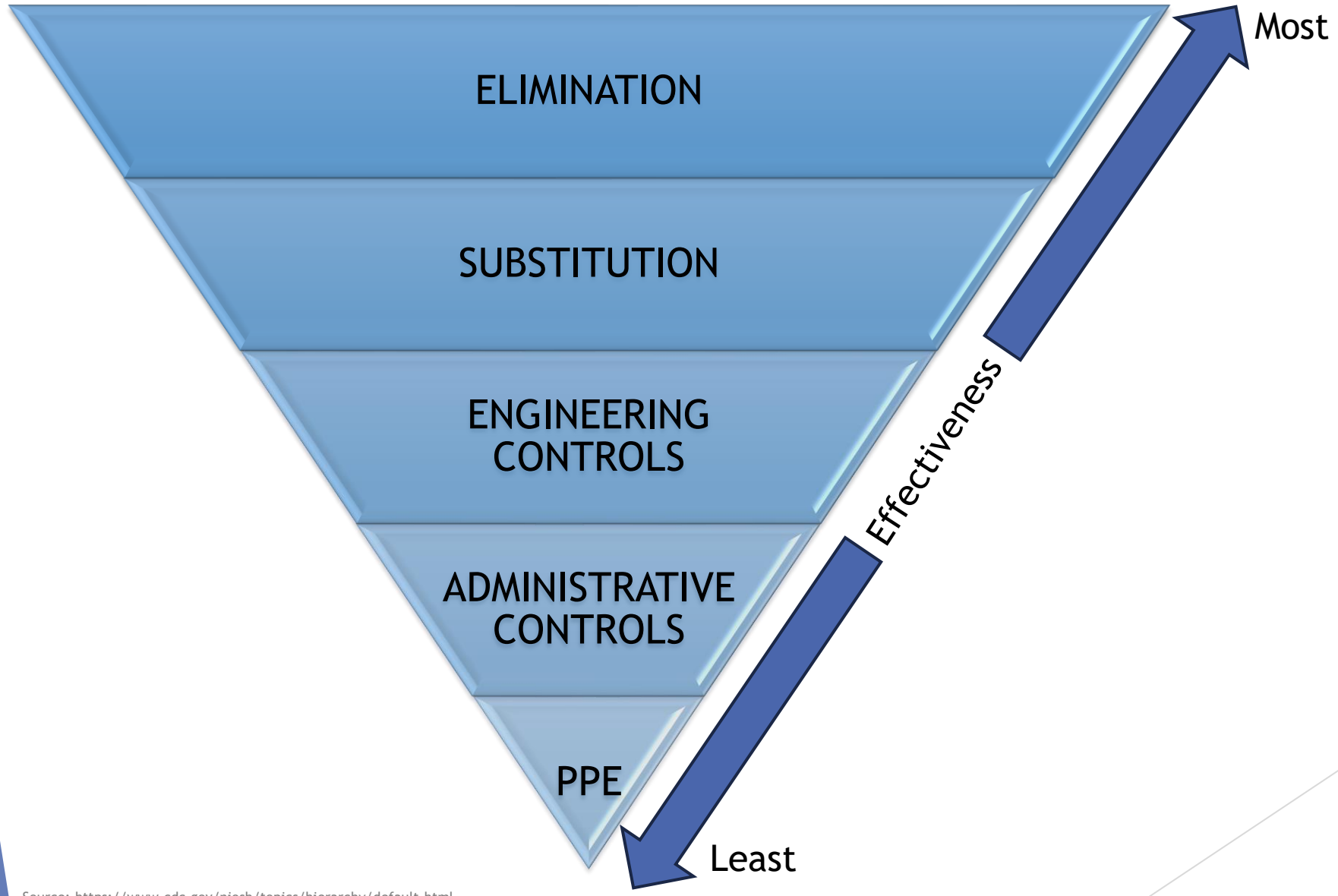
Pull to measure force (A)

Population for the task (B)



Source: https://libertymmhtables.libertymutual.com/

Controls: Hierarchy of Controls



Co-bot

Change the clip reducing insertion force

Power assisted tire installation

Rotation to a task with less risk

Impact gloves

Source: https://www.cdc.gov/niosh/topics/hierarchy/default.html

Controls Reduce Risk

- ❑ Process
- ❑ Object
- ❑ Workspace
- ❑ Tool
- ❑ Human
- ❑ Movement

ERGONOMIC IDEA GENERATION TOOL

A change in any one or more of the seven areas outlined below can lower musculoskeletal risk factors that lead to injury. After identifying a job's risk factors for musculoskeletal disorders, use the tool as a brainstorming guide to rethinking the task.

