Building Resilience in Construction Site Operations:

Shifting from Protective Safety to Productive Safety

Professor Sherif Mohamed, MSc, PhD, PMP

Griffith University, Queensland, AUSTRALIA

Associate Editor, Journal of Safety Science, Elsevier

Presentation Outline

- Early Thoughts on Safety
- Current Thoughts on Safety
- New Thoughts on Safety
- What Research tells us…



Early Thoughts on Safety

- Traditional Safety Programs – 4E's
- Environment
  - **Hazard identification: to improve physical opportunity to be safe**
- Engineering
  - **Risk Reduction: to reduce risk associated with production**
- Education
  - **To enhance awareness and performance skills**
- Enforcement
  - **To enforce rules again specific unsafe acts.**



Early Thoughts on Safety

Follow standard operating procedures

+

Pay attention to what you're doing

+

Don't make mistakes or break rules

+

No equipment failure =

Things are Safe

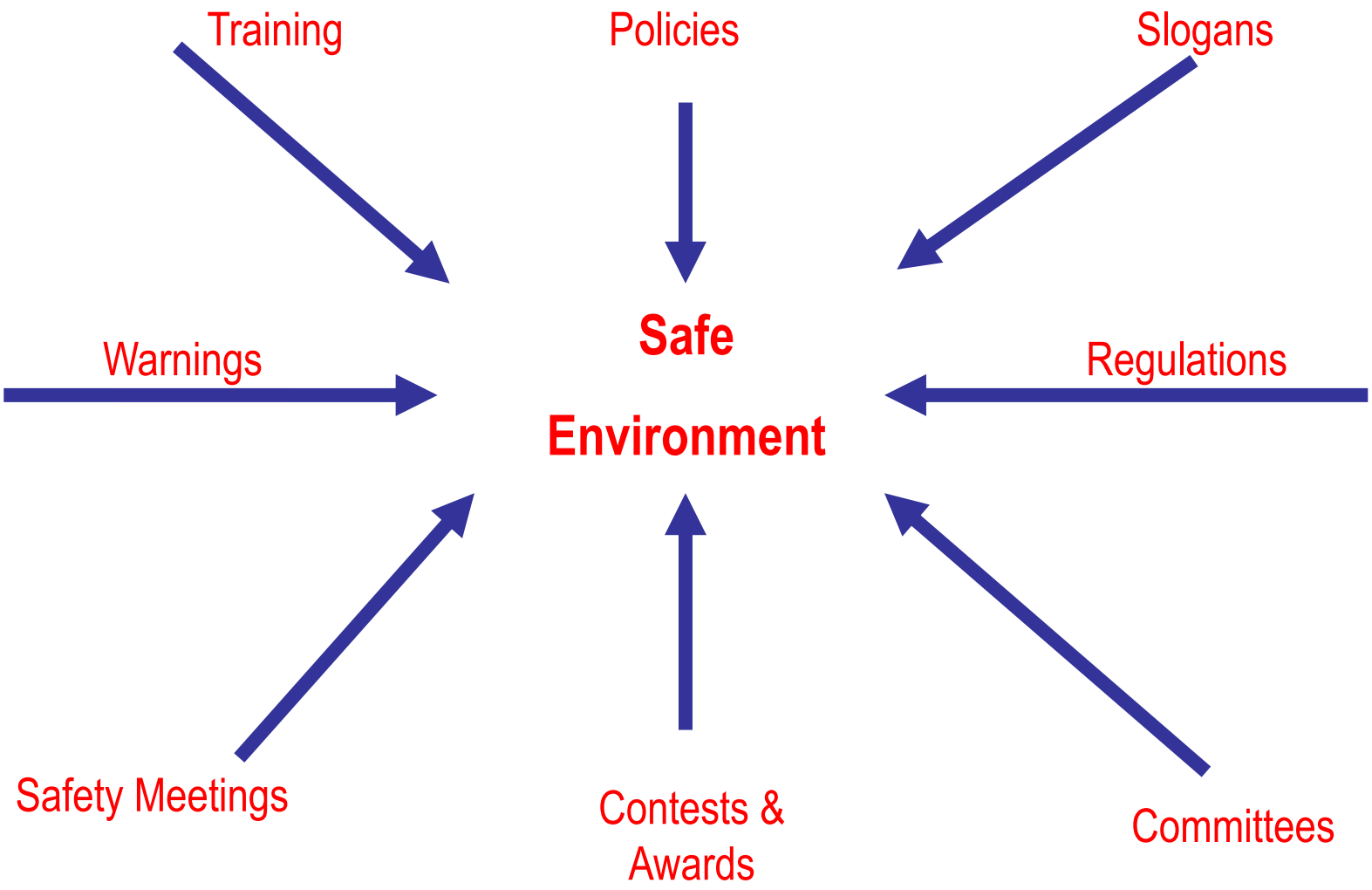
Early Thoughts on Safety

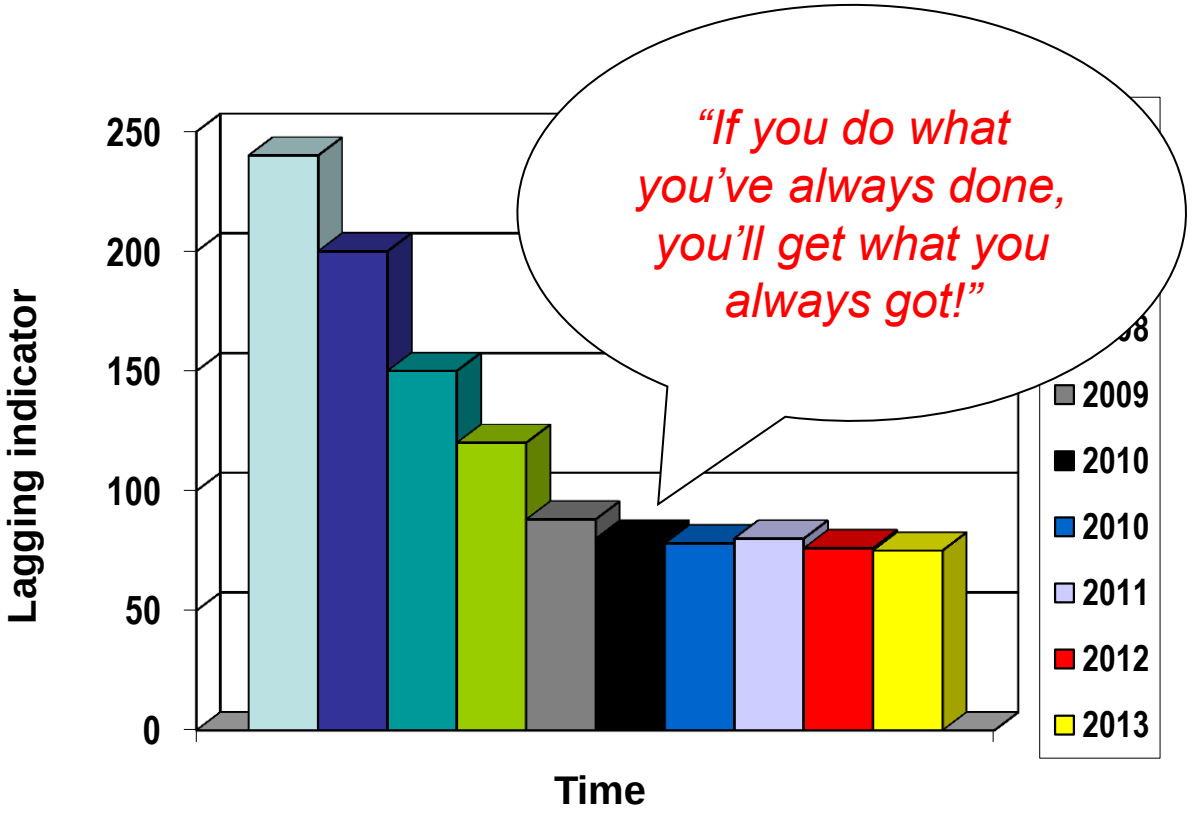
- Punish violators
  - » Fire them
  - » Suspend them
  - » Retrain them
  - » Counsel them



- **If you follow the rules you cannot have an accident**
- Accidents happen because of **Human Error**
- Workers must be reckless, incompetent, etc…….
- Therefore “Fix the people”
- Be more careful, vigilant, etc..

Current Thoughts on Safety





<u>Compliance does not drive change</u>, it drives incremental adherence.

There comes a point where <u>compliance and injury reduction split</u>. Where better compliance may not further reduce injuries.

War on Errors

Myth: If we only can get rid of **Errors**, life would be great.

If exposure is reduced, will the injuries be reduced?

Maybe……. Are we sure??

Is it luck?

Maybe……But how can you manage or acquire luck?!!!

Just add more procedure, training, and tighter monitoring of performance!!!

What is Safety, anyway?

- Error, violations and all other negatives are NOT the ‘right’ and ‘useful’ ‘targets for intervention.
- Safety should not be defined as the *absence of something* (e.g. violations, incidents)
- The assumption is that the systems are already safe, and all is needed is protection from “those unreliable People”
- Our systems are complex.

New Thoughts on Safety

- These systems are complex and dynamic because of the presence of:
- multiple goals (speed, quality, cost, etc.),
