



32nd Annual **INCOSE**
international symposium

hybrid event

Detroit, MI, USA
June 25 - 30, 2022

Sandra Dawson

Empowering Engineers in a Digital Engineering Transition

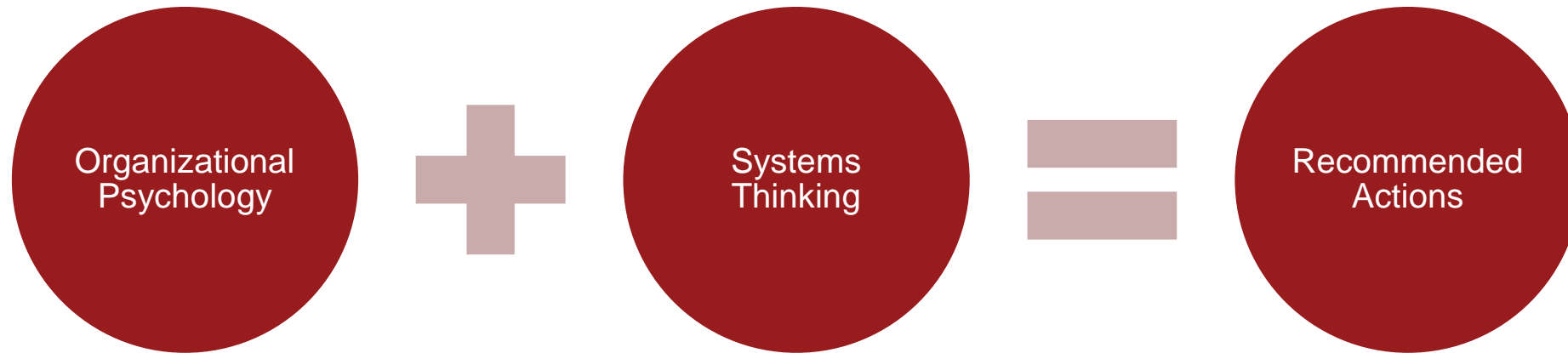


Agenda

- Introduction
- Organizational Psychology Approach
- Systems Thinking Approach
- Recommended Actions
- Challenges
- Conclusion



