Complexity Science & Implementation

VHA Cyberseminar

December 6, 2012

What is your familiarity with complexity science?

1. Just heard of it
2. Some passing familiarity from the literature
3. Know it moderately well / familiar with the literature
4. Have used the framework in my own work

Objectives

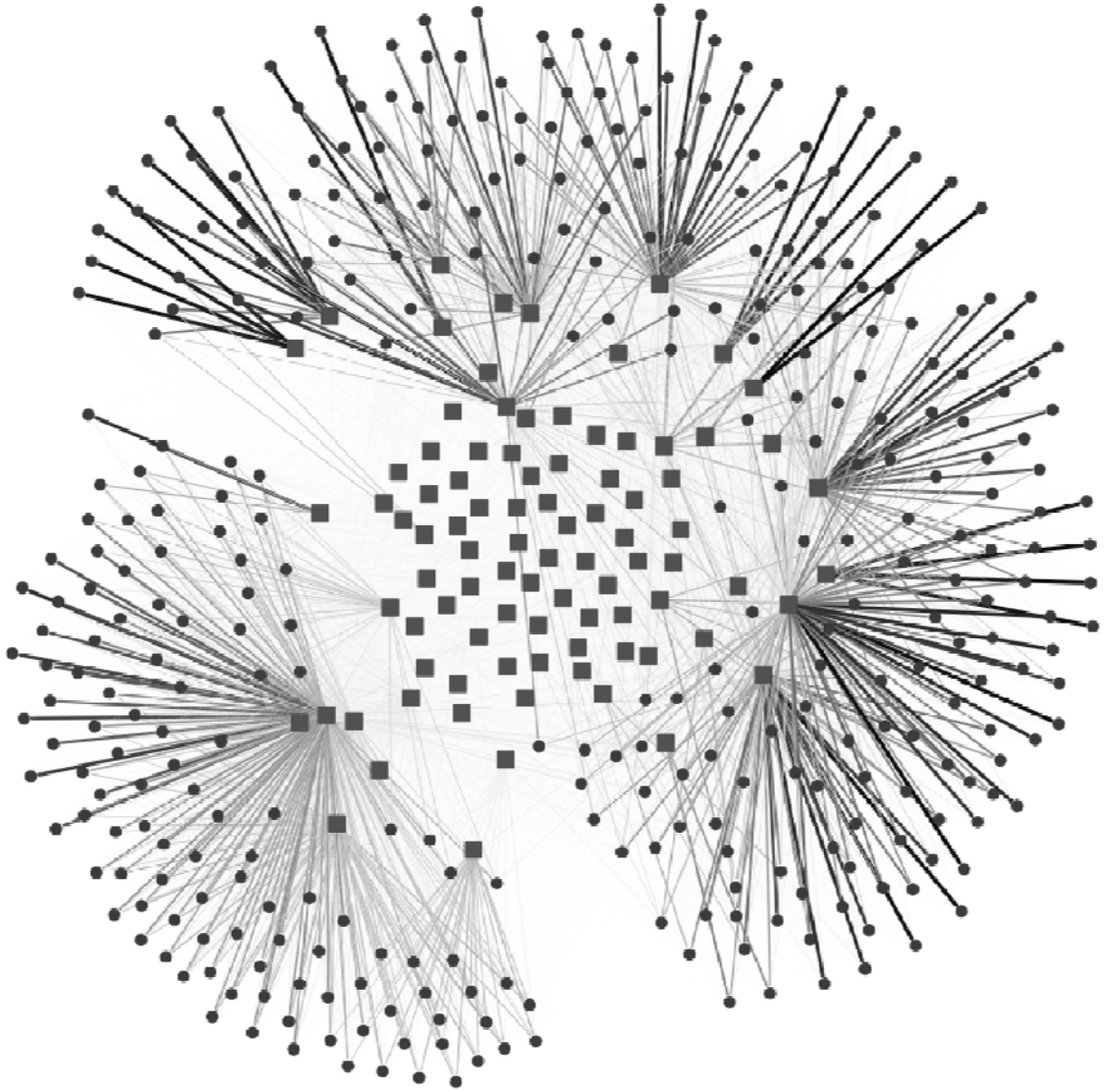
Discuss the insights that complexity science provides for implementation science:

- Presence of uncertainty
- Focus on relational infrastructure & interdependencies
- Importance of sensemaking, improvising, & learning

Challenges in implementation

- Difficulties scaling interventions across multiple systems
- Unpredictable diffusion of knowledge through organizations
- Understanding how the local context influences implementation efforts
- Tension between “local” and “generalizable”

Complexity Science



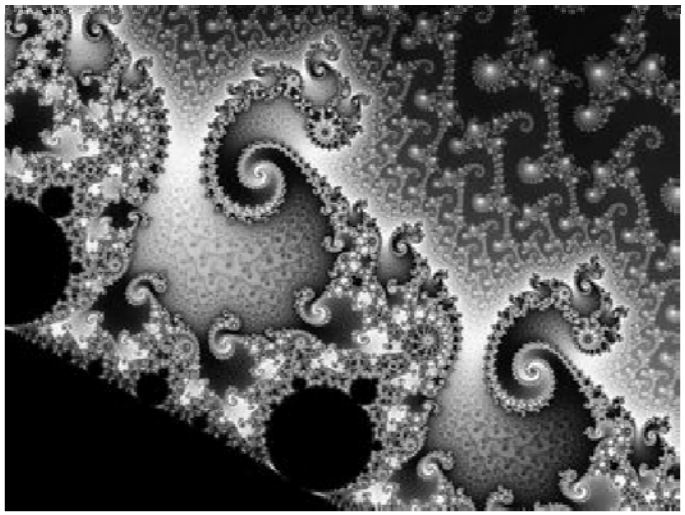
Uncertainty is inherent!

