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## Agenda

1. Introduction to macro ergonomics
  - **Group input** - Practical problems that can benefit from macro ergonomics
2. Work-systems model overview
3. **Group activity** - Collaborating with strategic partners in an organization
4. Strategic partners and the work-systems model
5. Examples of macro ergonomics interventions
  - **Group input** – Practical solutions using macro ergonomics
6. Group activity – plans for design or revision of your interventions

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## Introduction: HFE is a Multidisciplinary Field

Psychology

Medicine/  
Occupational  
Health

Physiology

Anatomy

Engineering

Anthropometry

Industrial  
design



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## Origins of macroergonomics

The HFES commission a study A new discipline was developed to fill a void in human factors and ergonomics

Human  
Factors

Ergonomics



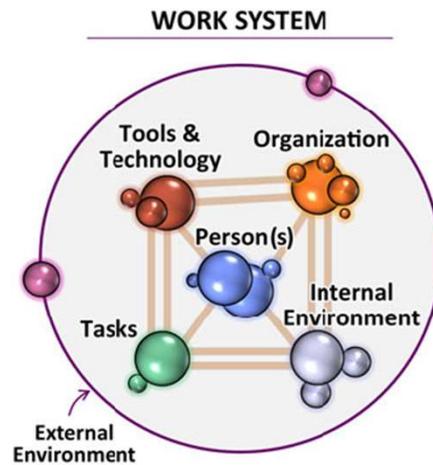
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## Macroergonomics...

Is a scientific discipline that concentrates on designing **overall work systems** by providing the **knowledge and methods** necessary for the improvement of work systems and, thus, developing the effectiveness and **performance of companies**

-Hendricks, 1996



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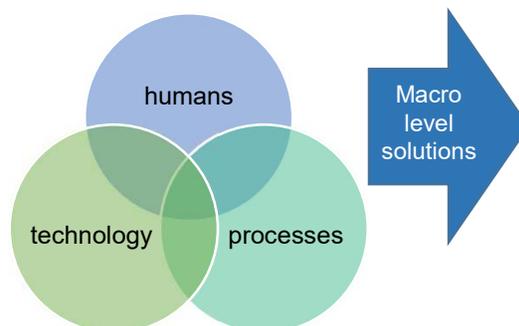
## Micro ergonomics vs Macro ergonomics

### Micro ergonomics (individual)

- Human-machine
- Human-task
- Human interface



### Macro ergonomics (system level)



Specific and refined methodologies & tools for work system analysis and design to understand the larger system factors for successful impacts



an PT, MS-EHS, CPE • COEH Online Ergonomics Program ©2018

Michelle M. Robertson, PhD, CPE COEH Online Ergonomics Program©, 2019

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## Work system 101

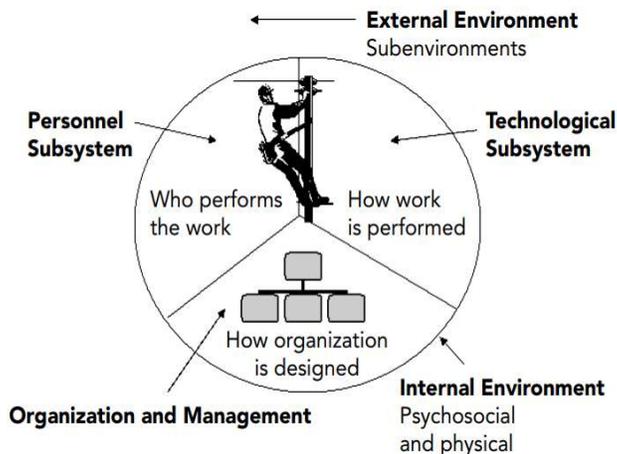
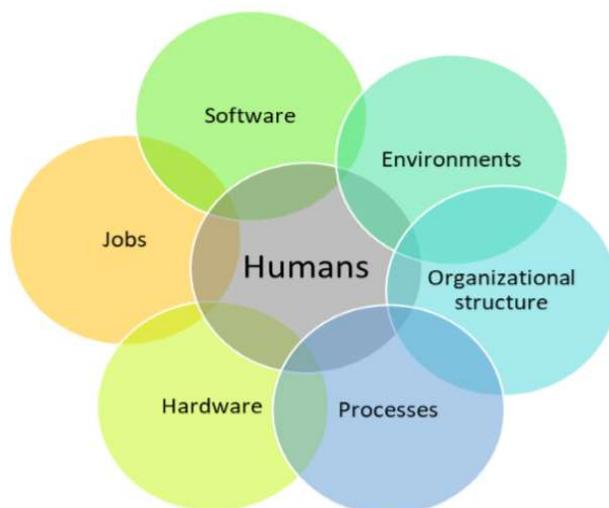


Figure 1. Basic conceptual model of a work system.