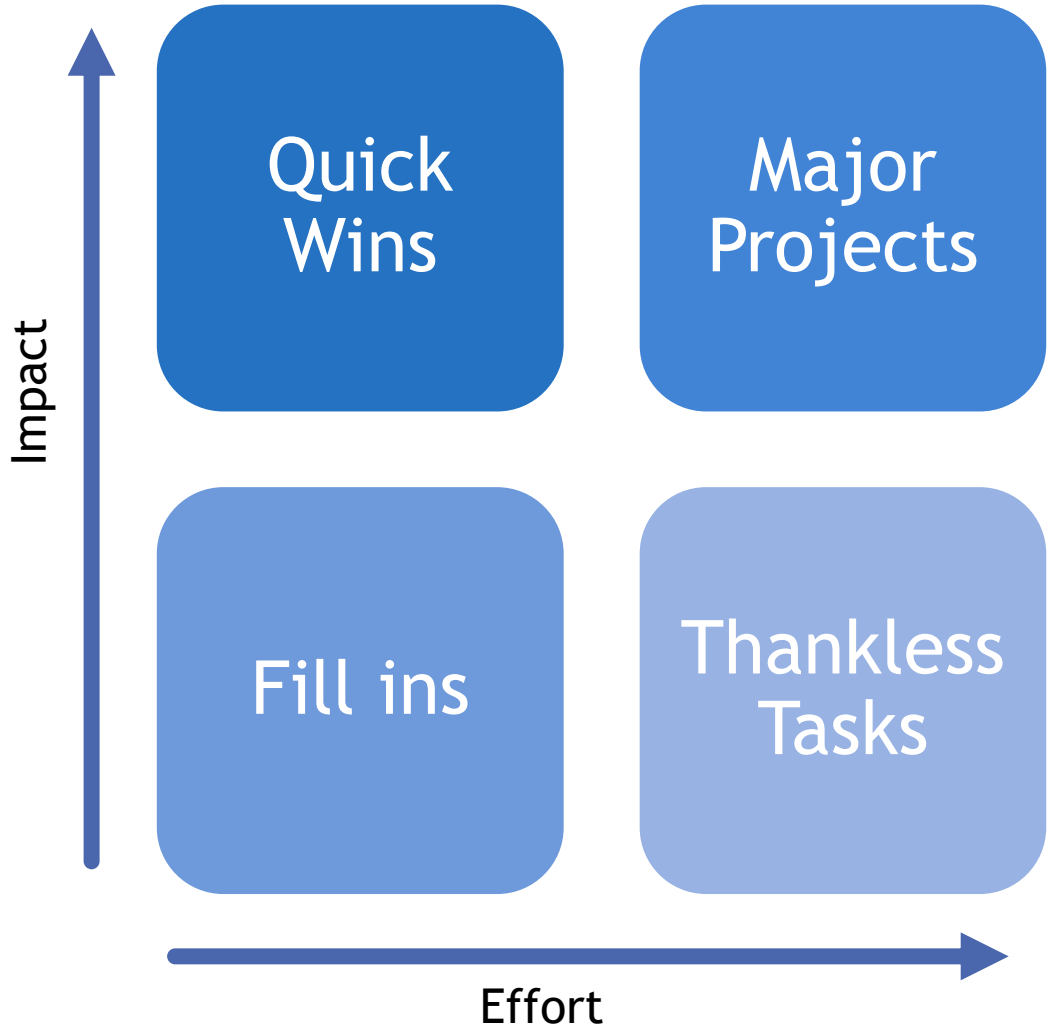
Concept	Task	Improvement
Process	Change the order of steps	Instead of building from A+B+C+D+E+F, consider building C+D+E+F first, then adding this to A+B. For example, consider building a preassembly that attaches to the final assembly rather than building everything in the final assembly.
	Change the upstream process	Consider changing a preceding step to eliminate or reduce risks in a downstream task.
	Eliminate or remove wasted steps	Consider eliminating steps in the process if they do not add value. For example, if ar item is picked up and moved twice, consider whether the process can be changed so it is only moved once.
	Substitute	Consider substituting a different material in the process to reduce risk. For example,lightweight plastic may be used in place of metal.
	Move substeps to another part of the process	Consider changing who performs specific substeps. For example, in a production line, consider moving a step to the upstream or downstream task.
	Job rotation	Consider job rotation so tasks with a similar risk factor are not done back-to-back.
Object	Improve coupling	Consider adding handles for moving or holding items. Consider placing amorphous-shaped items in a container with handles. Consider changing to a power grip instead of a pinch grip.
	Increase weight	Consider increasing object weight so it is too heavy for manual lifting, so staff will need to use manual material equipment.
	Reduce weight	Consider reducing the weight of the object, such as purchasing raw materials in a smaller container.
	Secure object	Consider securing the object to reduce the force a worker needs to apply to hold it in place, such as with a clamp or jig.
	Reposition closer	Consider moving the item closer to the worker.
	Balancer	Consider a tool balancer, pneumatic balancer or zero-G system for reducing force.
Workspace	Shorten reach distance	Consider ideas to bring the work or stored parts closer to the worker.
	Lower or raise workstation surface	Consider raising or lowering workstation so the upper arms are neutral with elbows at the side when the work is performed.
	Eliminate twists	Consider modifying the space so the person does not need to reach to the side or turn to the back, such as when accessing tools or materials.
	Improve headroom	Evaluate whether crouching or kneeling can be eliminated. Consider whether headroom can be improved.
	Store on carts	Consider storing items on carts if objects need to move.
	Racking placement	Consider storing heavy items in a middle shelf, lighter items on the bottom and lighrest on the top. Consider placing frequently used items in the middle.
Tools	Low-vibration power tool	Consider switching to a low-vibration tool.
	Change orientation of handles	Consider whether a pistol-grip tool or an in-line tool would allow a more neutral wrist and elbow posture. Consider extending or lengthening the handles on the tool.