Patient

Science

?

System



Han 2011

Interdependencies

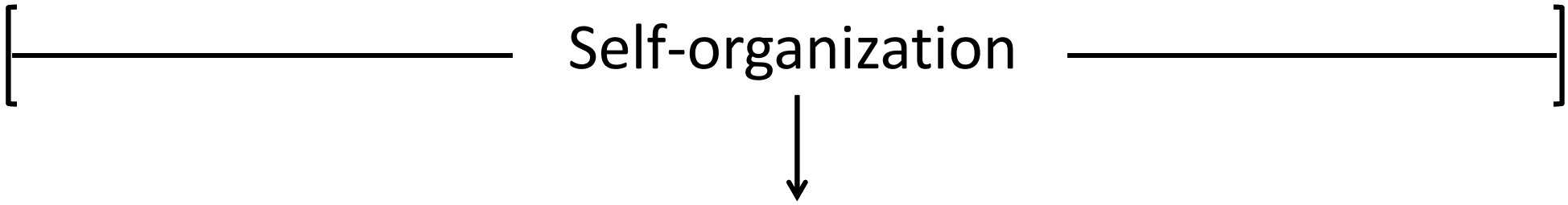
Relationships

Processes

Affordances

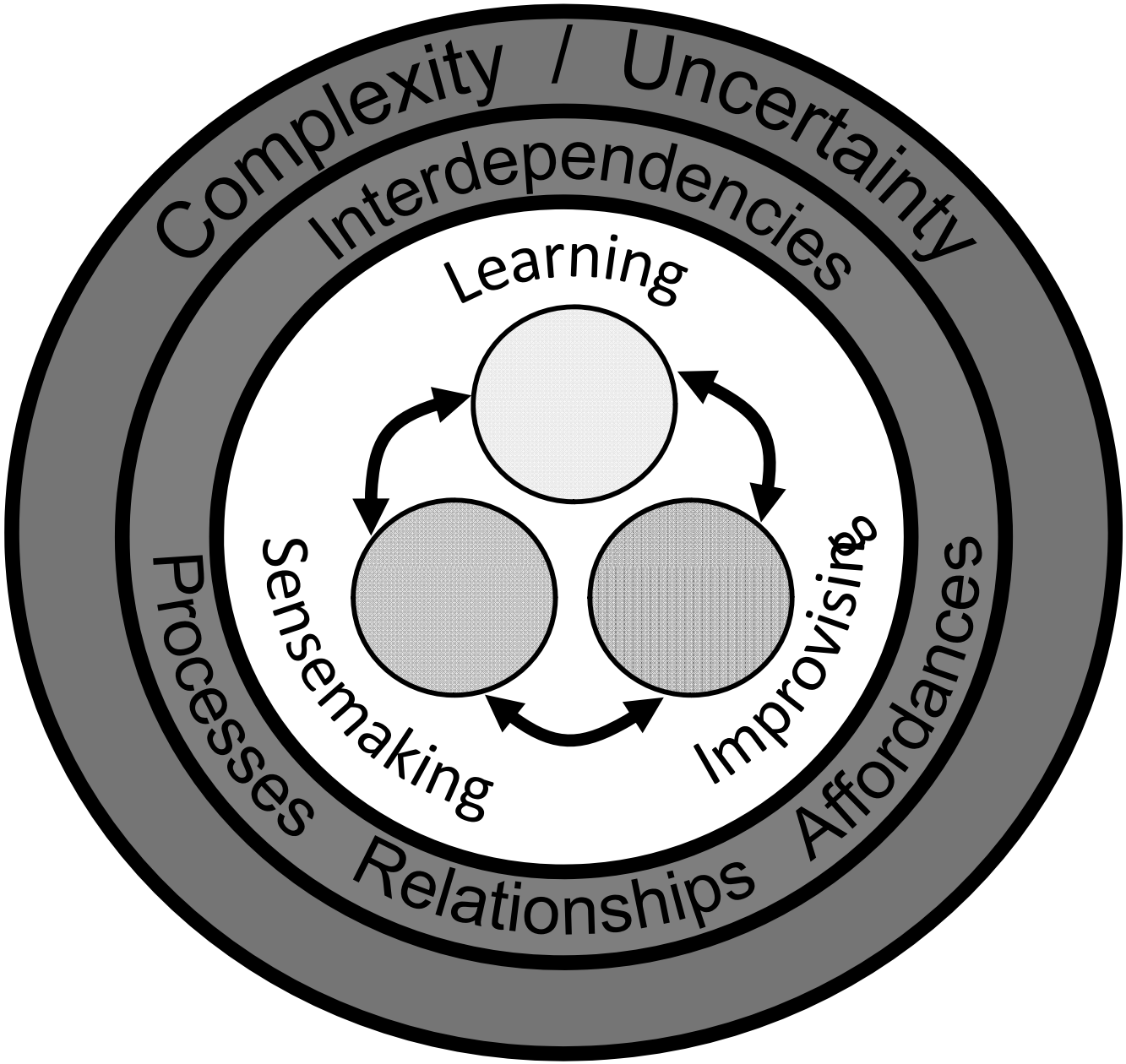
Interdependencies

Relationships	Processes	Affordances
The individuals in the system and how they relate	The ways we work e.g. care pathways	The resources at our disposal e.g. physical plant, EHR