Introduction - Approach to Problem

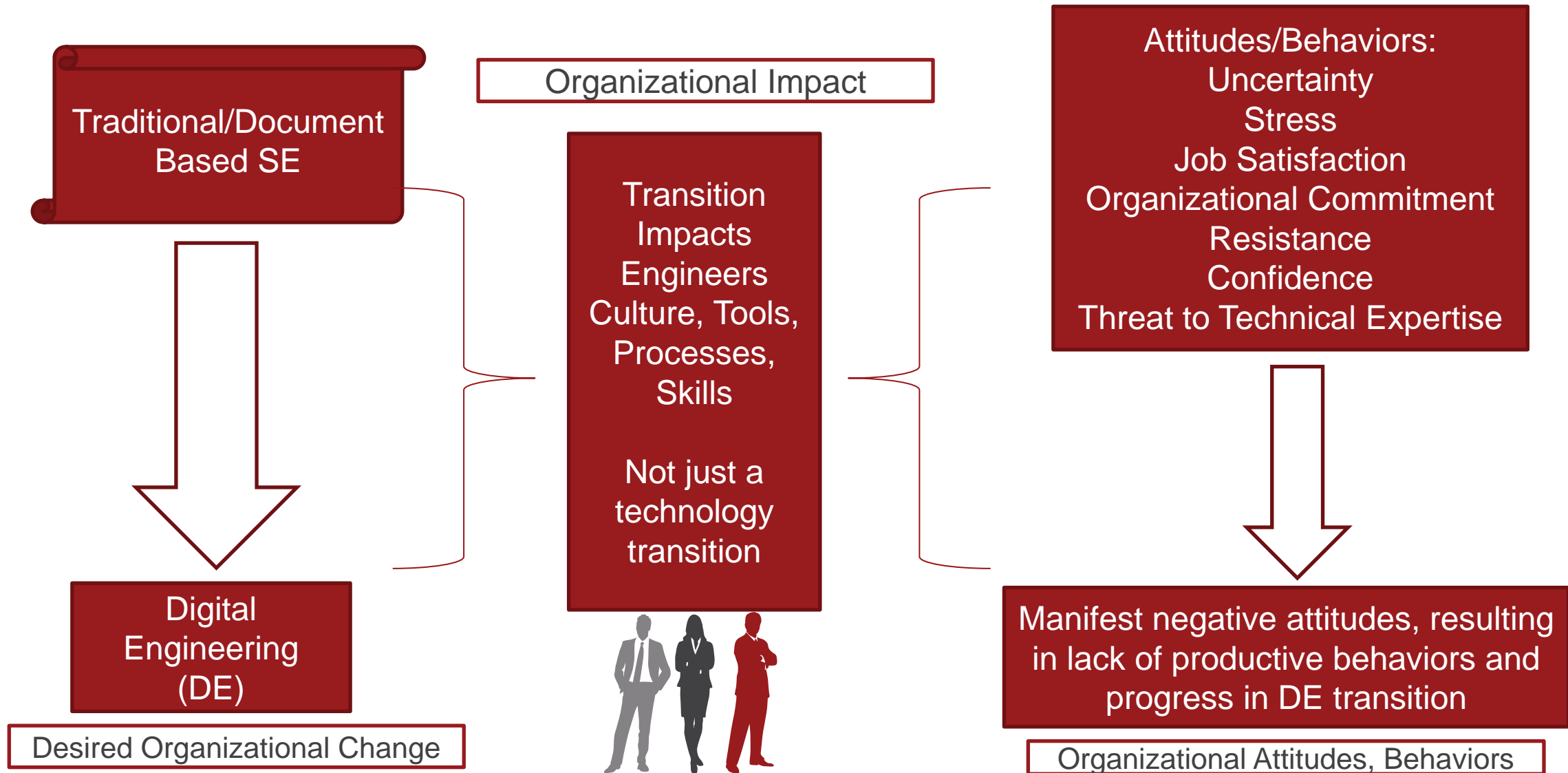


Systems Thinking Tools

- Iceberg Model
- Double Loop Learning
- Causal Loop Diagrams

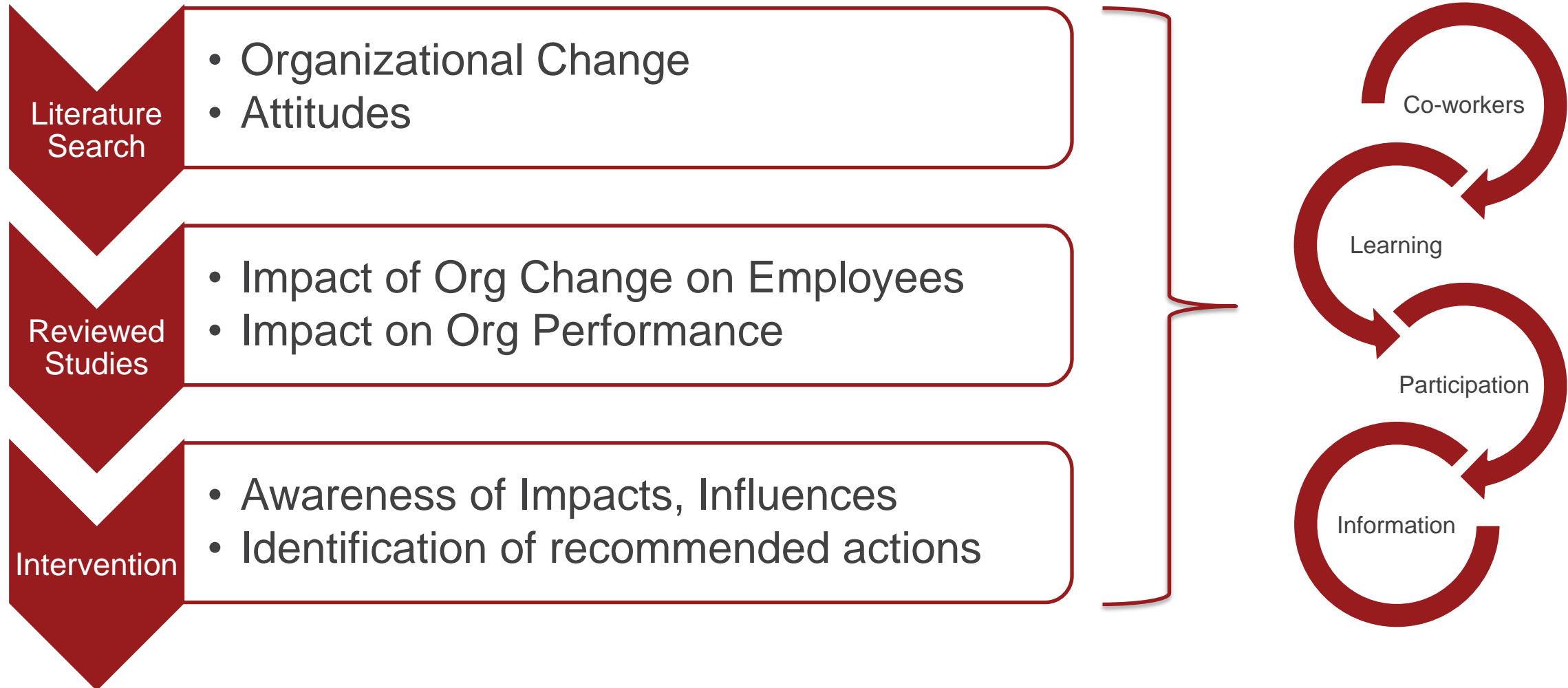
Knowledge Transfer
Training
Communication