	Power tool vs. hand tool	Consider switching to a power tool. In some cases, consider switching from a powertool to a hand tool.
	Automate or semi-automate	Evaluate whether an automated machine or semiautomated machine can help.
	Preventive maintenance	Establish a preventive maintenance program or evaluate current program for adequacy. Some tools require considerably more force when the cutting edge is dull and other tools generate moae vibration.
	PPE	Antivibration gloves, antivibration coatings, knee pads
Human	Isolate the employee	Consider isolating the employee from the hazard, such as a dampening seat to reduce whole body vibration, or an exoskeleton for reducing force.
	Team lift or handle	Consider whether a two-person lift is feasible and would reduce risk.
	Techniques	Consider whether there is a better technique to perform the job, such as improved body mechanics. For example, sometimes a small group of workers has discovered an easier way to perform a task.
	Training	Consider training options (Note: This should never be the first choice in any solution decision).
Movement	Vertical lift and lower	Consider a hoist or fixture to lift or lower (Note: Ensure that one lift fixture can do 10(jobs rather than 100 jobs each with one fixture). Consider a vacuum system.
	Lateral hoist placement	Use a hoist that can make a lateral placement.
	Raise object from bottom	Use scissor lifts to raise objects up where they can be slid to another surface or worked on, mounted from underneath (e.g., transmission jack).
	Motorized vs. manual movement	Consider using a motorized way of transporting material, such as a cart tugger instead of manually pushing a cart.
	Slide vs. lift	Consider whether an object can slide instead of being lifted. Use a low coefficient of friction material (Note: Workers can push or pull more weight than they can lift).
	Cart design	Consider using large caster wheels and carts with vertical handholds.
	Push vs. pull	Pushing is generally better than pulling.
	Change applied force from horizontal to vertical	It is easier for workers to apply force in a horizontal direction than a vertical.
	Change applied force from lateral to forward horizontal	It is more difficult to reach across the body when applying force than fore/aft movement.
	Change applied force from axial to rotational	Consider changing the direction of force from a straight line to rotational. For example, in some cases using torque and a lever arm will make a task easier.
Time, duration, frequency	Shorten the duration of the risk factor	Consider changes that would allow the task to be completed quicker. It may reduce time spent applying force or in awkward postures.
	Shorten the frequency of the risk factor	Consider reducing the frequency of the task. For example, instead of something happening once every 3 minutes, is there a way to change it so it occurs once every 5 or 10 minutes instead?