Self-organization

Complexity Science



Navigating interdependencies & uncertainties

- Relationships form the basis for effective action in uncertain environments

- Relationships – the basis for:
  - Sensemaking
  - Learning

Relationship characteristics

Relationship characteristic	Definition
Trust	Willingness to be vulnerable to others
Diversity	Including different perspectives and different thinking
Respect	Valuing the opinion of others Honest interactions
Heedfulness	Awareness of how each person's roles impact the rest of the team
Mindfulness	Openness to new ideas and free discussion
Social / Task Relatedness	Balance of both work and social-related interactions
Rich / Lean Communication	Use of in-person communication for sensitive or difficult issues

Lanham 2009

Relationship impact

- Linked to outcomes in:
  - Surgical teams
  - Medical teams
  - Nursing homes
  - Primary care
  - Intensive care

Physician team relationships & outcomes of hospitalized patients

Team Number	1	2	3a	3b	4a	4b	5	6	7	8	9
Relationship score	0	5	7	2	2	3	5	7	0	7	6
Length of stay (days)	5.6	7.2	3	4	3.6	3.8	3.5	2.6	4	3.2	3.3
Complication rate (%)	25	32.3	19	UR	20.6	UR	21.9	9.8	26.1	UR	UR

Leykum prelim data

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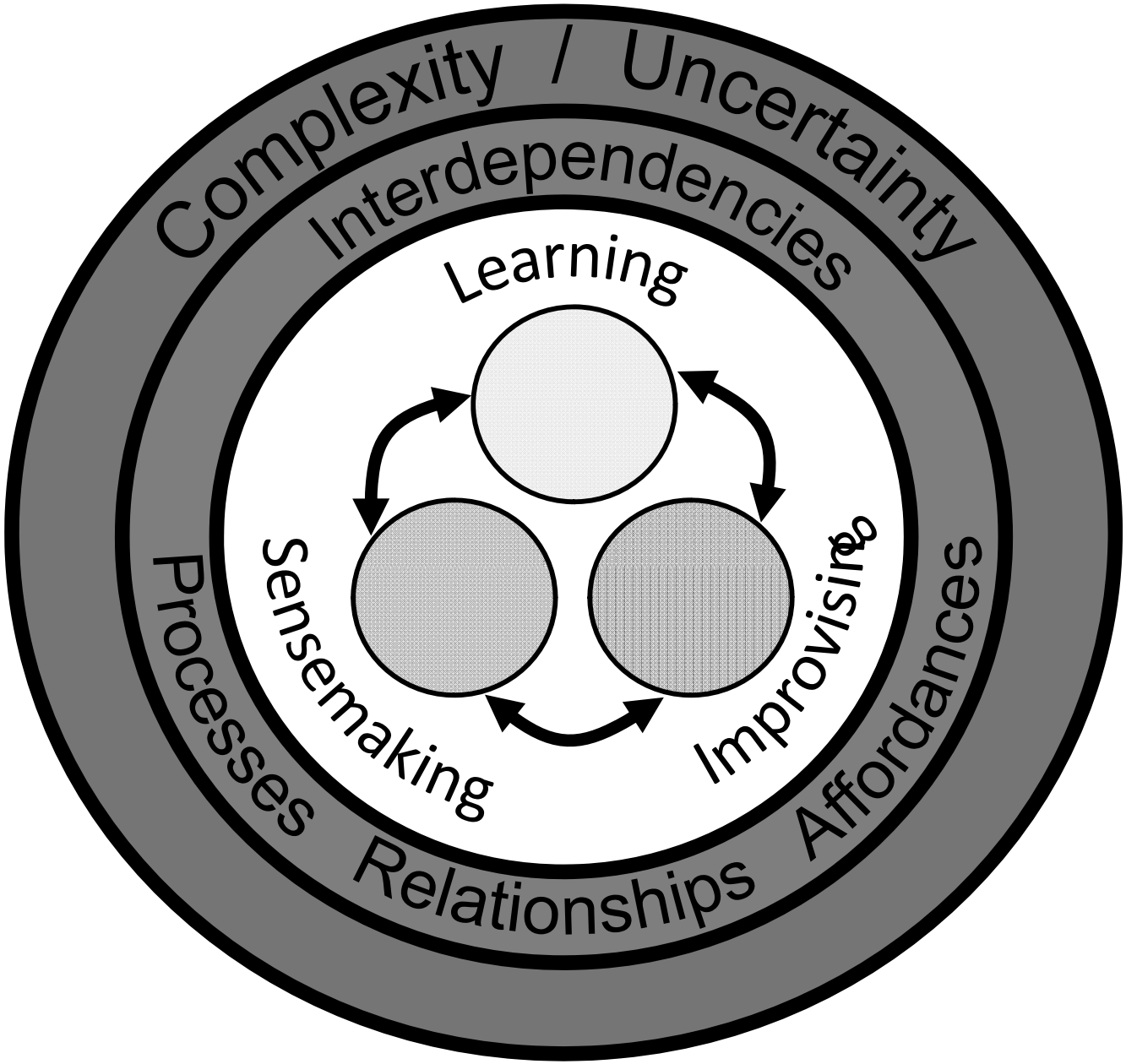
Leykum prelim data