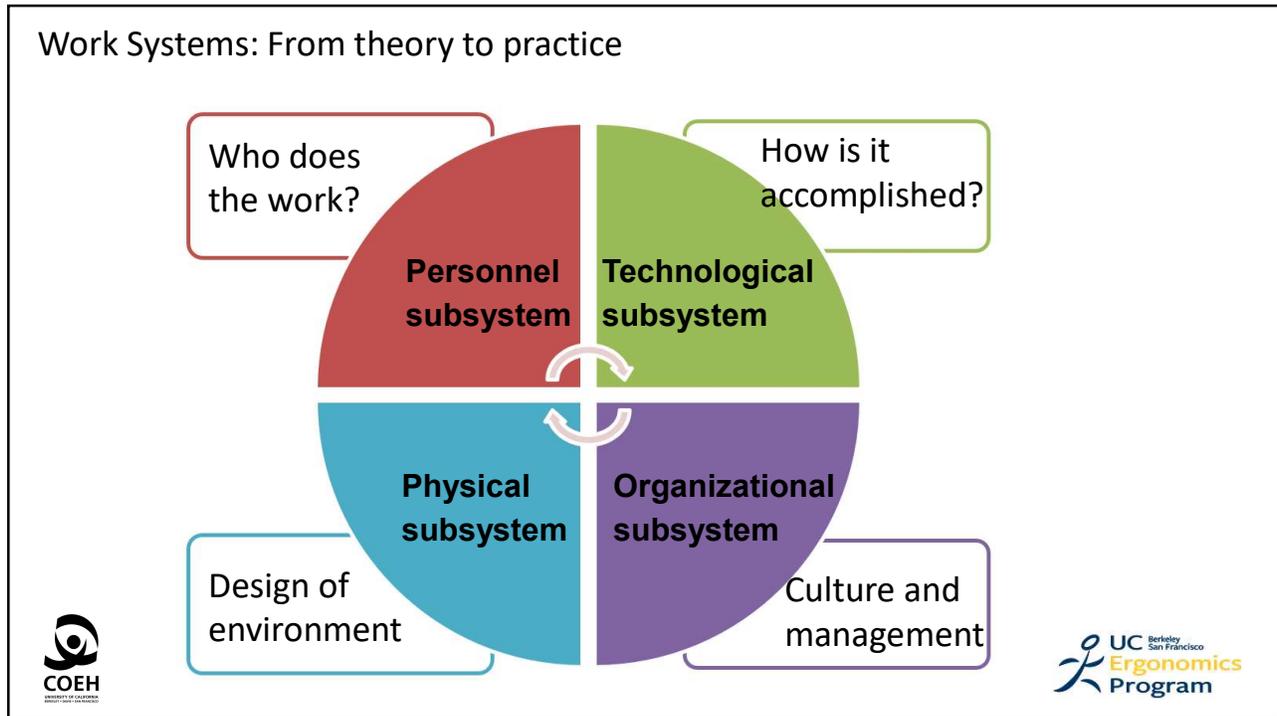


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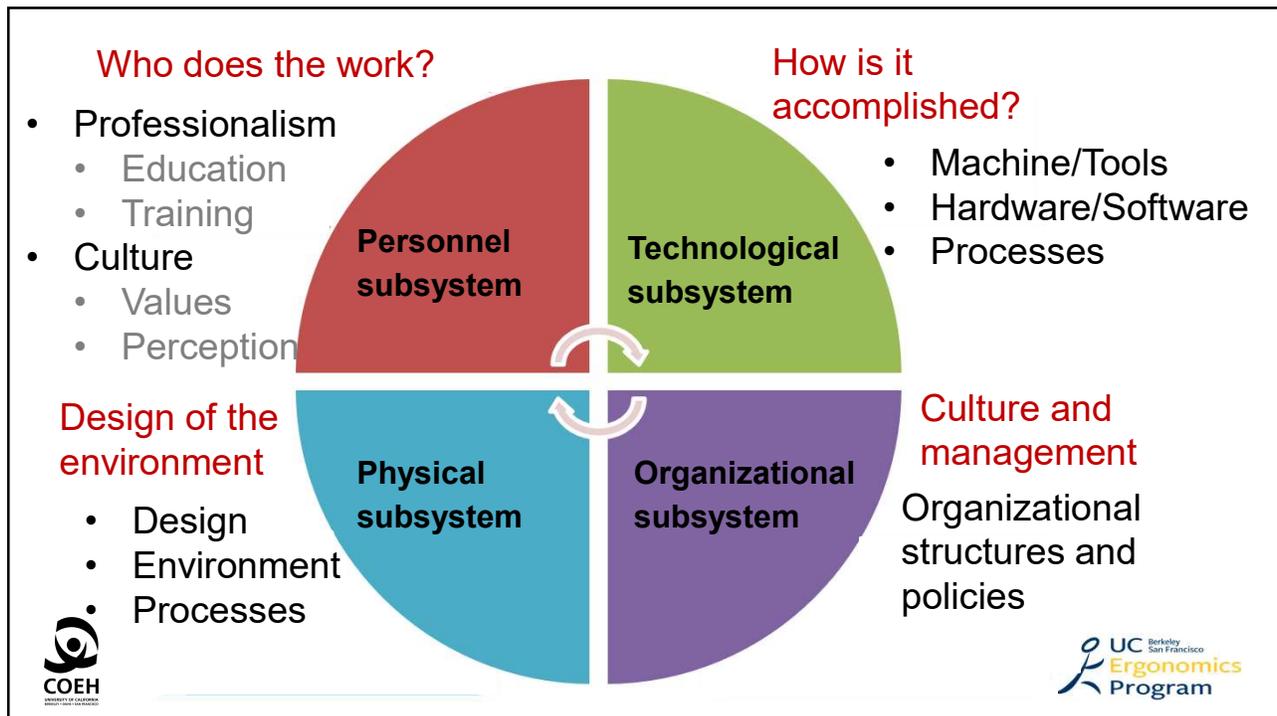
## Human-centric work system