Note. Adapted from "Brainstorming Solutions for Ergonomic Issues," by SAIF, 2020. Used with permission. The original can be downloaded at https://bit.ly/3cizg93.

Source: Guided Brainstorming: A Method for Solving Ergonomic Issues by Tony Brace and Jim Nusser. April 2021 Professional Safety PSJ

F3BraceNusser_0421.pdf

Prioritization



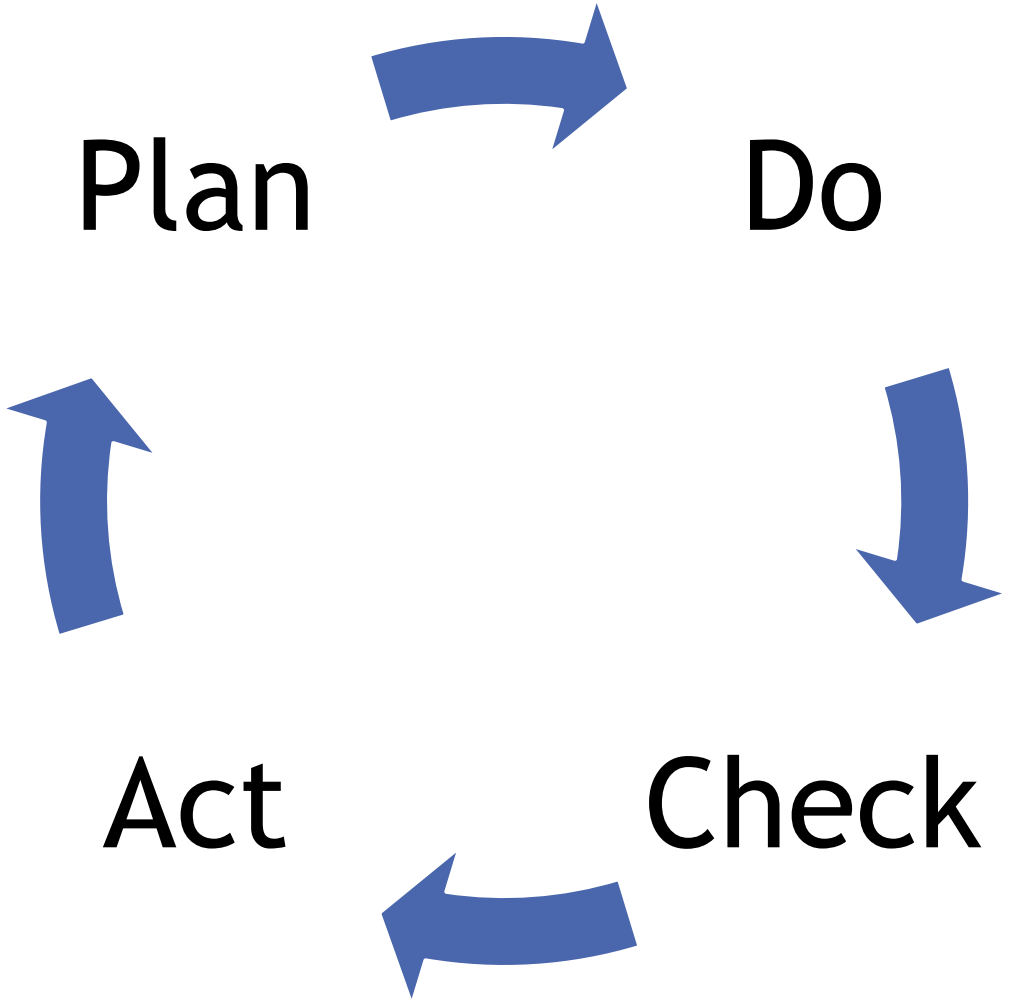
Impact

- High = change reduces risk level by more than 30%, or improves 10 jobs
- Low = change reduces risk by less than 30%, or improves 9 jobs or less