Sensemaking



Sensemaking

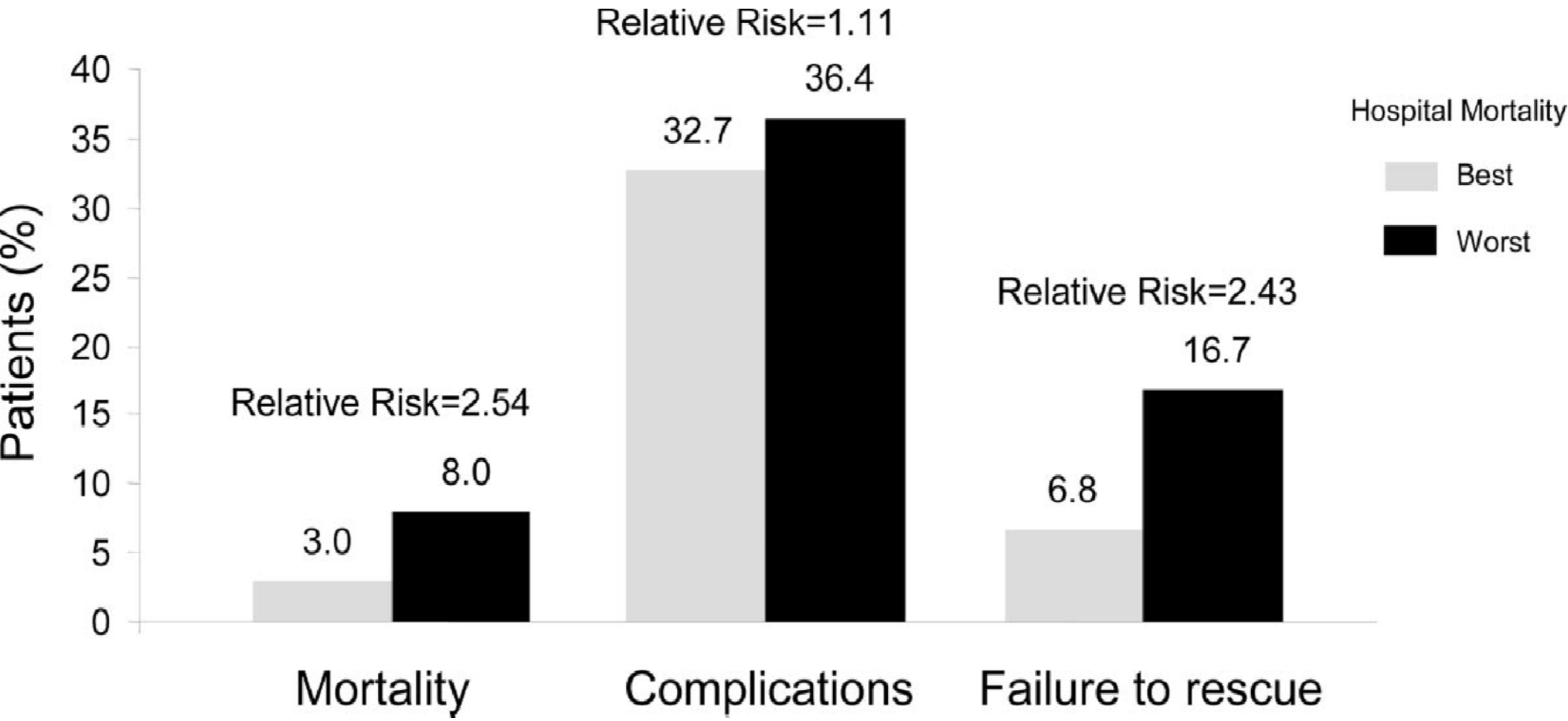
- “a diagnostic process directed at constructing plausible interpretations of ambiguous cues that are sufficient to sustain action”