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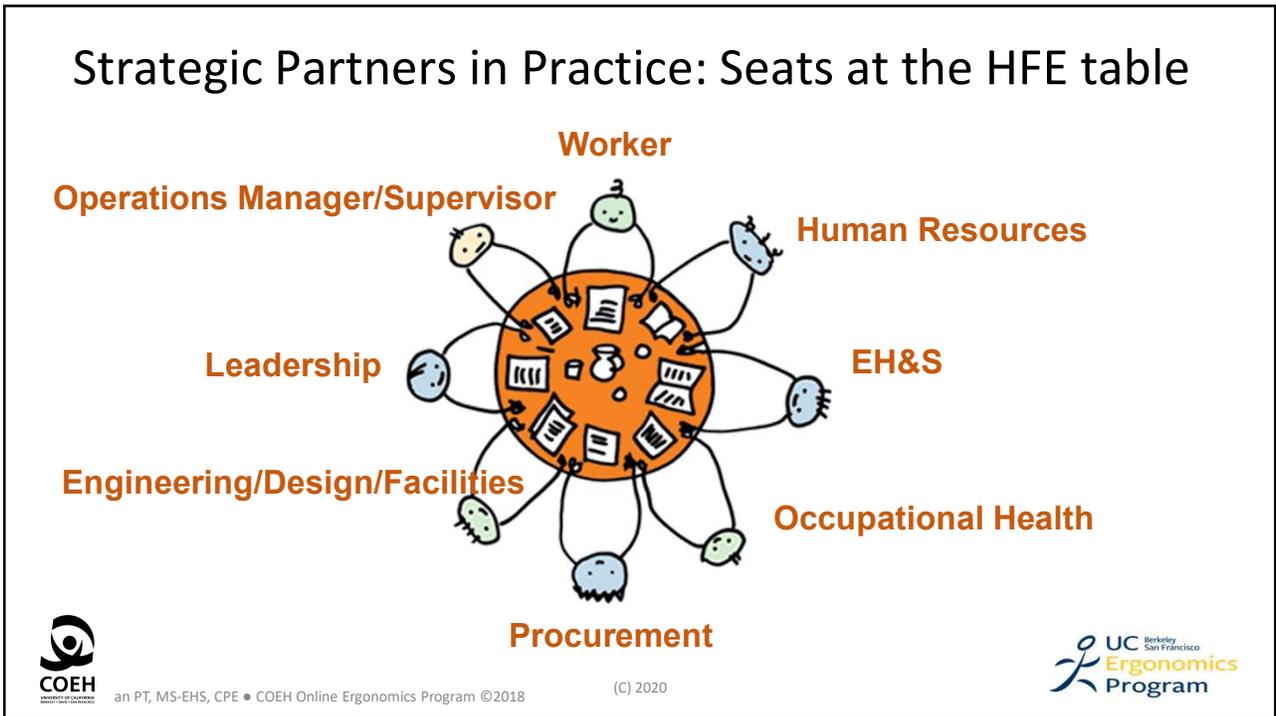
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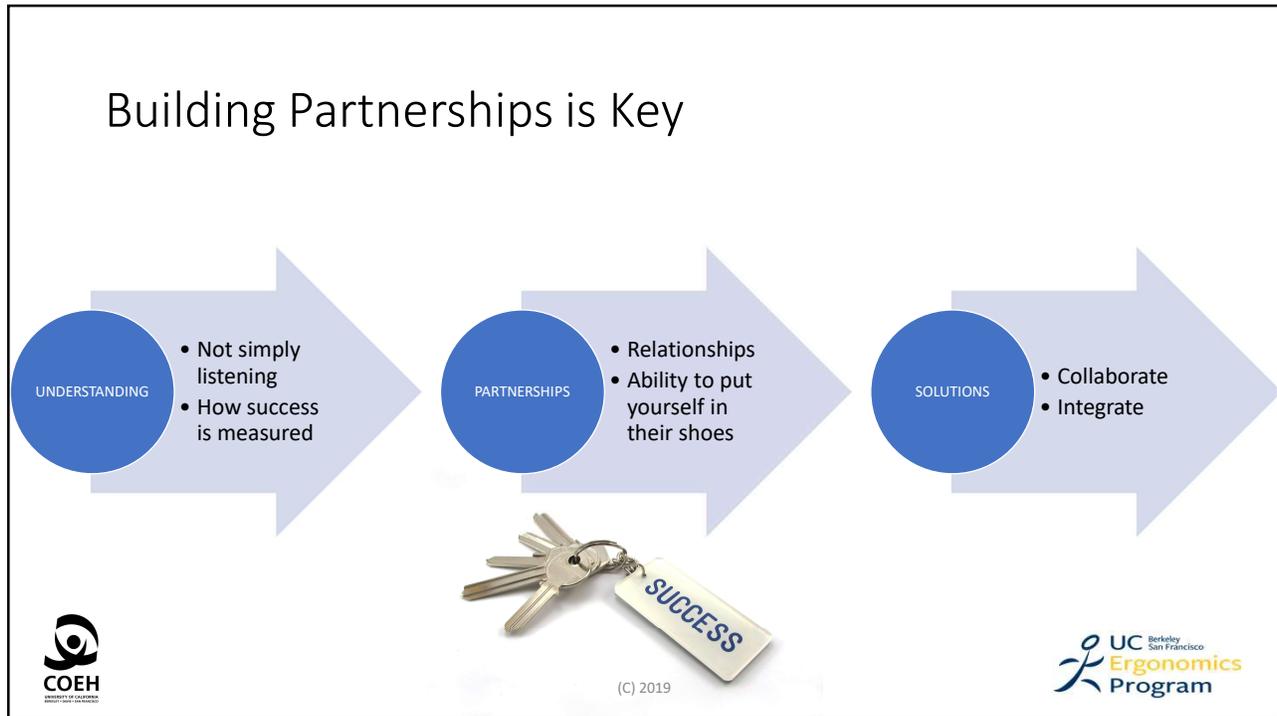
