

# Health System Innovation at Scale

**Evan M. Benjamin, MD, MS, FACP**  
**Chief Medical Officer, Ariadne Labs**  
**Harvard School of Public Health**  
**Harvard Medical School**  
**Brigham and Women's Hospital**



# Ariadne Labs - Who We Are

- Founded in 2012, we are a joint center for health systems innovation at the Brigham and Women's Hospital and Harvard T. H. Chan School of Public Health.
- **Our Mission:**  
Saving lives and reducing suffering through simple, scalable solutions for better systems of care at the most critical moments in people's lives everywhere.



# The Fundamental Problem in Health Care:

## Failure of Execution

- **Finding:** Among Americans and Europeans who died before the age of 75 years, **at least 30% would have lived** if they'd received appropriate medical treatment for their condition. It's far worse globally.

By Ellen Nolte and C. Martin McKee

**In Amenable Mortality—Deaths Avoidable Through Health Care—Progress In The US Lags That Of Three European Countries**



- We aimed to build a community creating scalable solutions for this problem.

Source: *Health Affairs*, 2012 September;31(9):2114-2122.

# The Ariadne Labs Approach to Improving Performance

**What All Places  
Do**



**What Many  
Places Do**



**What Ariadne  
Labs Does**

- Set Expectation: You should do X
- Through: Training
- Result: Widely variable performance
- Set Expectation: You must do X
- Through: Mandates/incentives (Examples: guidelines, regulations, pay for performance)
- Result: Modest improvement in performance
- Set Expectation: Systematize X
- Through: checklists, defaults, coaching, data feedback loops, and other systems
- Result: High reliability performance

# Ariadne Labs Methodology

## Key Questions for Every Systems Problem

1. What is the outcome to change (goal)?
2. What are the minimum required practices to improve outcomes (research)?
3. How far are current practices from the ideal (gap)?
4. What is the primary cause of the gap?
  - Knowledge/skill? Resources? Motivation? System barriers?
5. What is the simplest system tool/intervention to make it easier for frontline to close the gap?
6. Who will own (or agree to own) closing the gap?
7. How much improvement (in practices and/or outcomes) results?
8. How do we *scale* and drive widespread adoption?

# Ariadne Labs

## Tool development

- Ariadne Labs uses a proven pathway to develop, test, and disseminate simple, scalable interventions that address failures in the delivery of best practice health care.



Develop interventions based on clinical experience and contextual understanding, with input from stakeholders and experts

Subject interventions to rigorous field testing to ensure effectiveness and impact (and incorporate lessons learned)

Use proven implementation science strategies (marketing and communications, coaching, measurement and monitoring) to support spread of solutions

# Ariadne Labs

## The First Five Years



- We've built a community of 109 Faculty; 95 staff with world-caliber expertise in systems design, data and informatics, and implementation science.
- We've proved that design and testing of simple system interventions (such as checklists, coaching, data feedback) can save lives and reduce suffering.
  - Designed and tested interventions focused on
    - **childbirth,**
    - **surgery,**
    - **primary care,**
    - and at the **end-of-life**
  - Collaborated with the CDC to create clinical checklists to address **H1N1** and **Ebola care** and **opioid abuse prevention**

# Example: Surgery

## The Problem

- The average person undergoes **eight operations** in their lifetime in the US;

Surgery. 1999 Jul;126(1):66-75.

**The incidence and nature of surgical adverse events in Colorado and Utah in 1992.**

Gawande AA<sup>1</sup>, Thomas EJ, Zinner MJ, Brennan TA.

- 66% of hospital patients underwent a surgical procedure.
- The incidence of a death or disabling complication following surgery was **3.0%**. 1 in 8 hospital deaths was associated with an adverse event arising from surgical care.
- Among surgical adverse events, 54% were preventable.



# Example: Surgery - Design The Intervention

Surgical Safety Checklist			World Health Organization	Patient Safety <small>A World Alliance for Safer Health Care</small>
<b>Before induction of anaesthesia</b> (with at least nurse and anaesthetist)	<b>Before skin incision</b> (with nurse, anaesthetist and surgeon)	<b>Before patient leaves operating room</b> (with nurse, anaesthetist and surgeon)		
<b>Has the patient confirmed his/her identity, site, procedure, and consent?</b> <input type="checkbox"/> Yes	<input type="checkbox"/> Confirm all team members have introduced themselves by name and role.	<b>Nurse Verbally Confirms:</b> <input type="checkbox"/> The name of the procedure		
<b>Is the site marked?</b> <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable	<input type="checkbox"/> Confirm the patient's name, procedure, and where the incision will be made.	<input type="checkbox"/> Completion of instrument, sponge and needle counts		
<b>Is the anaesthesia machine and medication check complete?</b> <input type="checkbox"/> Yes	<b>Has antibiotic prophylaxis been given within the last 60 minutes?</b> <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable	<input type="checkbox"/> Specimen labelling (read specimen labels aloud, including patient name)		
<b>Is the pulse oximeter on the patient and functioning?</b> <input type="checkbox"/> Yes	<b>Anticipated Critical Events</b>	<input type="checkbox"/> Whether there are any equipment problems to be addressed		
<b>Does the patient have a:</b>	<b>To Surgeon:</b>	<b>To Surgeon, Anaesthetist and Nurse:</b>		
<b>Known allergy?</b> <input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> What are the critical or non-routine steps? <input type="checkbox"/> How long will the case take? <input type="checkbox"/> What is the anticipated blood loss?	<input type="checkbox"/> What are the key concerns for recovery and management of this patient?		
<b>Difficult airway or aspiration risk?</b> <input type="checkbox"/> No <input type="checkbox"/> Yes, and equipment/assistance available	<b>To Anaesthetist:</b> <input type="checkbox"/> Are there any patient-specific concerns?			
<b>Risk of &gt;500ml blood loss (7ml/kg in children)?</b> <input type="checkbox"/> No <input type="checkbox"/> Yes, and two IVs/central access and fluids planned	<b>To Nursing Team:</b> <input type="checkbox"/> Has sterility (including indicator results) been confirmed? <input type="checkbox"/> Are there equipment issues or any concerns?			
	<b>Is essential imaging displayed?</b> <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable			