- Reflection, conversation and briefing / debriefing

Weick 1995

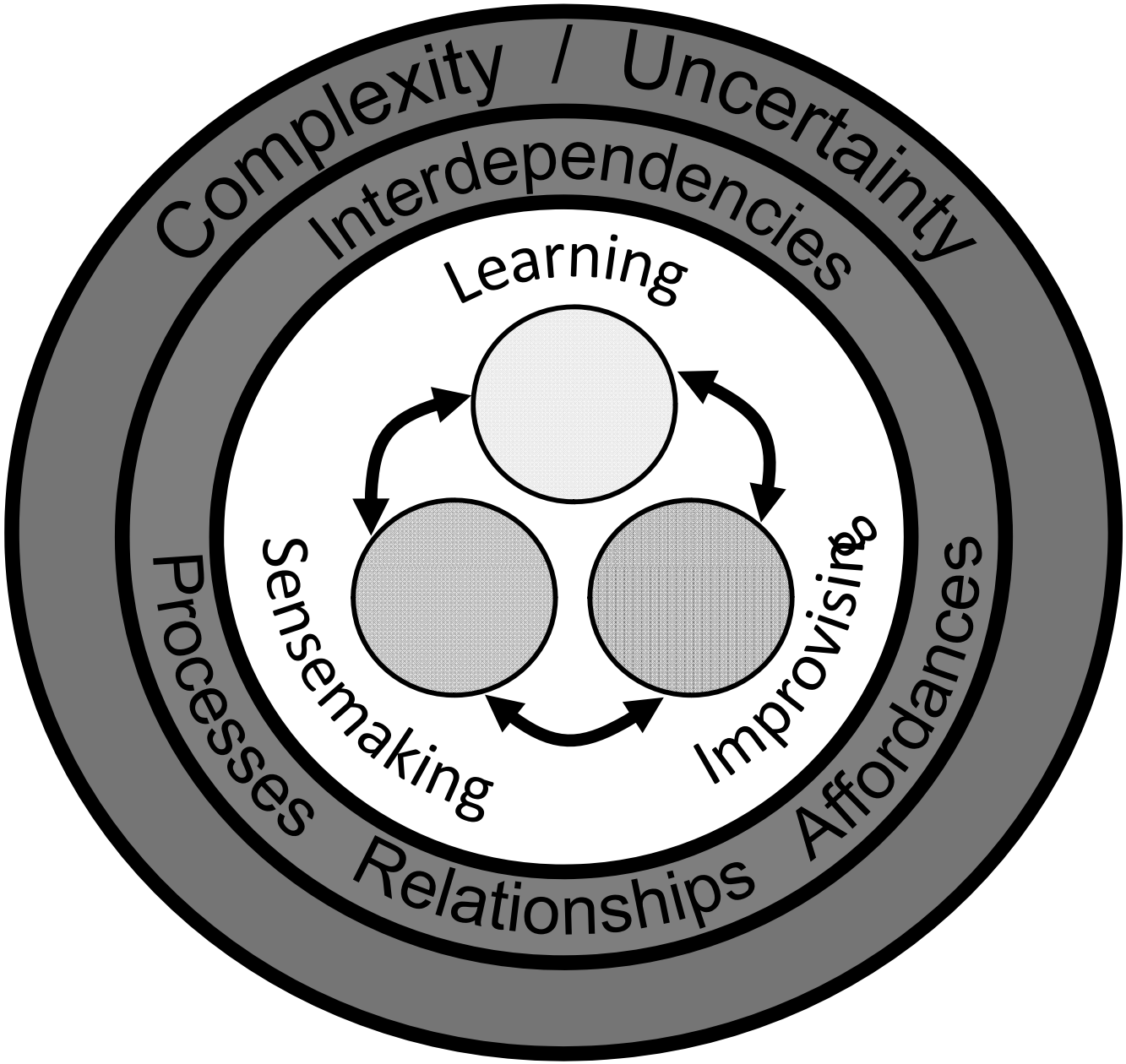
Surgical mortality

Study of differences between hospitals with low and high surgical mortality



Ghaferi 2009

Improvising

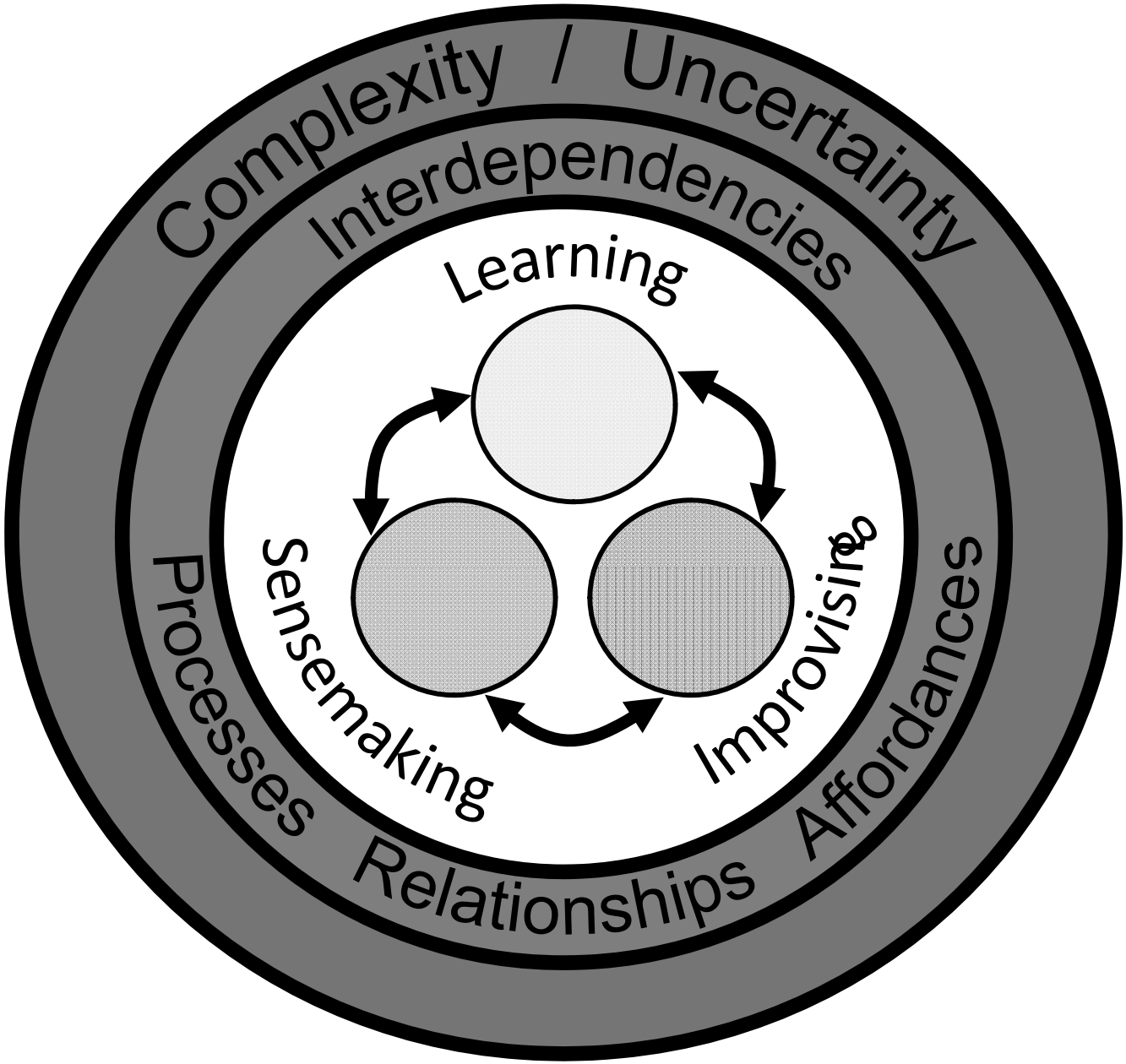


Improvising