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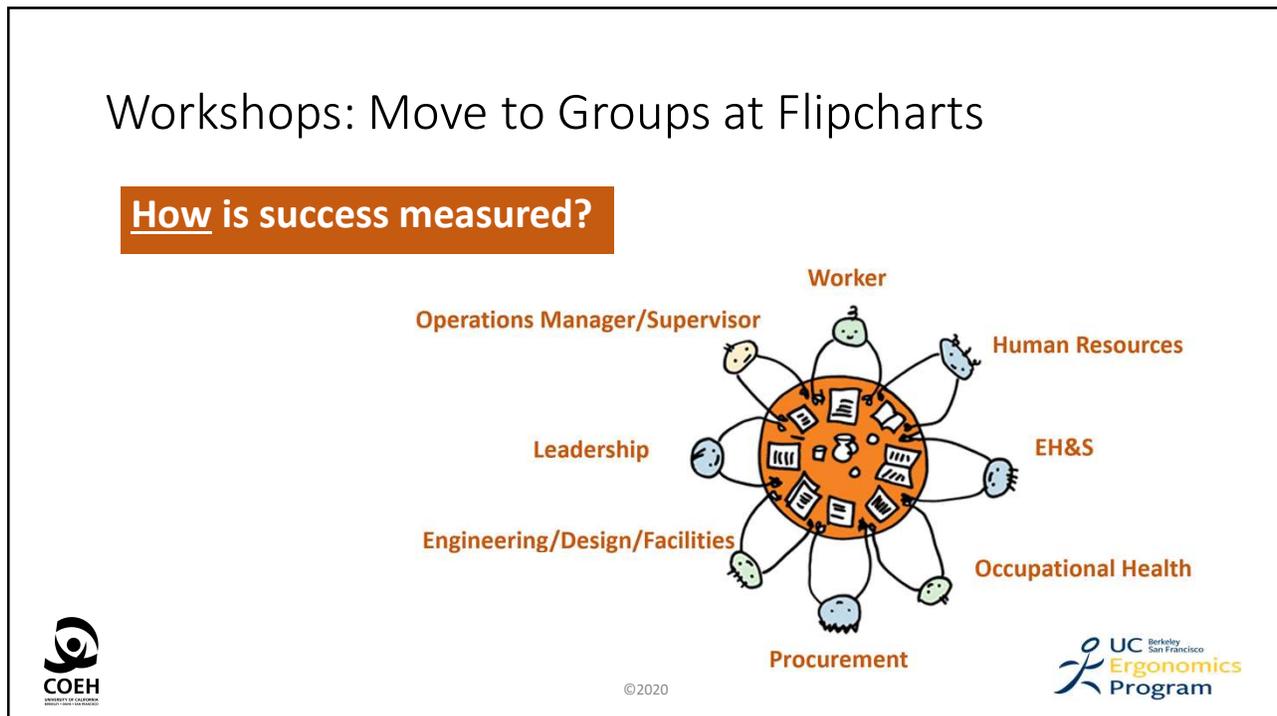
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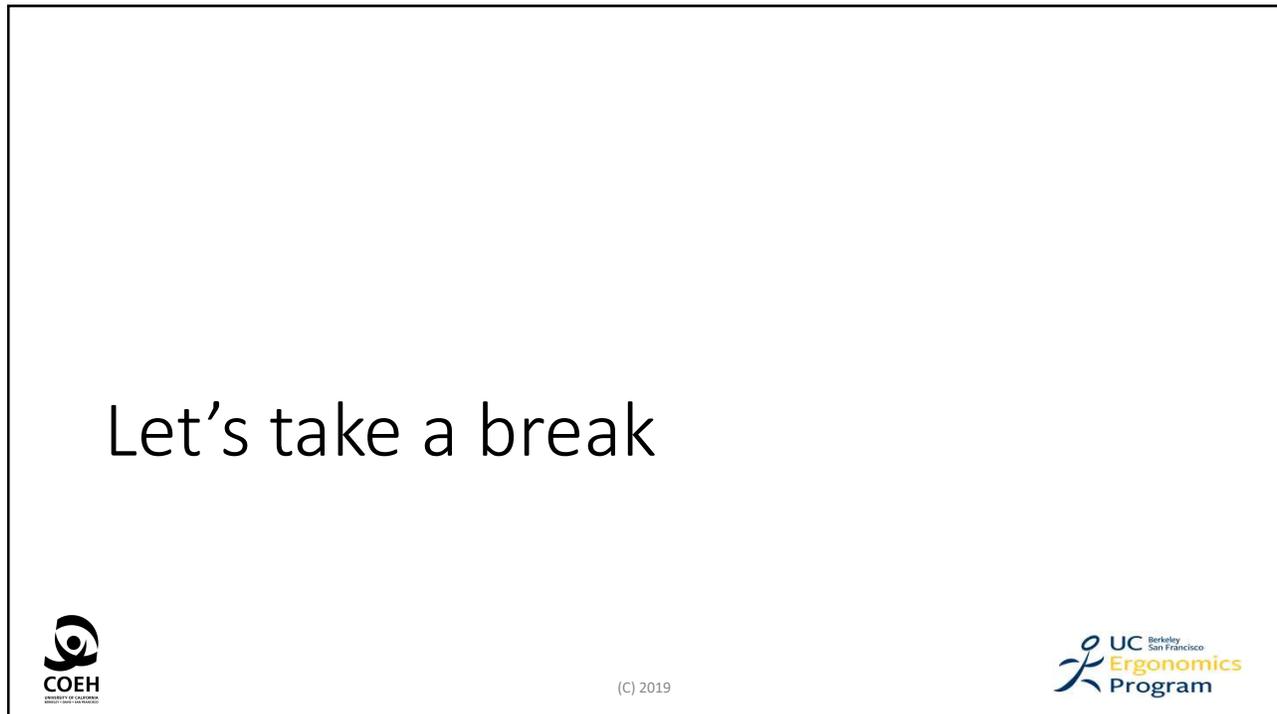