Introduction – Organizational Perspectives





Organizational Psychology Approach

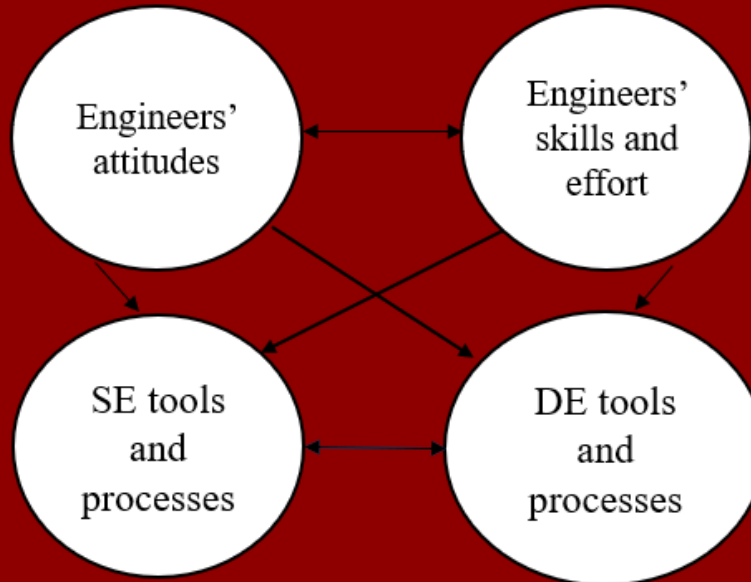


Systems Thinking Approach



System Context = DE Transition across Product Development Lifecycle

System of Interest = Culture of Engineers in DE Transition



Elements

Interconnects

Enabling System = Organization

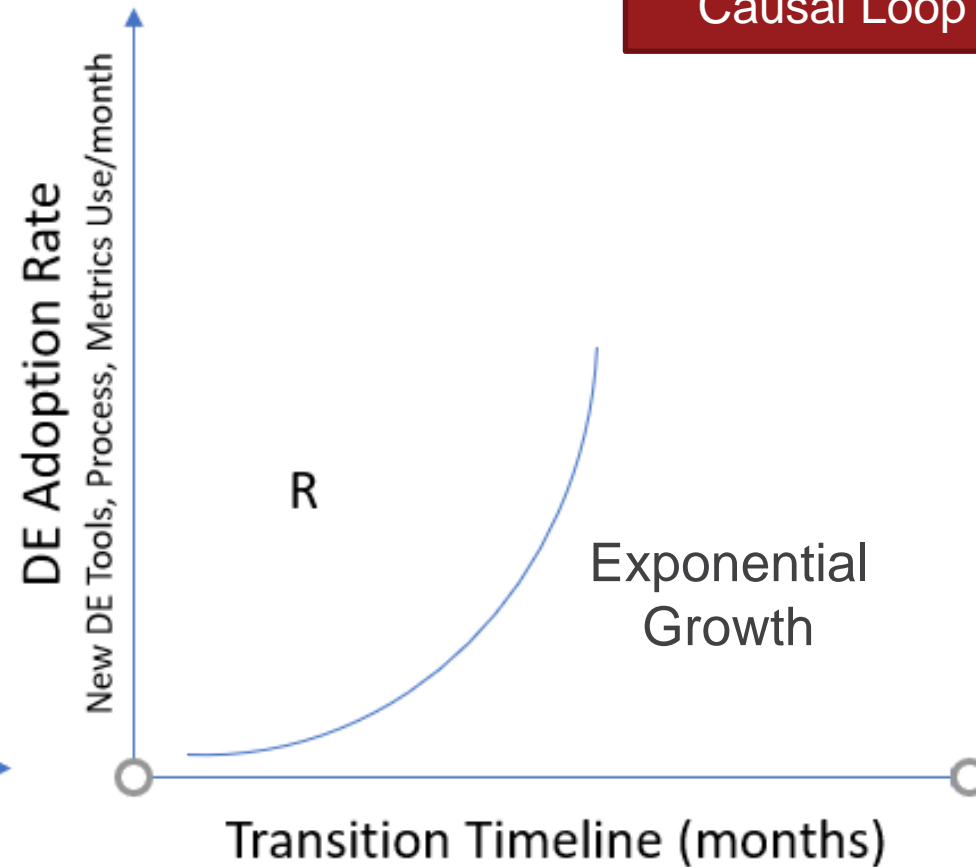
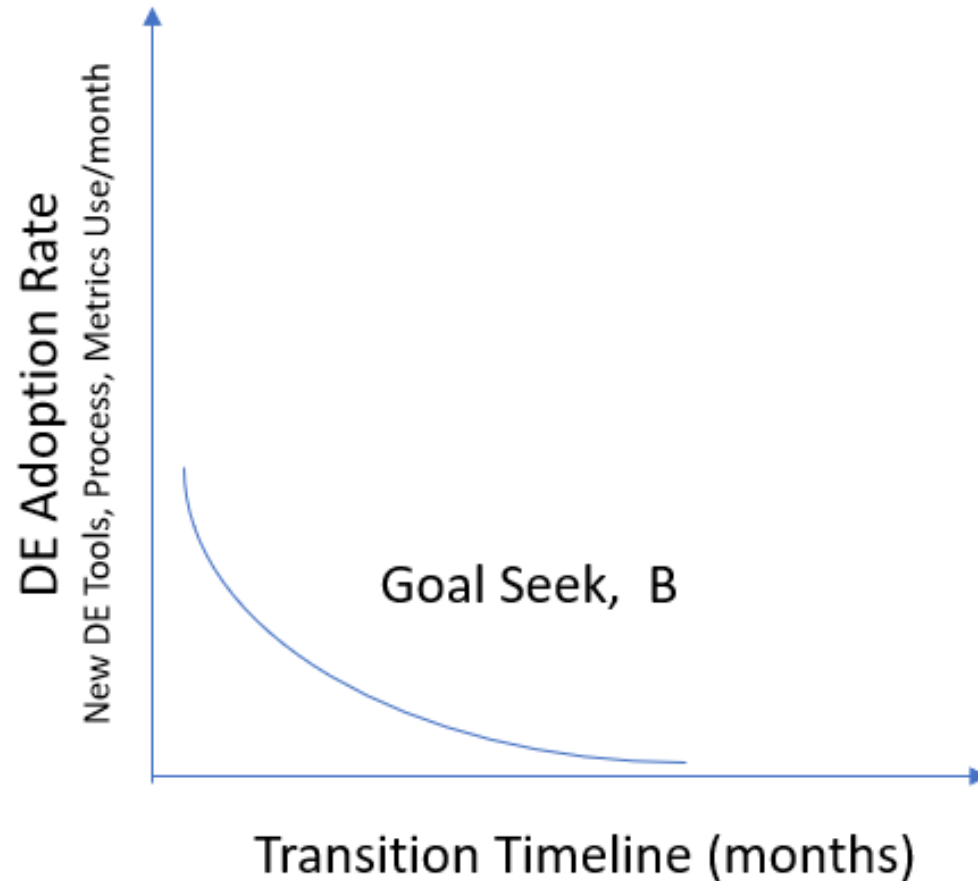
Systems Thinking Tools