- Applying scientific knowledge and clinical experience in novel ways
  - Reliant on knowledge
  - Reliant on relationships

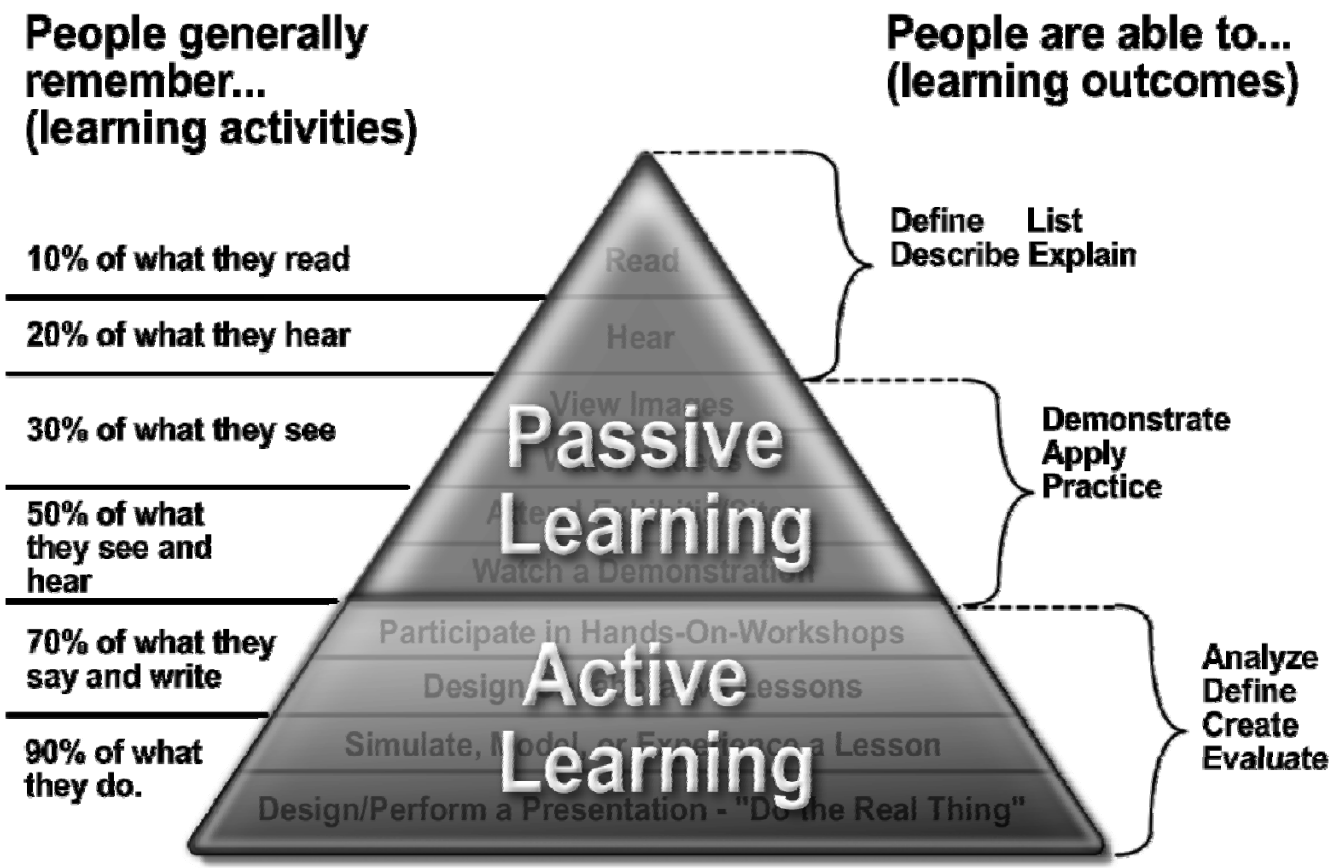
McKenna 2012

Learning


Complexity / Uncertainty
Interdependencies
Learning
Sensemaking
Improvising
Processes
Relationships
Affordances