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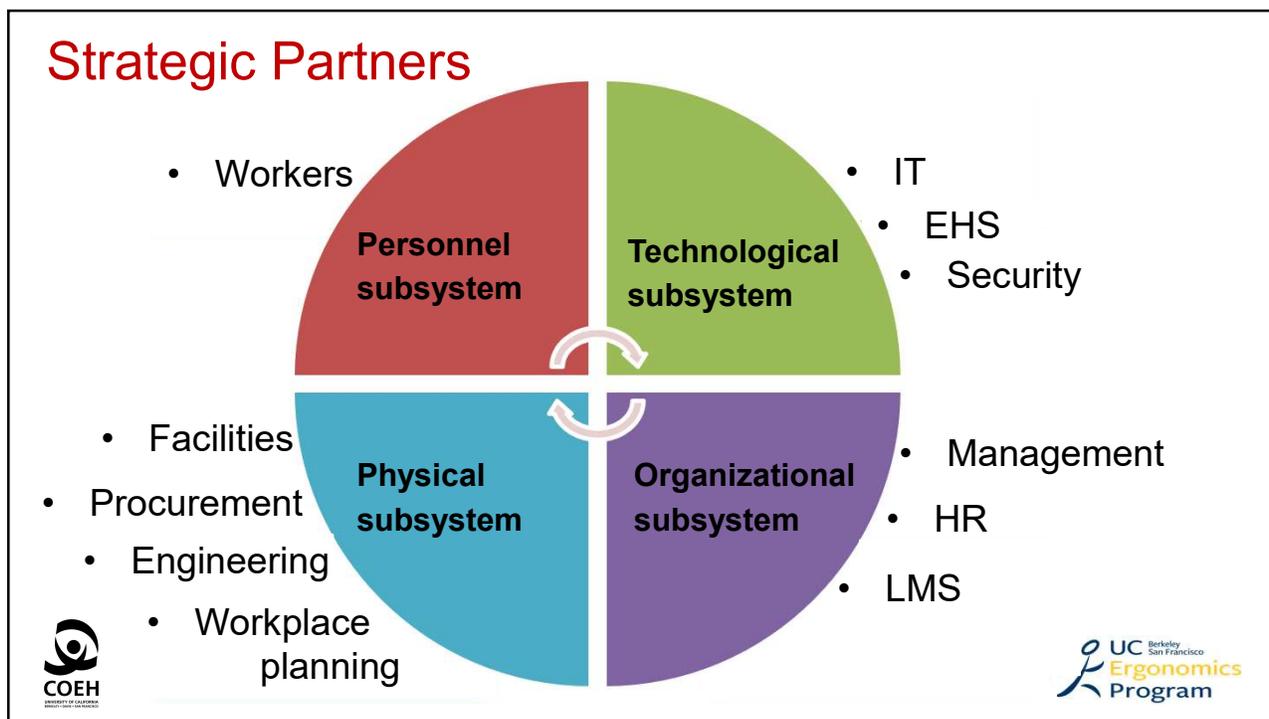
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### Example Problem