- Iceberg Model
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Systems Thinking Approach – Define problem

Behavior Changes and
Causal Loop Diagrams



Difference between current behavior (left) and desired behavior (right) is the organizational problem

Systems Thinking Approach – Iceberg Model

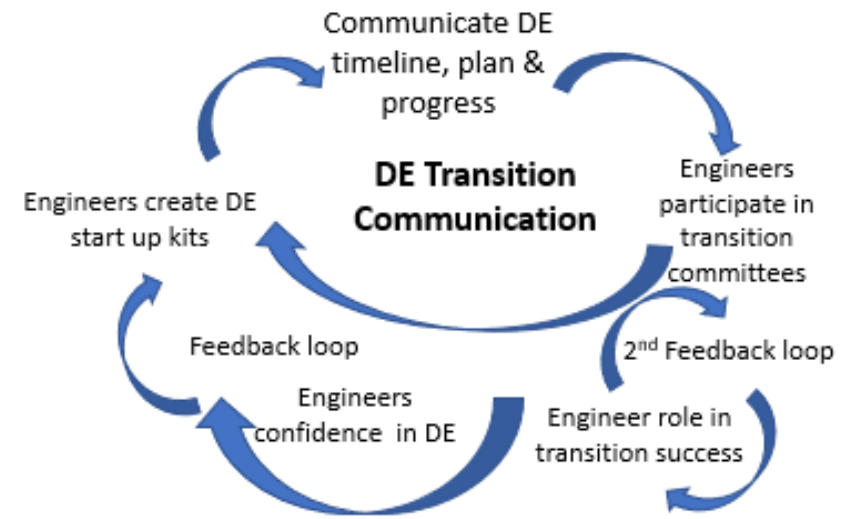
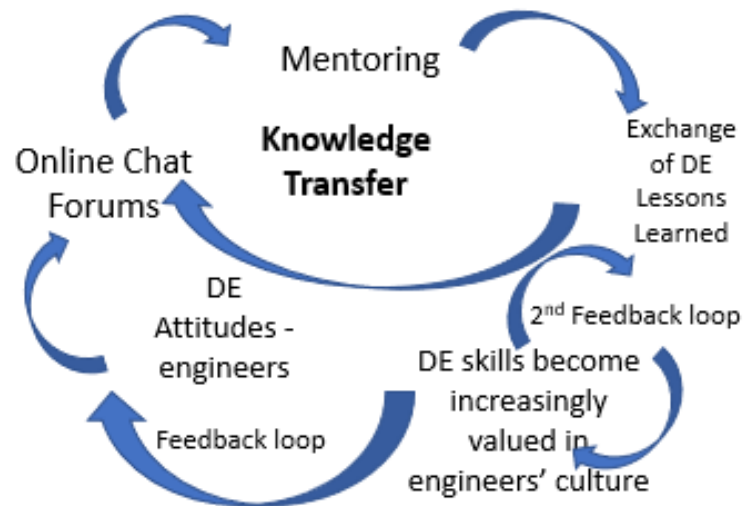