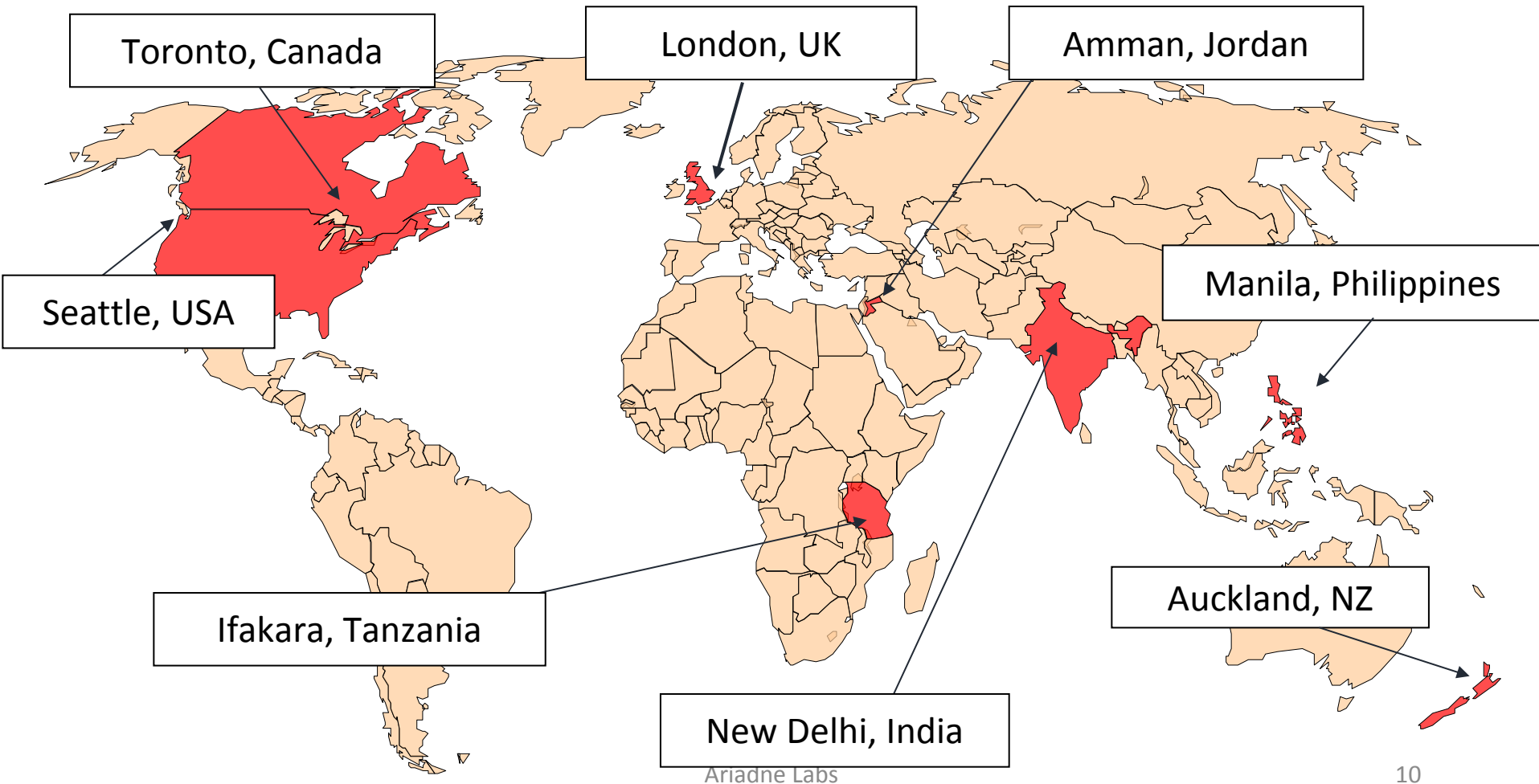
This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009

© WHO, 2009

# Example: Surgery - Testing

- We Tested the Checklist in 8 Sites Globally...