Numerous individual lab ergo evals that exhibited patterns:

- ✓ Same department/work group
- ✓ Similar injuries/complaints
- ✓ Common tasks/exposures
- ✓ Repeated reasons for “no’s”

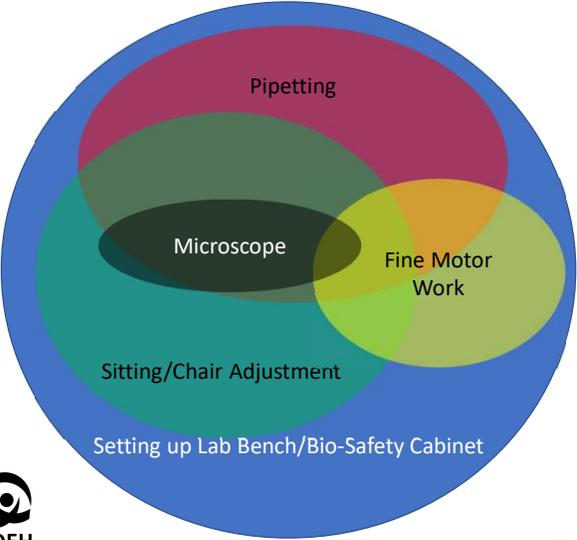
**“Save-as Syndrome”**

Inefficient approach to repeat the same messages without gaining effective traction for change

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## The Initial Approach: Identify patterns



1. Research a list of recommended products
2. Develop handouts
  - Summarizing the risks and recommendations (tools & preferred practices) by task
3. Self-assessments by task
  - Including recommendations to mitigate risk

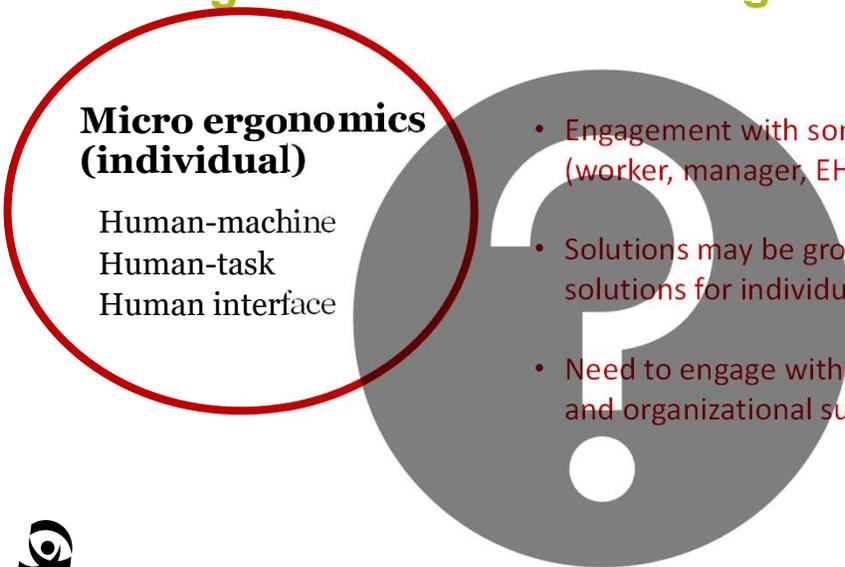
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## Micro ergonomics vs. Macro ergonomics