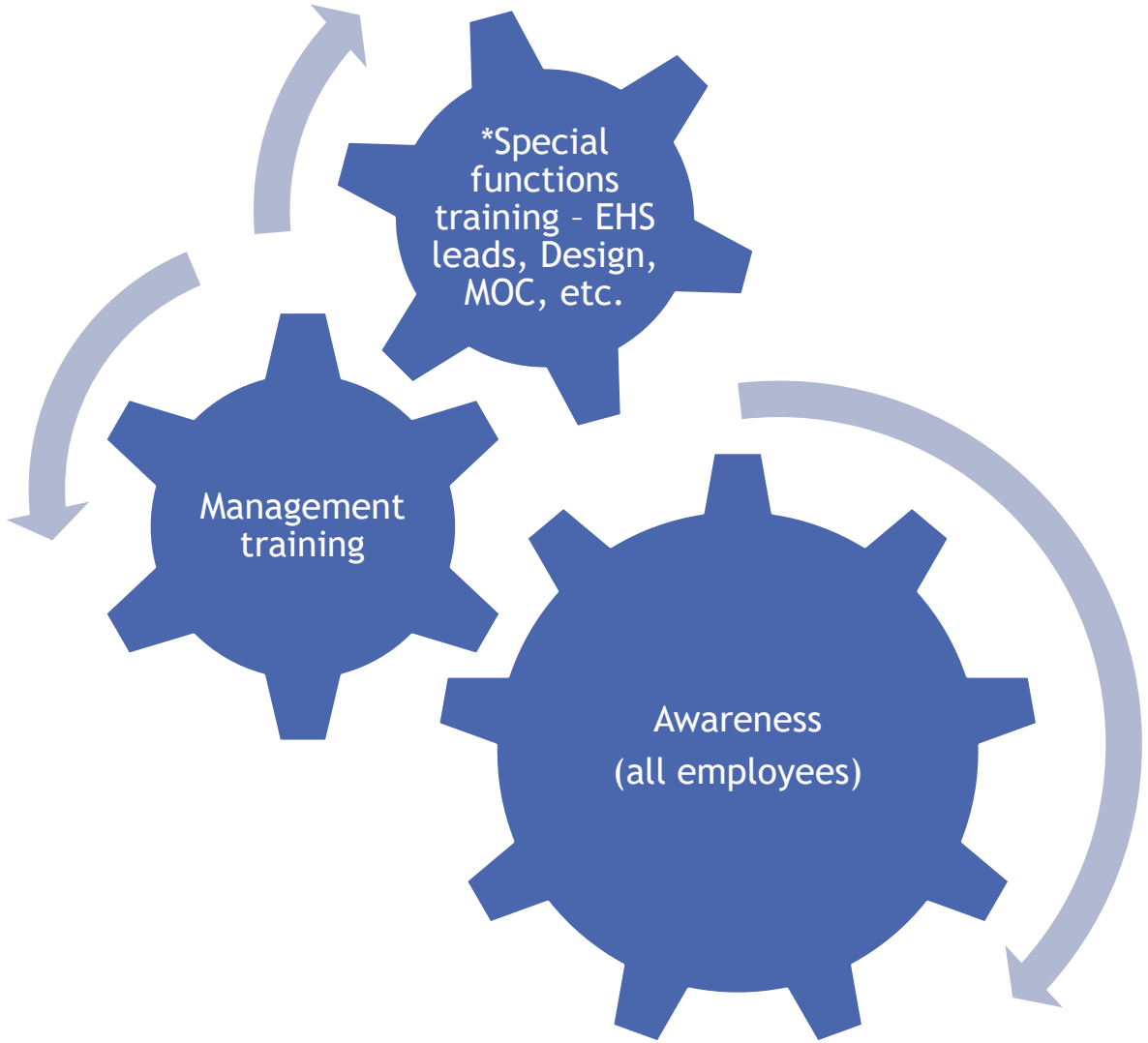
Effort

- High = costs more than $5k, project will take more than 6 months to implement
- Low = costs less than $5k, project will take less than 6 months to implement

Plan-Do-Check-Act, MOC



Training


*Special functions training – EHS leads, Design, MOC, etc.
Management training
Awareness (all employees)

Training: Identify hazards

- You introduced yourself, and ask employees to tell you about the job
- Observe the job/task
  1. The area requires reaching overhead to do the task.
  2. Body posture, kneeling and bent over.
- During talking, you makes notes of what you don't see:
  - Employees mentions using hand tools, ask them to show you toolboxes, do you see any modified or taped tools.
  - The employees use power tools but not all the time.
  - The area they are working now, first they had to remove old parts/equipment and are now routing new cables to equipment that will be installed in several weeks.
  - The equipment removed, and the new equipment weighs greater than 32 lbs.
- Remember to review findings with the supervisor. Ask if they have any questions. Ask if they can think of something not reviewed.

Training: Use a template with their example

Do you see?