<https://islikeaniceberg.tumblr.com/post/125092243749/iceberg-model-is-like-an-iceberg>

	Current	Desired
Events – what is happening		
Patterns of behavior, trends over time		
System Structure – influences patterns		
Mental Models – values, beliefs		

Actions to drive change from current to desired state – Engineers’ Culture and DE Transition

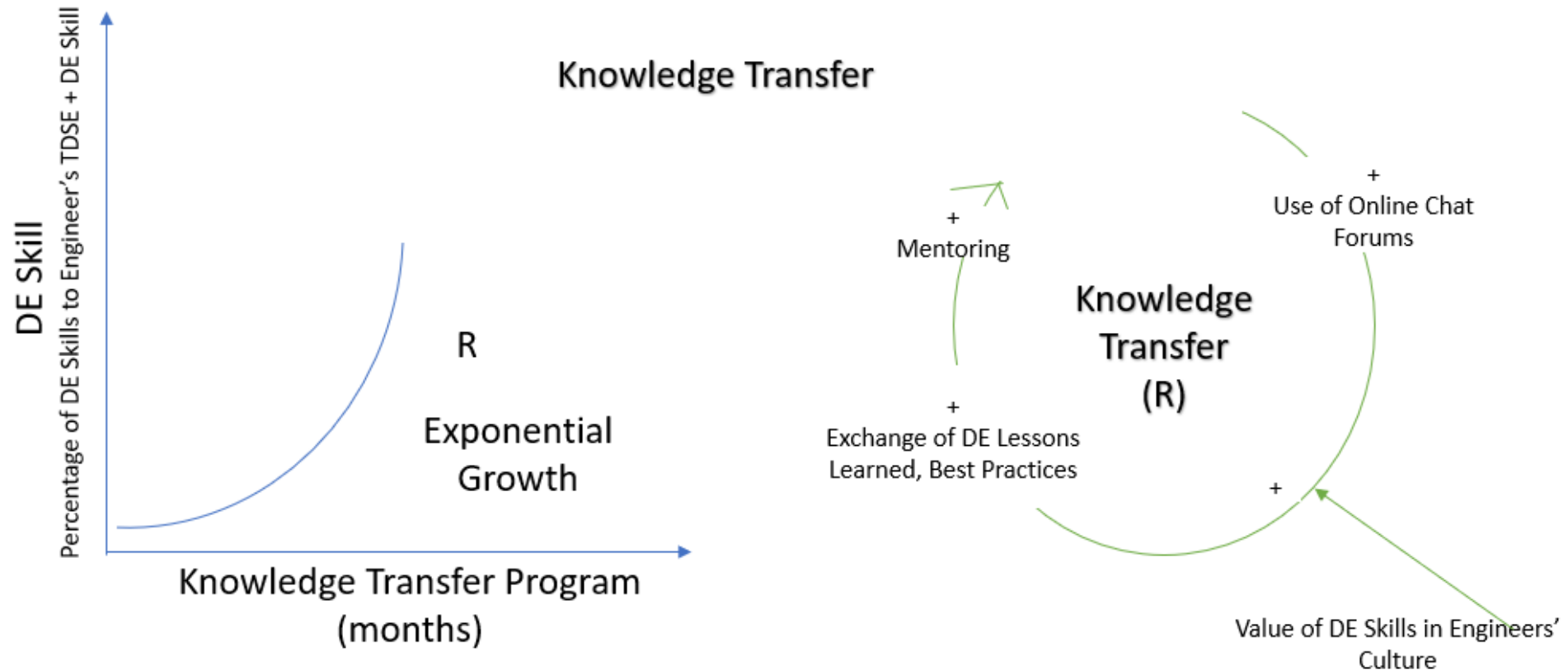
Systems Thinking Approach – Double Loop Learning