**Micro ergonomics (individual)**

- Human-machine
- Human-task
- Human interface

- Engagement with some strategic partners (worker, manager, EHS, vendors)
- Solutions may be grouped by task, but they are solutions for individuals
- Need to engage with the technological, physical and organizational subsystems

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## Additional Work to Engage with Strategic Partners

- Partner with **EHS & management** to develop and disseminate information and resources
  - Including online trainings by task – **Training/LMS** make available on corporate learning portal
- Recommended products tested and vetted by **workers**
- Collaborate with **Facilities** to identify adequate seating options available from preferred vendors and to maintain inventory
- Collaborate with **Procurement** to identify preferred vendors for ergonomic tools
  - Streamline access to products via onsite supply cabinets and online ordering portal

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## Additional Work to Engage with Strategic Partners

- Lab Ergo Advocate participatory program developed in conjunction with **Safety Team (EHS, management/leads, workers, Facilities, Engineering)**
  - Multi-disciplinary participatory ergonomics programs are a primary methodology of macro ergonomics
- Area risk assessments performed by **Lab Ergo Advocates**
  - Utilize standard **Facilities** system to adjust furniture and workspaces as needed
- Ergonomics incorporated into mandatory new hire OJT trainings for assays (**Lab Ergo Advocates, Training/LMS**)

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### Additional Work to Engage with Strategic Partners

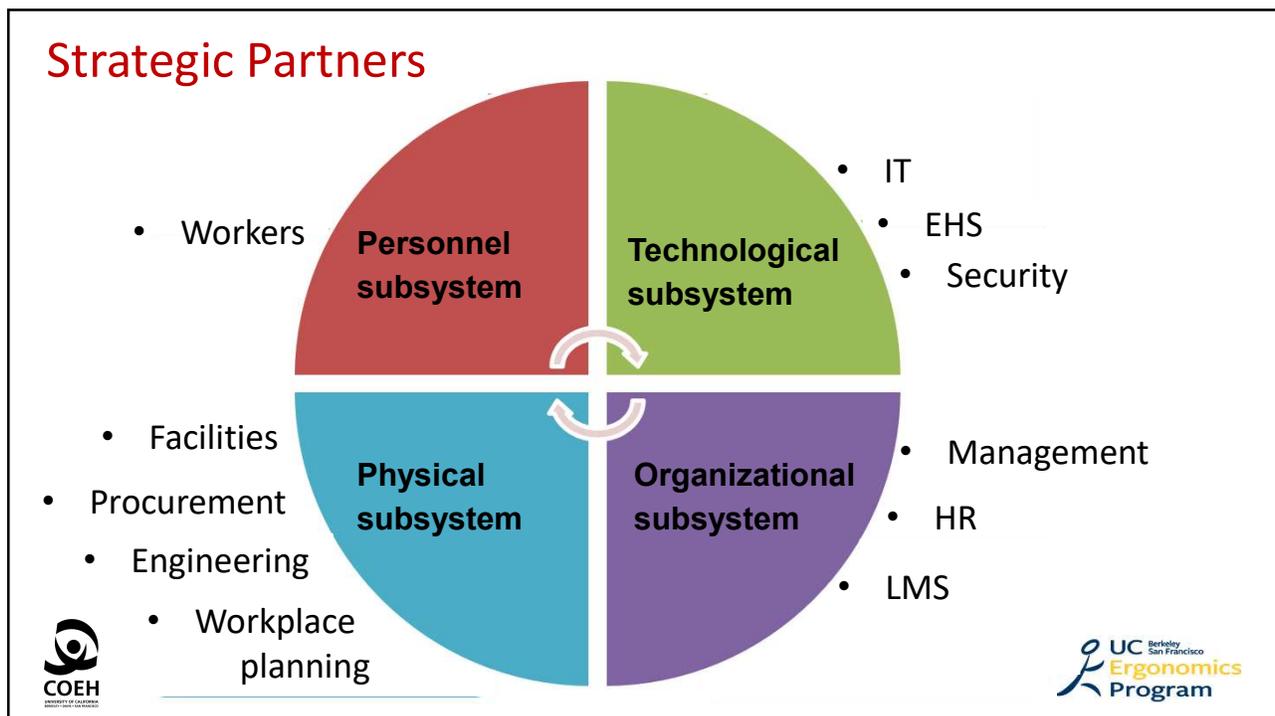
- **Management** utilizes exposure information (from **Ergo/EHS** and from **Workers**) to design schedules that minimize physical and cognitive strain
- **Workplace planning** collaborates with **EHS/Ergo, workers, IT, Facilities** to design new labs
- **EHS/Ergo and management** works with **HR** on system for supporting individuals with return-to-work or other job accommodations



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## Is it macro ergonomics?