# Example: Surgery - Results

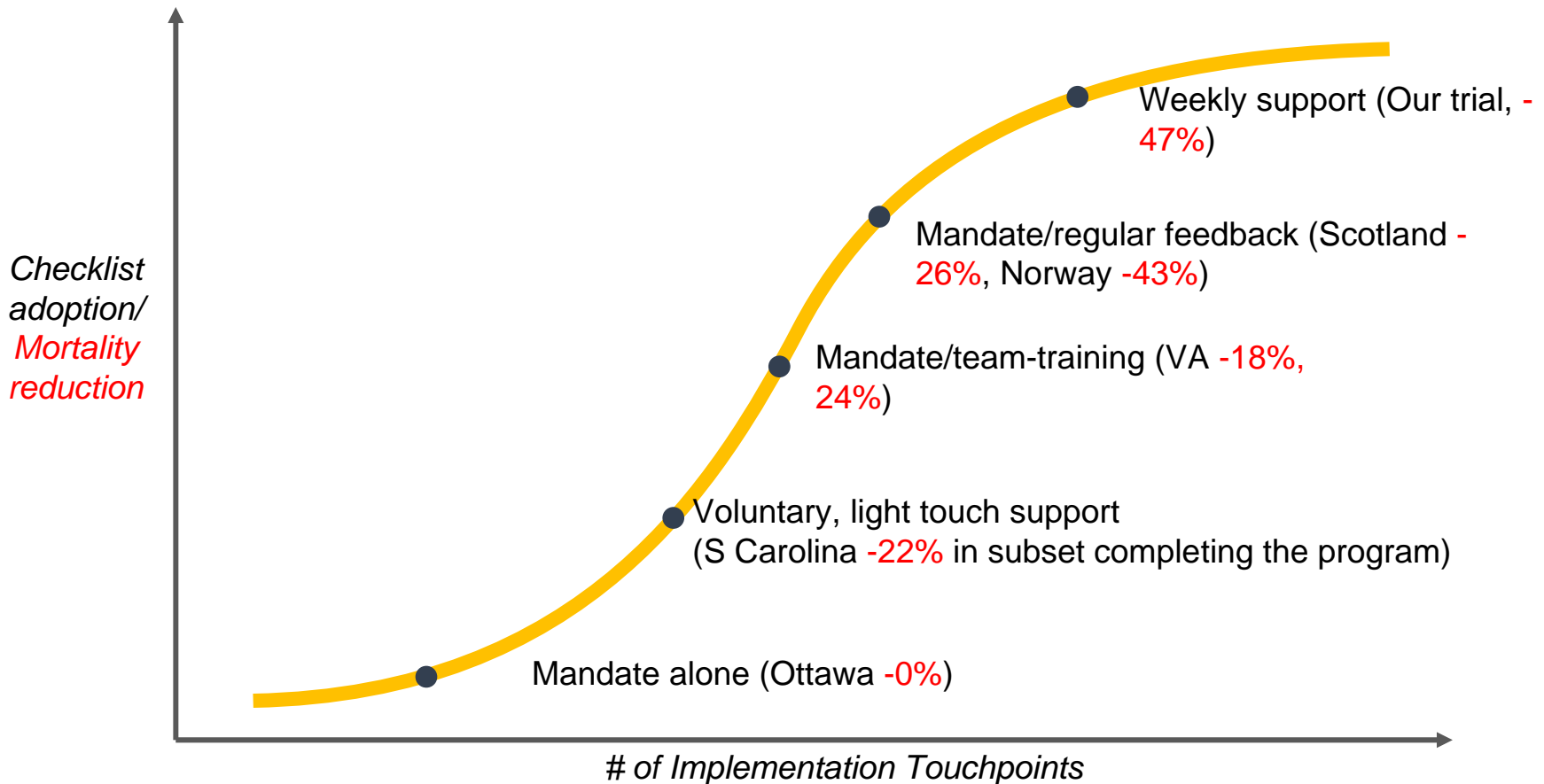
...And it cut deaths by half

	Baseline	Checklist	P value
<i>Cases</i>	3733	3955	-
<i>Death</i>	1.5%	0.8% (-47%)	0.003
<i>Any Complication</i>	11.0%	7.0% (-36%)	<0.001
<i>Surgical Site Infection</i>	6.2%	3.4% (-45%)	<0.001
<i>Unplanned Reoperation</i>	2.4%	1.8% (-25%)	0.047

Source: AB Haynes, et al. *NEJM* 2009;360:491-9.

