

Panel 5 – Human Interactions

# Designing for Soft Constraints in Human-Agent Coordination

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**Achieve operational  
excellence, obtain  
competitive **advantage****

**The promise of autonomous systems.**

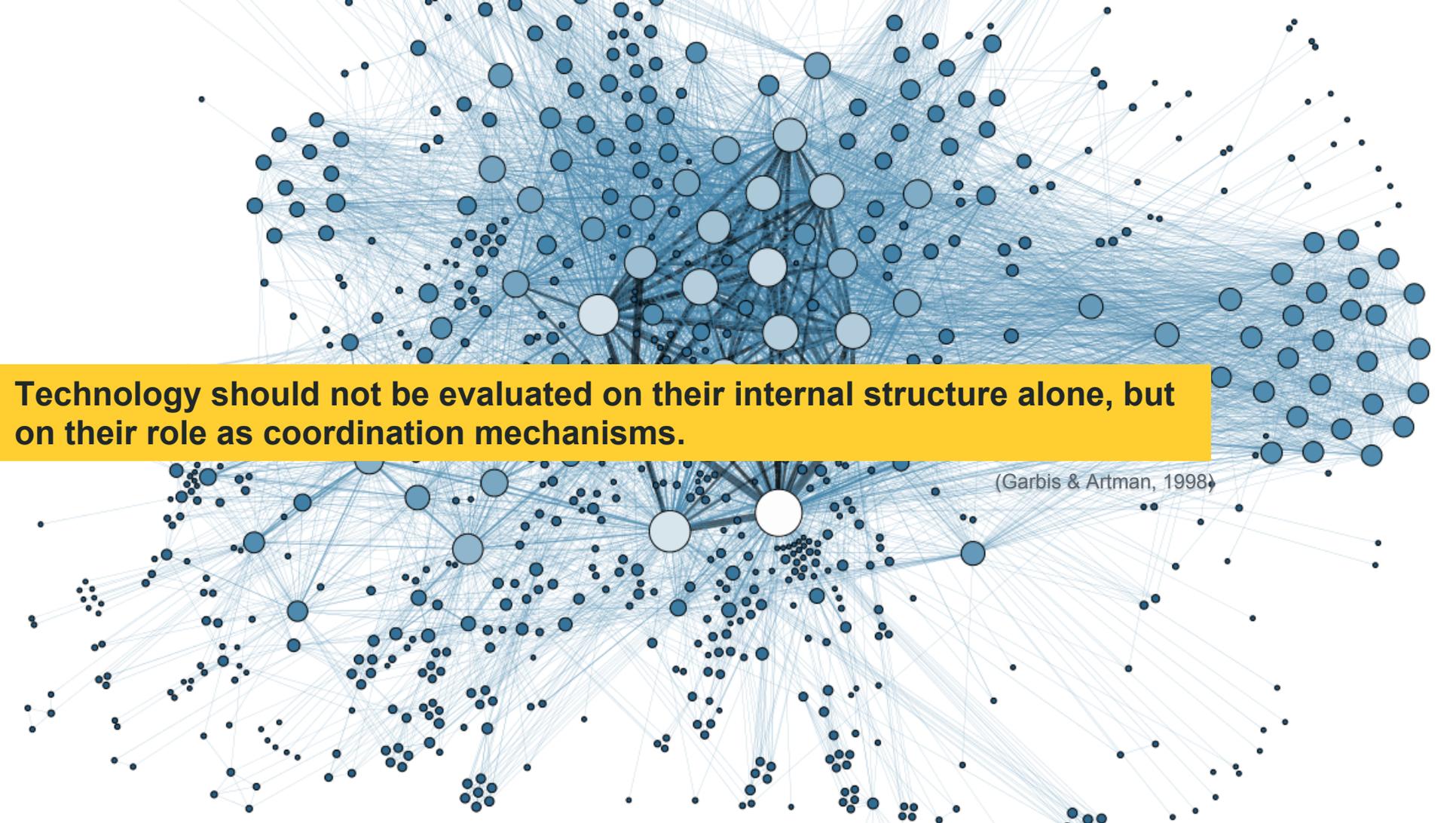
# Three popular approaches

1. Proceduralize
2. Shift control
3. Add technology

**Procedures address  
the knowns, reduce  
ambiguity, and lead to  
rule following**

**Front-end control  
enables discretion  
when unknowns occur,  
and requires expertise**

**Technology increases efficiency, consistency, reduces workload, and introduces system gaps**



**Technology should not be evaluated on their internal structure alone, but on their role as coordination mechanisms.**

(Garbis & Artman, 1998)

**System resilience is**  
**graceful extensibility**  
**in the face of**  
**unexpected events**

**System resilience  
requires people to  
make the right  
decisions in under-  
defined circumstances**

# Three proposed approaches

1. Trust
2. Cooperation
3. Accountability

# Trust is useful in the absence of **complete control**

Trust guides – but does not completely determine – reliance and compliance

**Cooperation is the  
willingness to forgo  
individual goals **for**  
**shared goals****

**Cooperation requires trust; coordination is dependency  
management**

**Accountability refers  
to **social pressures**  
that impact decisions**

**An obligation to justify conduct, especially when procedural or social sanctions are present**

# Agent behaviors affect human behaviors

*An agent that maximized for individual goals resulted in similar behaviors from participants, undermining joint performance; this was also true when faced with high workload (Chiou & Lee, 2016)*

*Under high workload, participants were less proactive, but still cooperated reactively (Chiou & Lee, 2016)*

# Interaction **structures** affect joint performance

*A reciprocal exchange structure led to more efficient but lower-quality resource sharing behaviors compared to a negotiated exchange structure (Chiou, Lee, & Su, 2019)*

# Increasing accountability pressures

*can reduce errors of omission and commission  
(Skitka, Mosier, & Burdick, 2000)*

*and increase cooperative behaviors, but at some costs to  
efficiency (Salehi, Chiou, & Wilkins, 2018)*

# Consider **process-based performance** and the ability to resolve conflicting goals

The promise of autonomy in complex systems: Does your organization have the superior doctrine and understanding of soft constraints?

**Conclusion:**  
**Build capabilities**  
**that allow for**  
**graceful extensibility**

<https://adapt.engineering.asu.edu/>

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## 1. What are the key problems your field thinks about?

Lack of human system integration, interoperability

## 2. What are problems that your field views as solved?

Need to conduct studies in naturalistic settings, theory development must connect with implementation science

## 3. What are the current research trends in your field?

Designing for worker empowerment, human-machine interdependence and system resilience

## 4. What are problems that your field views as unsolved but important?

How to keep the human in-the-loop, not just for their attention and control, but also accountability

## Types of Accountability Systems

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		Source of Agency Control	
		Internal	External
Degree of Control Over Agency Actions	High	1. Bureaucratic	2. Legal
	Low	3. Professional	4. Political

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(Romzek & Dubnick, 1987, p. 229)