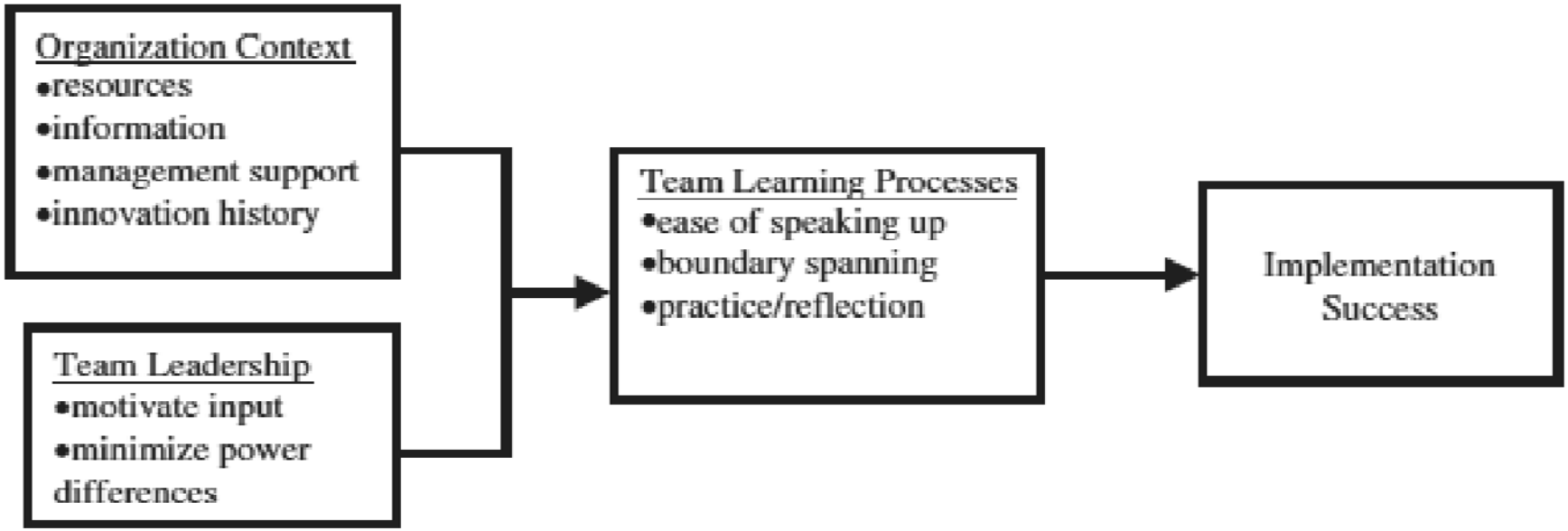
Learning

- Changing your mental model



Speaking up in the O.R.

- Surgical teams where team members “spoke up” learned more quickly
- Surgical outcomes better