# Example: Surgery Implementation

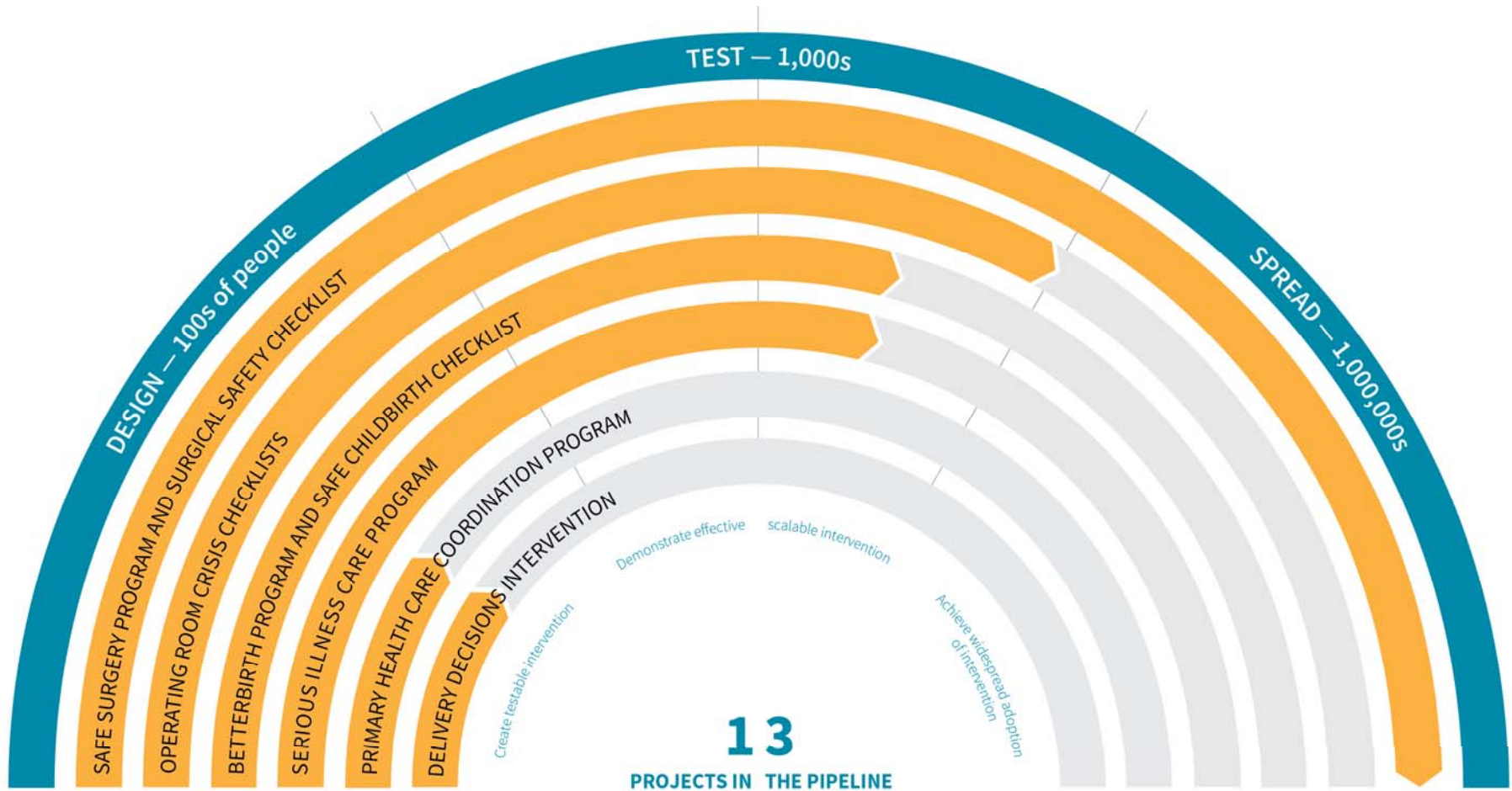
- We've now fostered Safe Surgery Checklist adoption globally. Results have depended on the implementation strategy used.



# Ariadne Labs

## The First Five Years: Results

Numbers of People reached annually



# Big problems where we've made progress

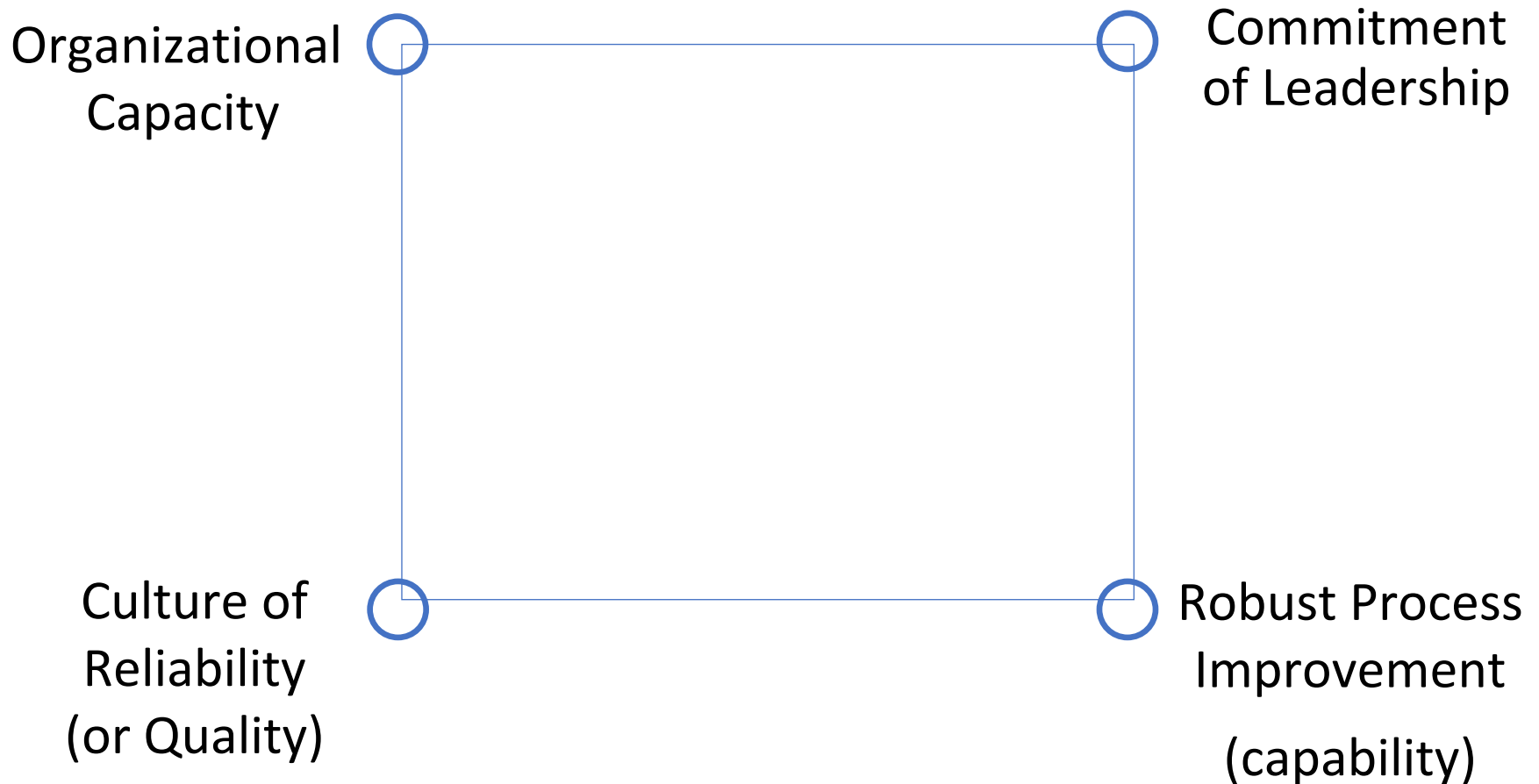
1. How to design practice innovations at high leverage, moments of care in ways that are likely to improve quality of care/outcomes.
2. How to design implementation packages that enable early adopters in settings ready to attempt quality improvement.
3. How to create surveillance systems for monitoring and feedback on processes of care.