- Subsystems are adequately educated, motivated and coordinated with the others to work together towards a common goal (ex: high quality output, mission statement, company goals).
- A Harmonized System (*Michelle Robertson, Northeastern University*)

### What does that look like?

- Ergo hears from a vendor about modified equipment for Bio-Burden assay (low force, low profile tools)
- Ergo learns about a new ergo training module created by the work group
- Self-reliant subsystems working together without Ergo driving each step



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## A practical path from micro to macro ergonomics

<u>Individual → (I<sup>n</sup>)</u>	<u>Task</u>	<u>Group</u>	<u>System Level</u>
	<ul style="list-style-type: none"> <li>• Office</li> <li>• Lab</li> <li>• Plant</li> </ul>	Quality, Production, Logistics, Administration, Research,	Organization wide
<ul style="list-style-type: none"> <li>• Findings</li> <li>• Recommendations</li> </ul>	<ul style="list-style-type: none"> <li>• Handout</li> <li>• Equip list</li> <li>• Training</li> </ul>	<ul style="list-style-type: none"> <li>• Participatory Ergo</li> <li>• Preferred vendors/↓\$</li> <li>• SOPs/Training system</li> </ul>	<ul style="list-style-type: none"> <li>• Macroergonomics</li> </ul>
<u>Partners</u> <ul style="list-style-type: none"> <li>• Manager</li> <li>• Facilities</li> <li>• Vendor</li> </ul>	<u>Strategic Partners</u> <ul style="list-style-type: none"> <li>• Manager</li> <li>• Facilities</li> <li>• Vendors</li> </ul>	<u>Strategic Partners</u> <ul style="list-style-type: none"> <li>• Management</li> <li>• Information Technology</li> <li>• Procurement</li> <li>• Workplace planning</li> <li>• EHS</li> </ul>	<u>Subsystems</u> <ul style="list-style-type: none"> <li>• Personnel</li> <li>• Organizational</li> <li>• Physical</li> <li>• Technological</li> </ul>
<b>Individual</b>	<b>Multiple Individuals (I<sup>n</sup>)</b>	<b>Group</b>	<b>System Level</b>

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## Office-Moves Example

**PROBLEM:** High number of individual evaluation requests post move

**OPPORTUNITY:** “New Work Environment” (NWE) prototypes

- Ergo input on workstation design (desk and chairs)



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## Open- Planned Office Building

**NEXT STAGE:**

1500 persons moving into a new building with unassigned, open-plan work environment

Workplace Planning group in the lead for design, construction and move planning

- Workstation and space design
- Lighting study
- Sound design
- Change management



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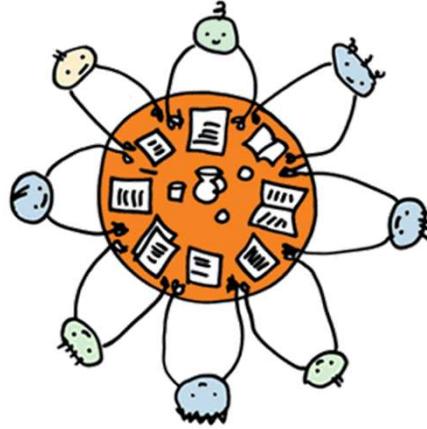


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## Open- Planned Office Building

### Key partners team for execution of project

- Facilities (housekeeping and maintenance)
- Security
- Procurement
- Information Technology
- Human Resources
- Local customer representatives “Advocates”



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## Your Next Steps



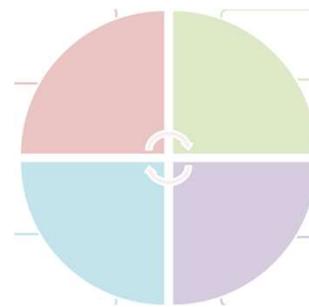
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## Conclusions & Take-Aways

- View your organization (work system) as a set of sub systems
- Identify the strategic partners from each sub system
- Do they have the human factors information they need?
- Are they all involved in the solutions?
  - If not, do you have plans to work with those subsystems in the future?
- Are all subsystems self-sufficient and working together towards a common goal?



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