Force – exerting energy or strength to move (push, pull, lift or carry) an object

- *Lifting or carrying objects, pushing, pulling, gripping, pinching*

Posture – position of the body at any given time

- *Hands above head, elbows above shoulders, wrists twisted, bent, gripping, pinching, knees squatting, kneeling, backs leaning, bending*

Duration – length of the exposure throughout the day

- *2 or more hours a day any at risk posture or forceful exertion*

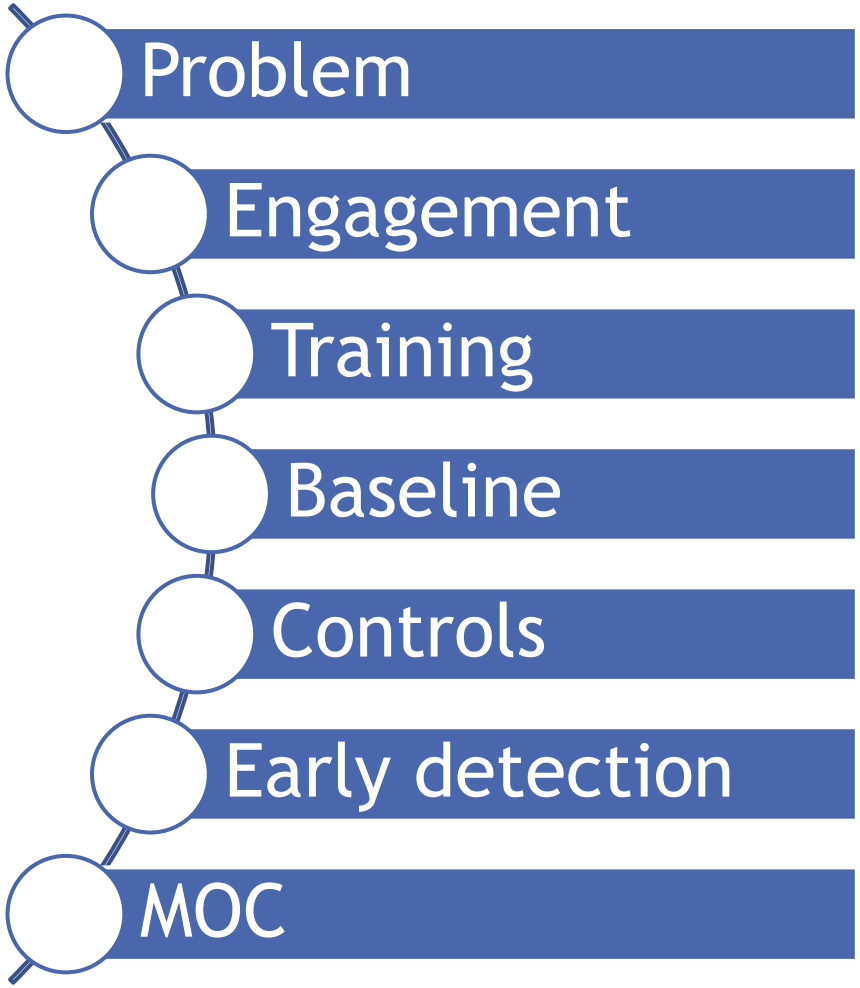
Repetition – number of times or how often task repeats

- *2 or more times per minute any at risk posture or forceful exertion*

- Vibration, lighting, noise, contact stress

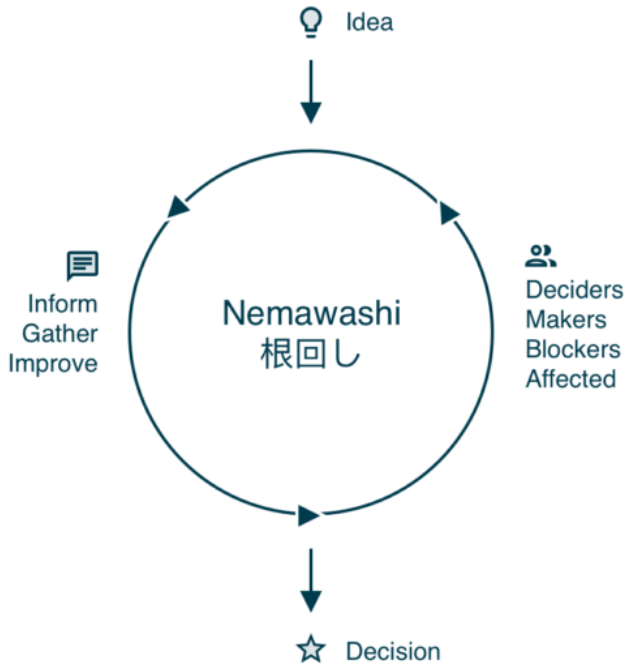
Source: https://content.iospress.com/download/work/wor0802?id=work%2Fwor0802

Before: The Roadmap



Reference: NIOSH Publication Elements of Ergonomic Programs 1997

Nemawashi (根回し) is a Japanese business informal process of laying the foundation for some proposed change or project by talking to the people concerned and gathering support and feedback before a formal announcement.