Assess Transition Progress using Feedback Loops

Systems Thinking Approach - Causal Loop

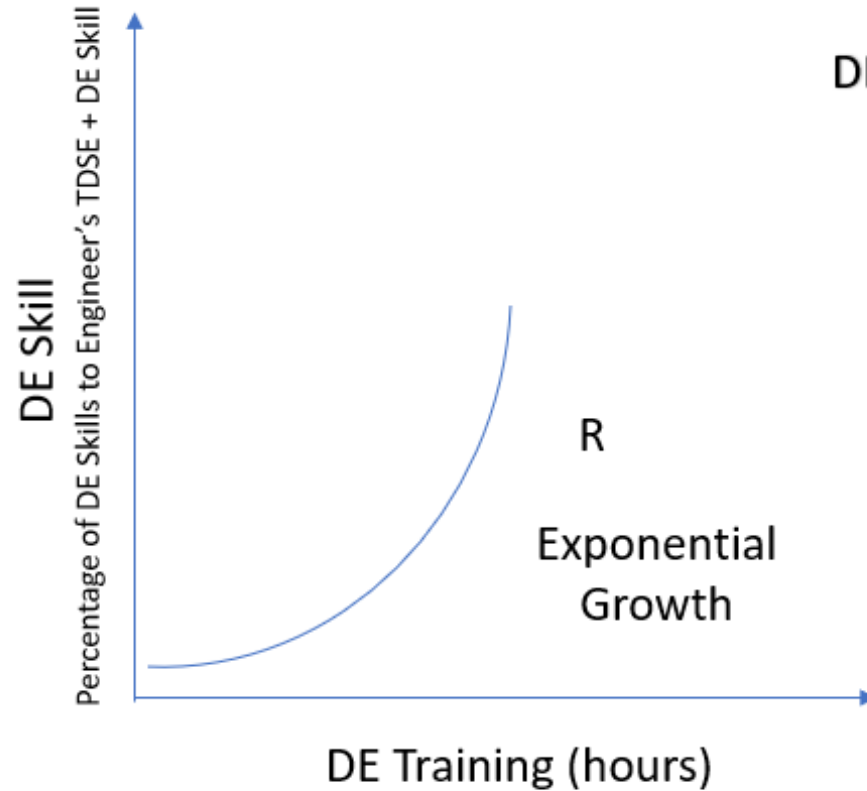
Knowledge Transfer



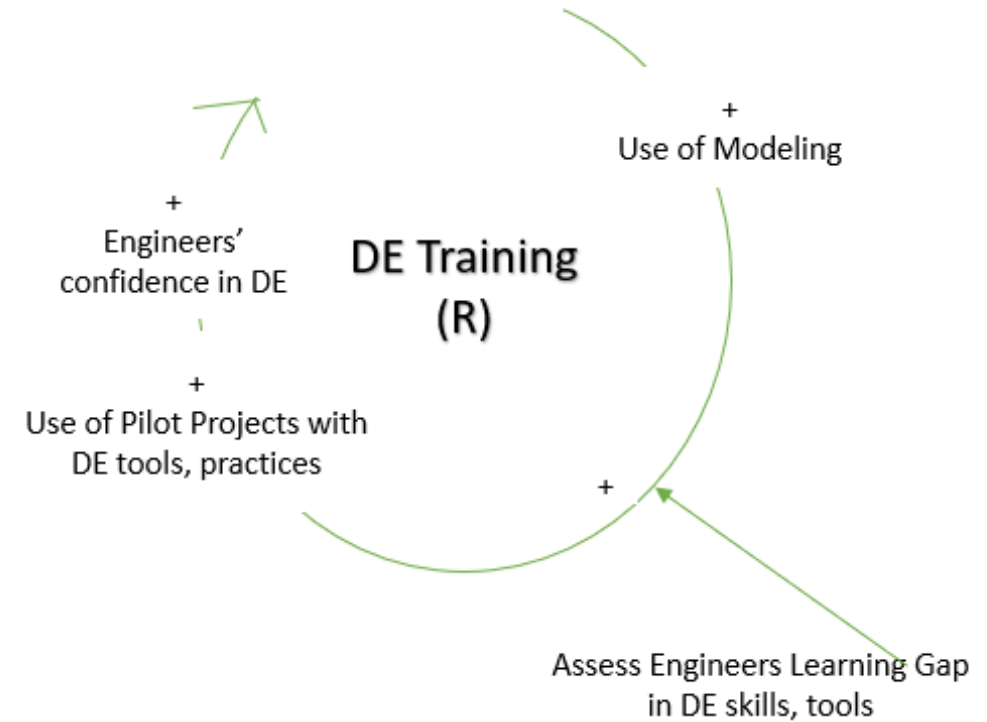
Impacts Attitudes – Decrease resistance, stress and Increase satisfaction