Edmundson 2003

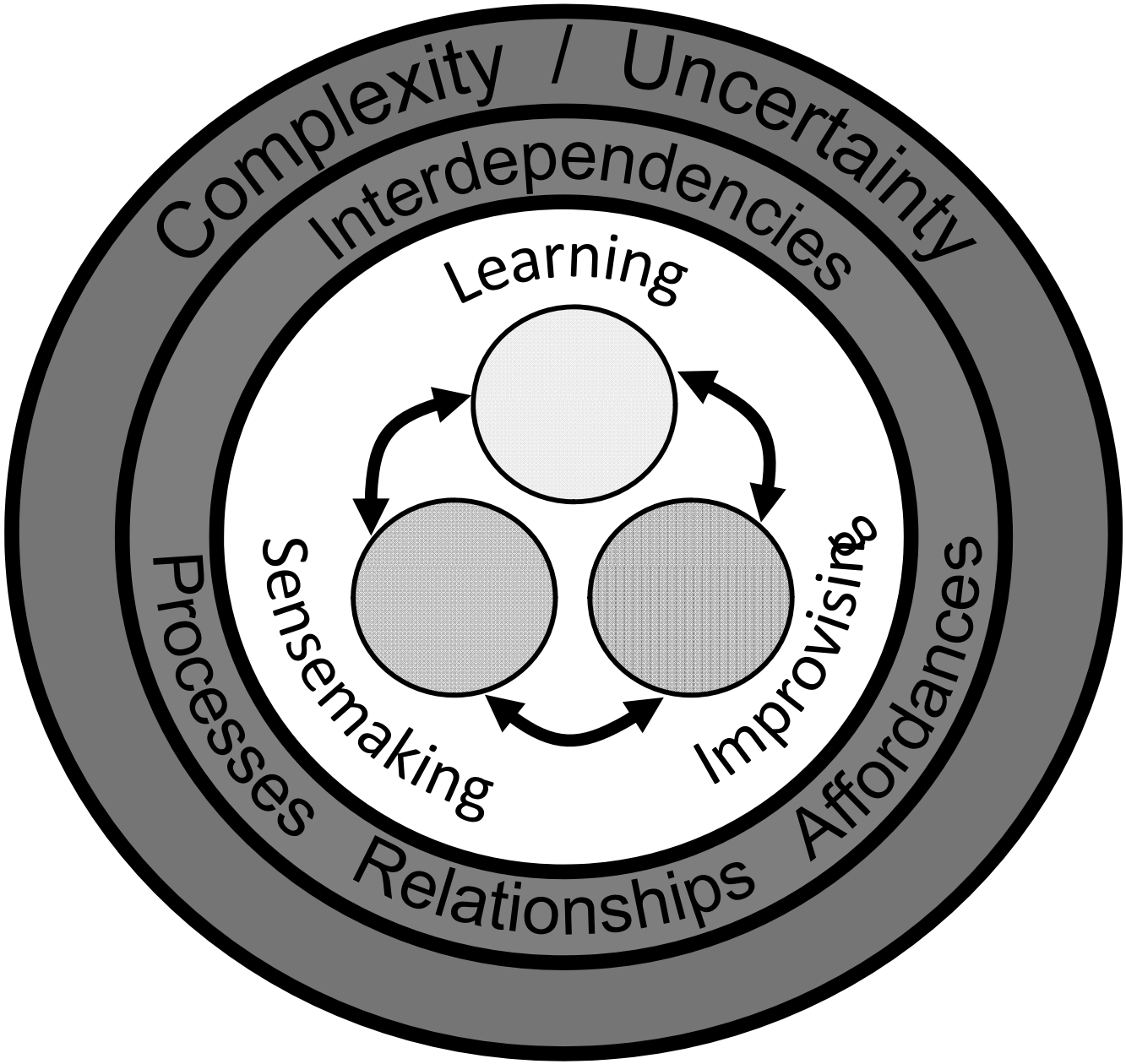
Learning in primary care

I am frequently taught new things by other people in this clinic
I learn a lot about how to do my job by talking with the people in the clinic
When we have a problem in this clinic, we tend to examine it carefully so that we can come to an understanding of the problem and why it occurred
In this clinic, we frequently learn about new things together as a group
I learn how to do things in this clinic by sharing knowledge with team members

Reciprocal learning significantly associated with clinic ability to implement the chronic care model

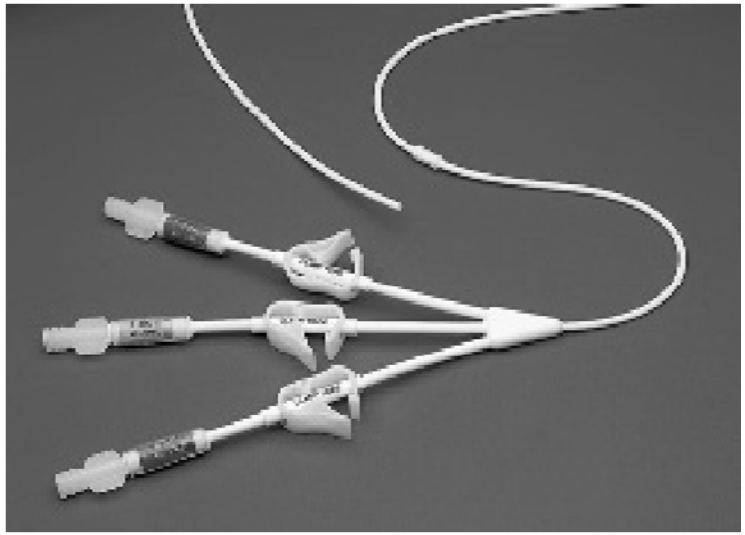
Leykum 2011

Tying these together



Bloodstream infections

- Michigan ICU project ➔ reduced rates of central venous catheter infections to 0
  - Checklists implemented by project teams



- Reframed as a “social process”

Dixon-Woods, 2011

Leveraging local patterns of relationships to enable sensemaking, improvising, and learning
will lead to more successful implementation efforts

Relationships

- Shared understanding of goals to encourage a more mindful and heedful process
  - Participatory elements built into the intervention, allowing intervention to be shaped
- Promote relationships among people whose collaboration is critical to intervention success
- Creation of complimentary interconnections between individuals

Intervention attributes that may impact the role of relationships:

- Degree of uncertainty
- Patient control over the process
- Degree of work-sharing required
- Pace of evolution of disease process

HIV Adherence

Setting	Three sites in Kenya
Intervention	Weekly SMS texts asking individuals in the first year of ART "How are you?"
Key attributes of implementation	Local group had input into the implementation design Regular meetings of patients and staff High degree of local input
Outcomes	95% adherence in 61.5% of intervention group, 50% of controls Lower levels of viremia

Lester 2011

Sensemaking, Improvising & Learning

- Make these activities explicit
- Time & space for conversations & reflection
- Allow the intervention to be shaped as it unfolds

Medical Team Training

- Operating room team briefing / debriefing

- 18% reduction surgical mortality among MTT teams vs 7%

Neily 2010

Acknowledgements

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Thank you!!

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