Source: https://intenseminimalism.com/2020/nemawashi-a-key-leadership-skill-to-foster-a-healthy-work-environment/

What best describes your organization?

Preventing things from going wrong

- Make workers better
- Tell workers what to do and what not to do
- Absence of accidents, incidents or events

Making sure things go right

- Workers are the problem solvers
- Ask the organization what they need
- Have the mindset we have the capacity for early identification and resolution of hazards or conditions

How does your leader get everyone engaged?

Trust, Deliver

“

Try honestly to see things from the other person’s point of view.

”

Dale Carnegie

Dale_Carnegie_Golden_Book-Se.pdf

Source: https://theintrovertentrepreneur.com/wp-content/uploads/2014/04/Dale_Carnegie_Golden_Book-Se.pdf

Build Trust: Tips & Tricks

- Provide two positive feedback items and limit to one concern
- Be specific when describing what you saw
- Avoid judgements and be careful using “but” or “however”
- Make it meaningful:
  - Use “I” when expressing concerns
  - Use “we” when seeking solutions
- Stand at a right angle when talking

Build Trust: Giving Feedback

POSITIVE FEEDBACK

- Describe the safe practice

"I noticed you lifted in a team lift"

~~I thought you were careful~~

- State the potential impact

That will help prevent a back injury

~~That's good~~

- Pause and listen to the person's response

CONCERN FEEDBACK

- Describe the concern

I noticed you picked up a heavy load without help.

- State the potential impact

I was concerned that you could be hurt by the lift.

- Discuss an alternative safe practice

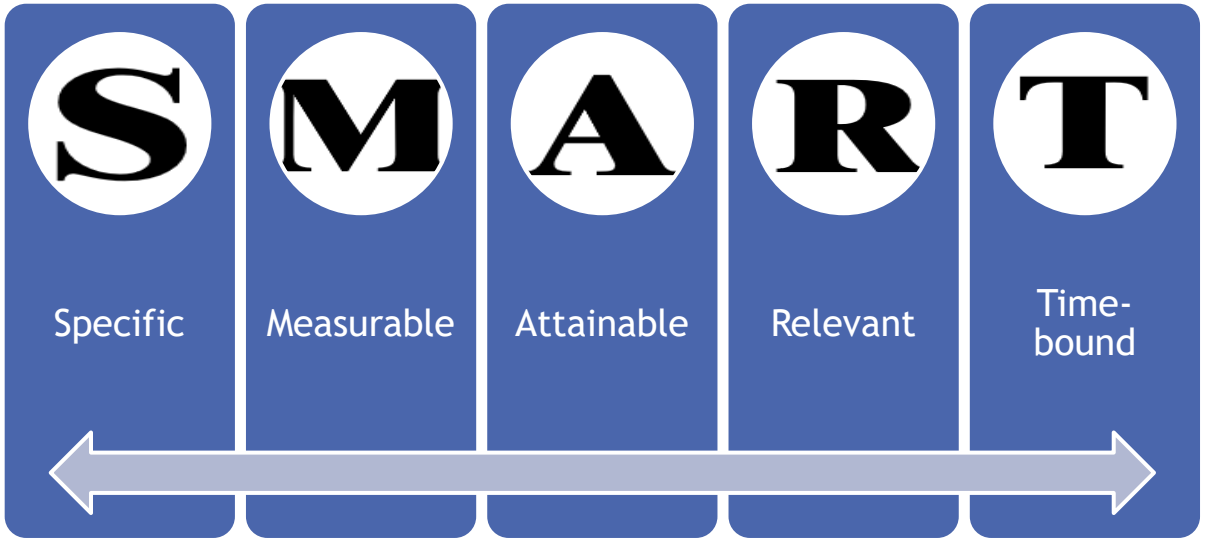
Maybe you could ask for help before you pick it up

(if safe alternative is unknown)

Is there a safer way to handle that material?