Systems Thinking Approach - Causal Loop

DE Training



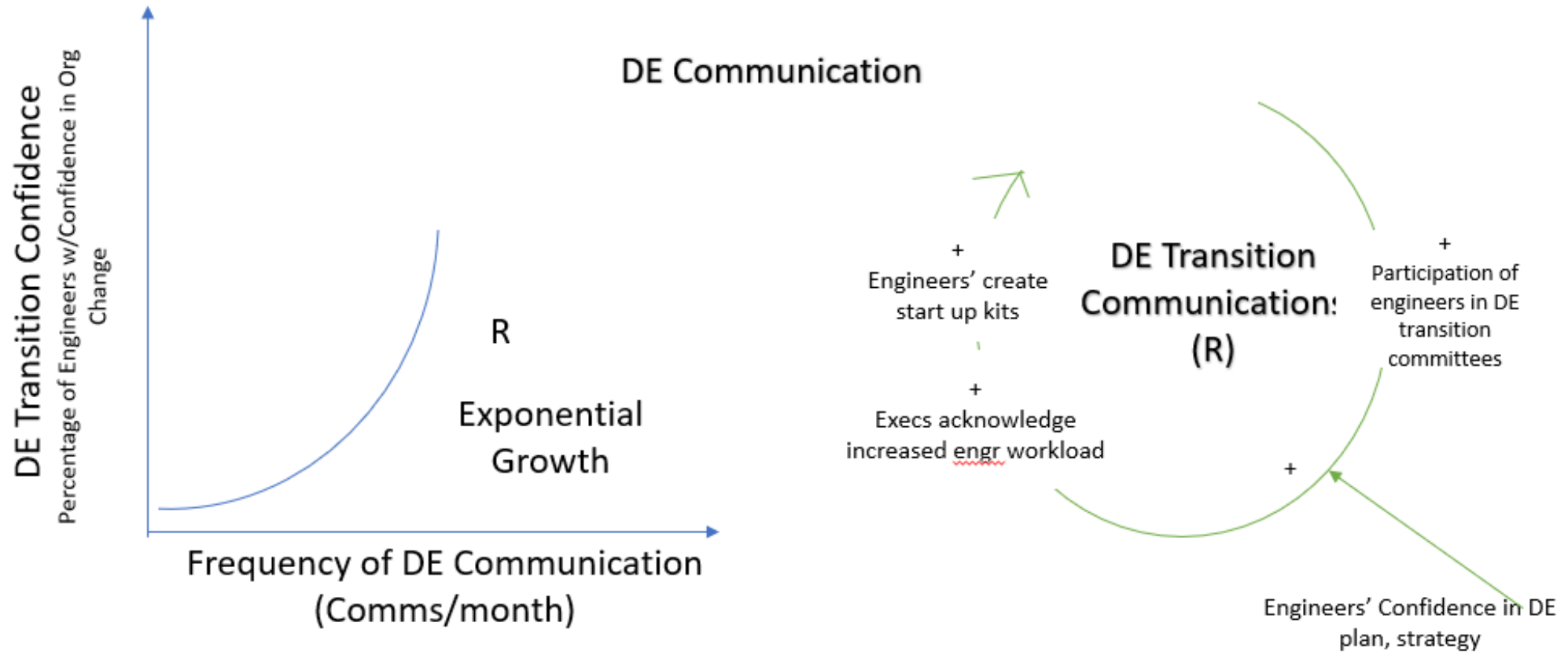
DE Training



Impacts Attitudes – Decrease uncertainty, threat and Increase trust, motivation

Systems Thinking Approach - Causal Loop

Communication



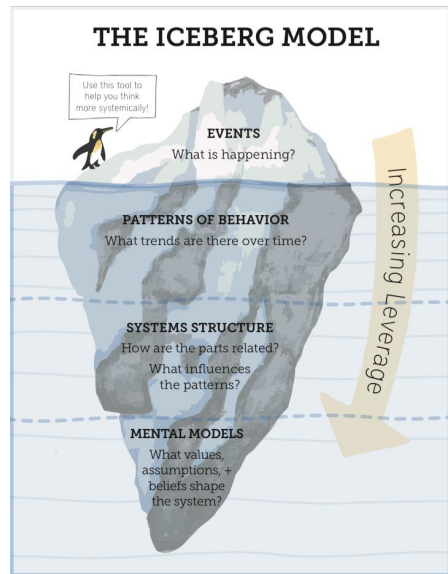
Impacts Attitudes – Decrease threat (expertise, status) and Increase confidence, participation, feedback