# The Challenges for Health System Innovation

1. Understanding Readiness – for change
2. Promoting Culture
3. Promoting Teams
4. Getting to widespread *scale*

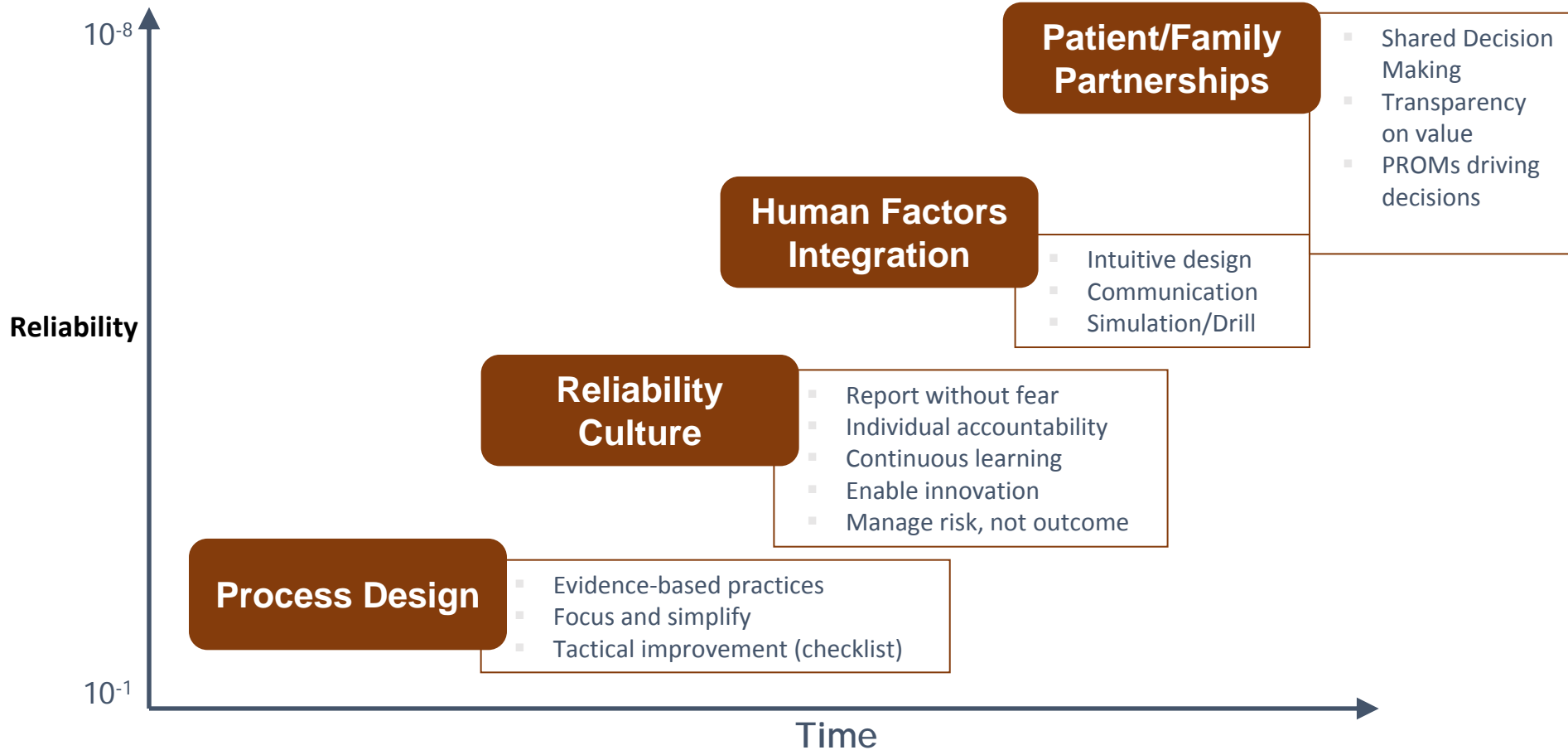
# Challenge 1. Readiness

Our solutions seem most effectively adopted where there is





# Challenge 2: climbing the pathway of *Culture Change*



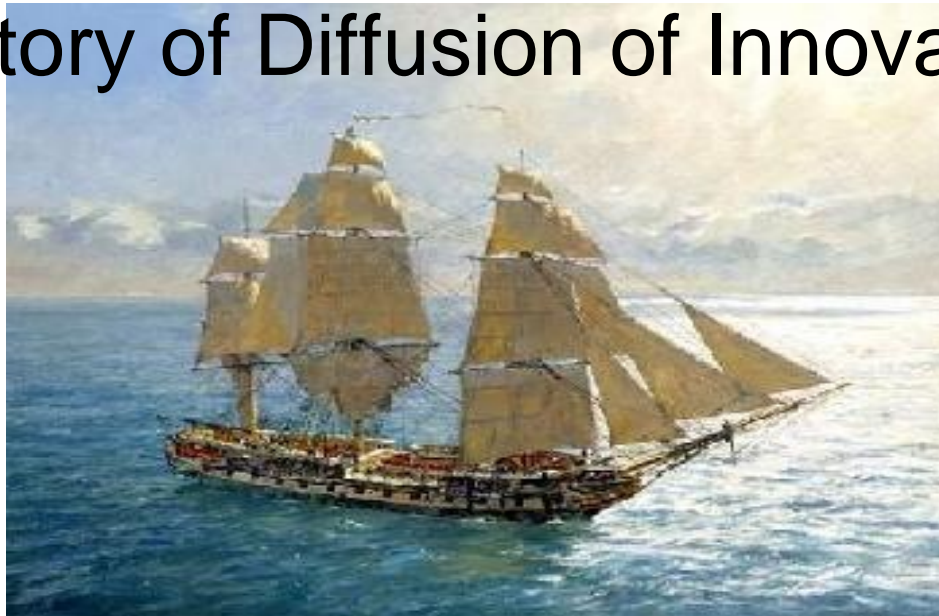
# Challenge 3: *Teamwork*

1. The complexity of medicine has made **teams more effective** than lone actors, **but** we built our systems to train, support, and reward lone actors.
2. Teams in medicine face particular challenges because:
  - Team members are separated in time and space and reporting relationships
  - They lack visibility into the condition of the patient, their progress against goals, and the activities of other team members
  - Their success requires large numbers of people to agree and coordinate on goals; decisions that require integration of large amounts of complex data
  - To be really effective, they must include the patient, family, or community