- Pause and listen to the person's response

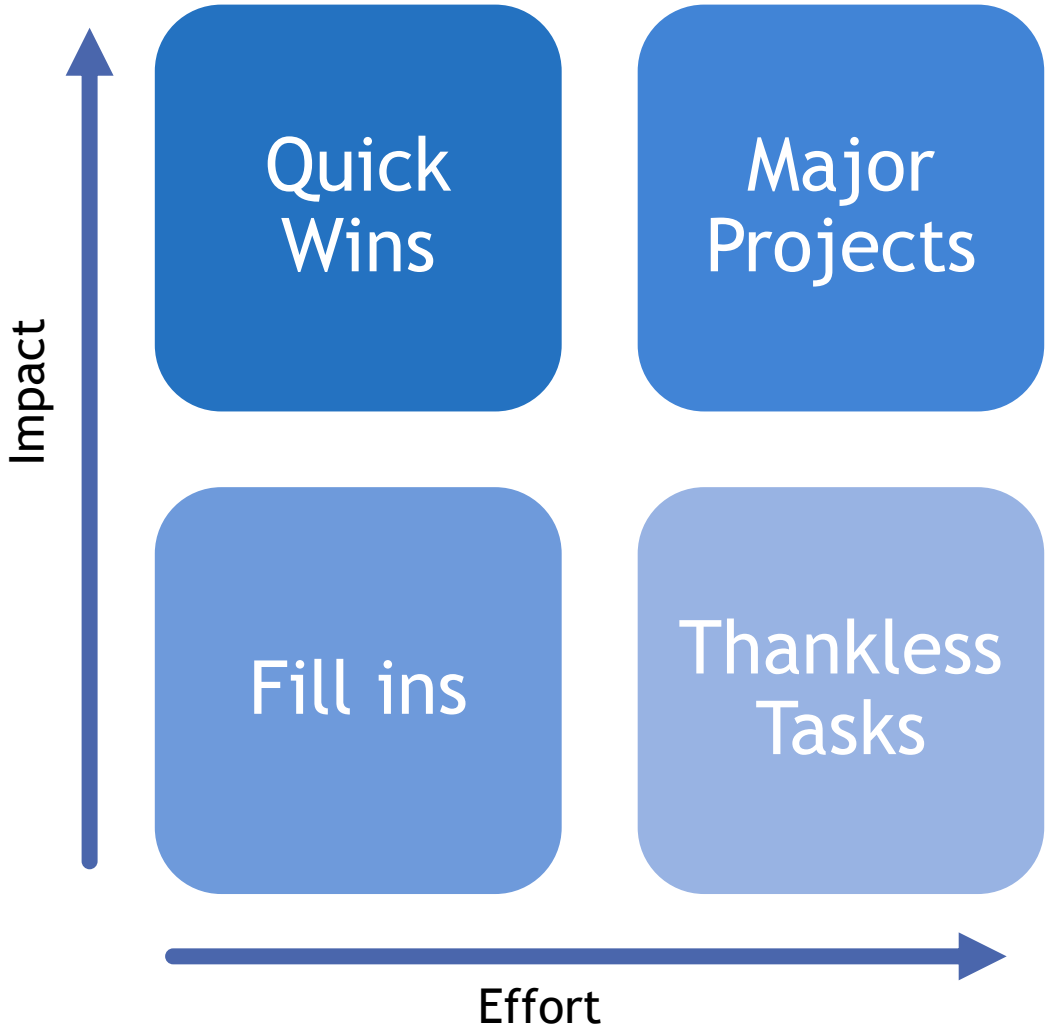
SMART Goals



What is your SMART goal?

https://en.wikipedia.org/wiki/SMART_criteria

Activity: Prioritization of SMART goals



Impact

- High = change reduces risk level by more than 30%, or improves 10 jobs
- Low = change reduces risk by less than 30%, or improves 9 jobs or less

Effort

- High = costs more than $5k, project will take more than 6 months to implement
- Low = costs less than $5k, project will take less than 6 months to implement

Culture

Strategy

Source: https://hbr.org/2018/01/the-culture-factor

Other resources and special thanks

- Susan Harwood grant by topic, https://www.osha.gov/harwoodgrants/grantmaterials/bytopic#e
- OSHA website, https://www.osha.gov/ergonomics/training and small business foundries, linked here.

Thank you

- All, for attending and your engagement today
- To Dr. Carolyn Sommerich, for always providing advice and guidance to me over the years in my profession.