Systems Thinking Approach - Causal Loop

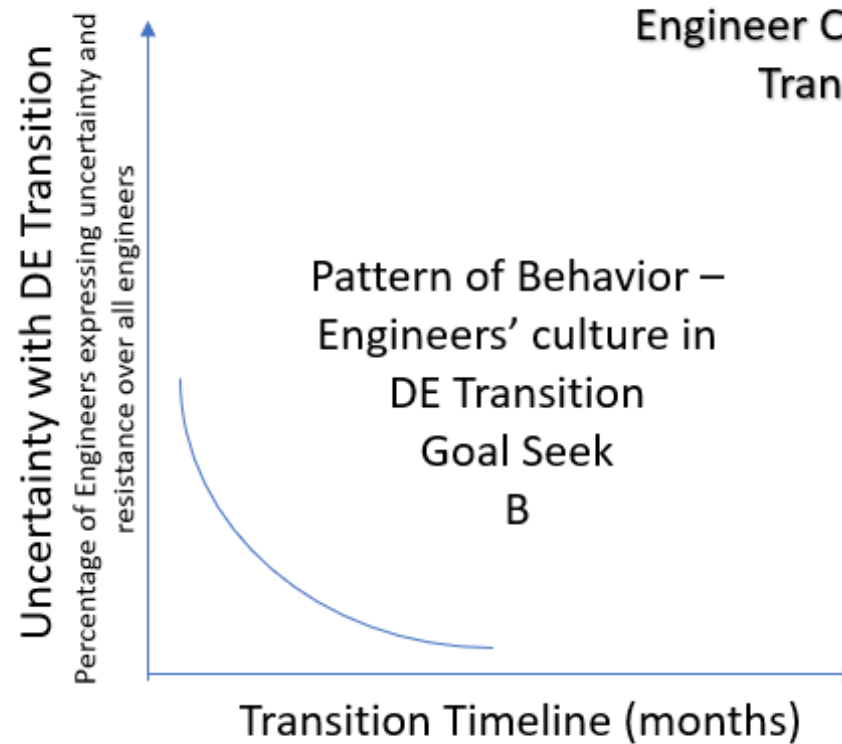
Culture Impact



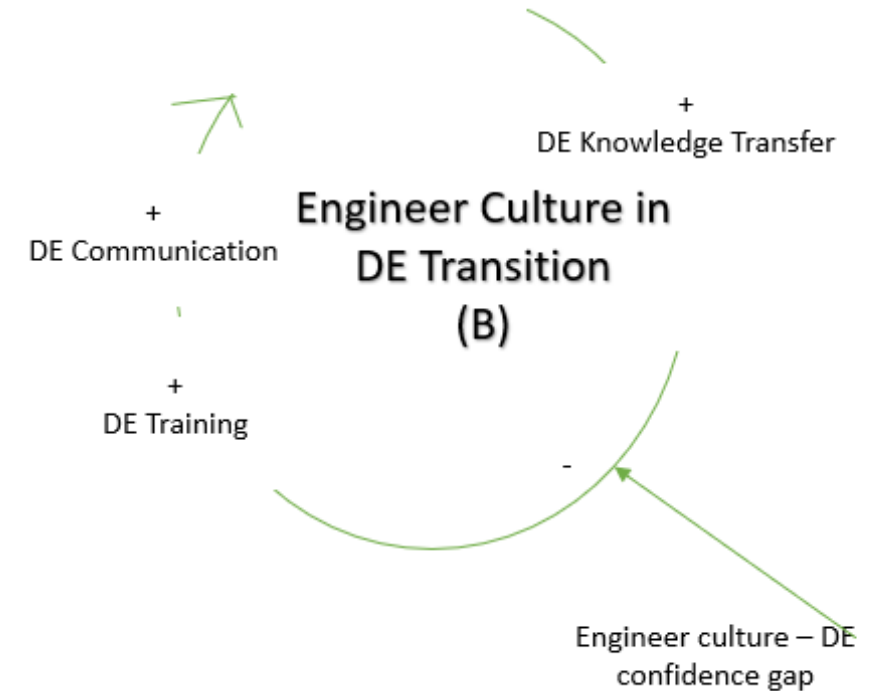
Systems Thinking Tools



<https://islikeaniceberg.tumblr.com/post/125092243749/iceberg-model-is-like-an-iceberg>



Engineer Culture in DE Transition



Impacts Culture (Mental Model) - Positive Attitudes, Productive Behaviors Enable Successful Transition



Interventions/Recommended Actions Summary

Knowledge Transfer	Training	Communication
Mentoring <ul style="list-style-type: none">• Surveys• Kickoff• Evaluations (feedback)• Job Redesign (Sr/Jr)	Training Options <ul style="list-style-type: none">• Assessment -gap analysis• Interviews, surveys (feedback)• Training Plan• Tool and workflow specific	Communicate organization's vision, strategy, timeline, plan for DE transition and tailor to lower levels
Social Support Options <ul style="list-style-type: none">• Peer to Peer on tools, process, expertise• Forums (incl online) to share Lessons Learned, Best Practices, seek advice	Seek pilot projects to demonstrate new DE tools, processes	Frequency – continual and assess timeliness and usefulness (feedback)
Transition Discussions <ul style="list-style-type: none">• Tools Evaluation• Tool Selection• Create/update processes	Surveys as feedback loop post-training and pilot projects	Acknowledge increased workload w/change <ul style="list-style-type: none">• Evaluation, selection of tools• Creation of new processes• Assist by creating start-up kits (recommended tools, processes, training, guidance)



Challenges to Actions

Challenge	Mitigation
Lack of organizational goal	Clarified executive communication on timeline, objectives and expectations <ul style="list-style-type: none">• Feedback from engineers builds trust
Uncertainty of how to grow DE skills	External 'expert' to conduct 'train the trainer' for building internal expertise, monitor feedback <ul style="list-style-type: none">• Growing DE skills builds confidence
Impact to engineer's daily job performance	Transition committees address impacts and details as implementation plans are developed <ul style="list-style-type: none">• Participation in DE builds trust and confidence

There is unknown complexity with pushing engineers to just 'accept' the DE transition

Conclusion



Organizational Change

Enable TDSE -----DE Transition

Organizational Psychology

Change Negative attitudes -----Positive

Systems Thinking

System Elements & Tools to Identify Actions

Recommended Actions to Empower Engineers

Knowledge Transfer, Training, Communication

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www.incose.org/symp2022