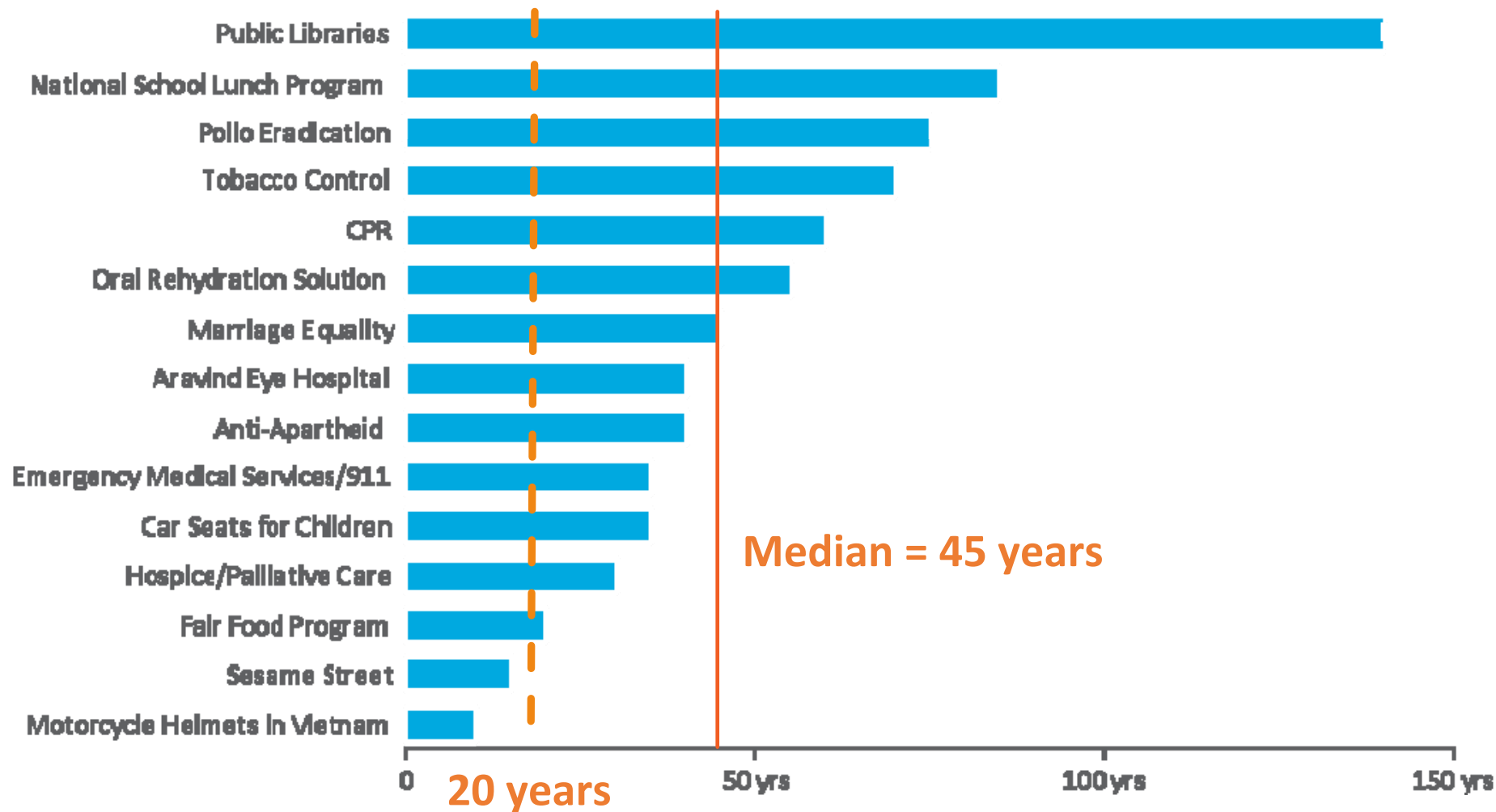
## **Challenge 4: Getting to Scale**

A Story of Diffusion of Innovation

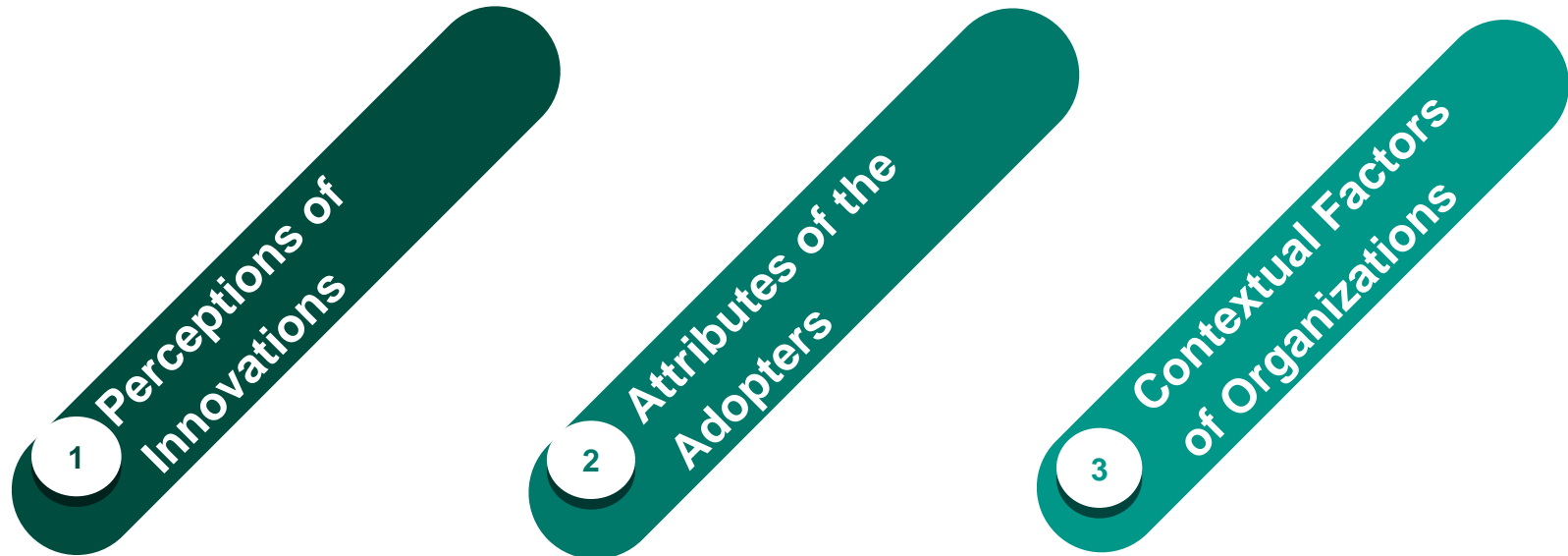


# Success is Possible, but it takes longer than we think!

Approximate time to achieve change at scale



# The science of diffusion of innovation



<b>Relative Advantage</b>	<b>Innovators</b>	<b>Management</b>
<b>Compatibility</b>	<b>Early Adopters</b>	<b>Incentives</b>
<b>Complexity</b>	<b>Early Majority</b>	<b>Communication</b>
<b>Trialability</b>	<b>Late Majority</b>	<b>Leadership</b>
<b>Observability</b>	<b>Laggards</b>	

Everett Rogers, The Diffusion of Innovation, 5th ed, 2003

Donald Berwick, Disseminating Innovations in Health care, JAMA.

2003;289:1969-1975

# Realistic Evaluation

- Outcome of dissemination of innovation is dependent on *context*.
- $O = M \times C$
- Outcome = Mechanism x Context

*Pawson R, Tilley N. Realistic Evaluation. Sage Publications, 1999*

# Diffusion of innovation: “It’s the context, silly”

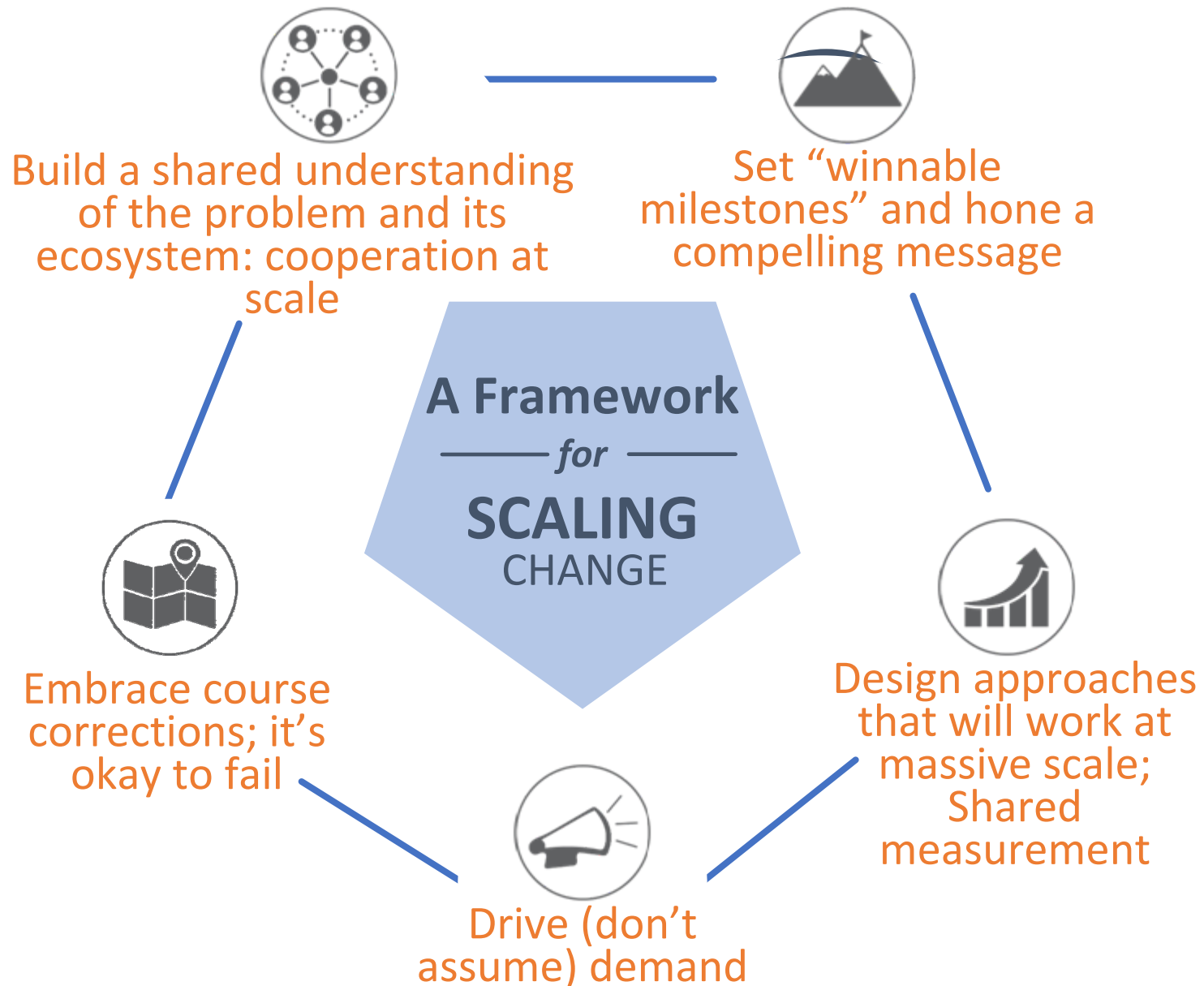
- A shift from how we conceive context from a focus on *organization* to focus on *societal sectors & social networks*
- Diffusion systems need to interface with social systems (more decentralized, multifaceted, yet keeping some centralized efficiency)

Dearing JW. Diffusion of innovation theory: Dissemination of interventions.  
*J Public Health Management Practice*, 2008, 14(2), 99–108

- Understanding the interdependence of players and their needs required for adopting an innovation

Adner R. The Wide Lens: What Successful Innovators See That Others Miss.  
*Penguin Publishing*, 2013

# stories point the way for today's **successful** change makers





# Health System Innovation at Scale

- Health System Innovation requires a methodology to “Design, Test and Spread” Solutions
- To succeed we need a systems-approach to every problem
- We need to create not only good “tools” but “social movements” with a deep understanding of a
  - Readiness for Change
  - Culture of Reliability
  - Ways to promote teamwork
  - How to understand *context* to do widespread scale including: organizational, social and adoption ecosystems