- multiple interacting parties (various trades and professional disciplines some of which have different mental models, and work packages, heterogeneous client organisation),
- complex social structures (hierarchical sub-contracting arrangements, multiple stakeholders), and
- the complex technology and operating environments (market pressures, institutional regulations).

New Thoughts on Safety

- Very difficult to predict **ALL** possible interactions between seemingly unrelated systems – complex interactions.

- Inadequate risk assessment of operational changes – drift into failure, inability to think of **ALL** possibilities.

- Safety improvements should come from organizations monitoring and understanding the **GAP** between procedures and practice.

New Thoughts on Safety

- New View of Human Error on what goes wrong:
  - » Human Error is a symptom of trouble deeper inside a system.
  - » To explain failure, do not try to find where people went wrong.
  - » Instead, find out how people's assessments and actions made sense at the time given the circumstances that surrounded them.
  - » Sources of error are structural, not personal. If you want to understand human error, you have to dig into the system in which people work. You have to stop looking for people's personal shortcoming.

Actions that made sense at the time!!





- WHY it made sense for people to do what they did **rather than** judging them for what they allegedly did wrong and
- What changes will reduce likelihood of happening again?

New Thoughts on Safety

- Assume we were doing reasonable things given the complexities, dilemmas, tradeoffs, etc..
- Simply finding and highlighting mistakes explains nothing.
- Saying what did not do or what should have done does not explain why they did what they did.





Yes for Resilience

- The Systems are not Perfect. They are usually inherited from one site to another.
- They often neglect productivity as an important operational factor, they assume unlimited resources, ignore time pressure realities.
- Safety is about the **Presence of,** and not **Absence of**, something.
- When things go well under difficult circumstances, it is because People have this remarkable adaptive capacity.

Yes for Resilience

Their ability to recognise, and adapt, absorb changes and disruptions – some of which might even lie outside what the system is designed for.

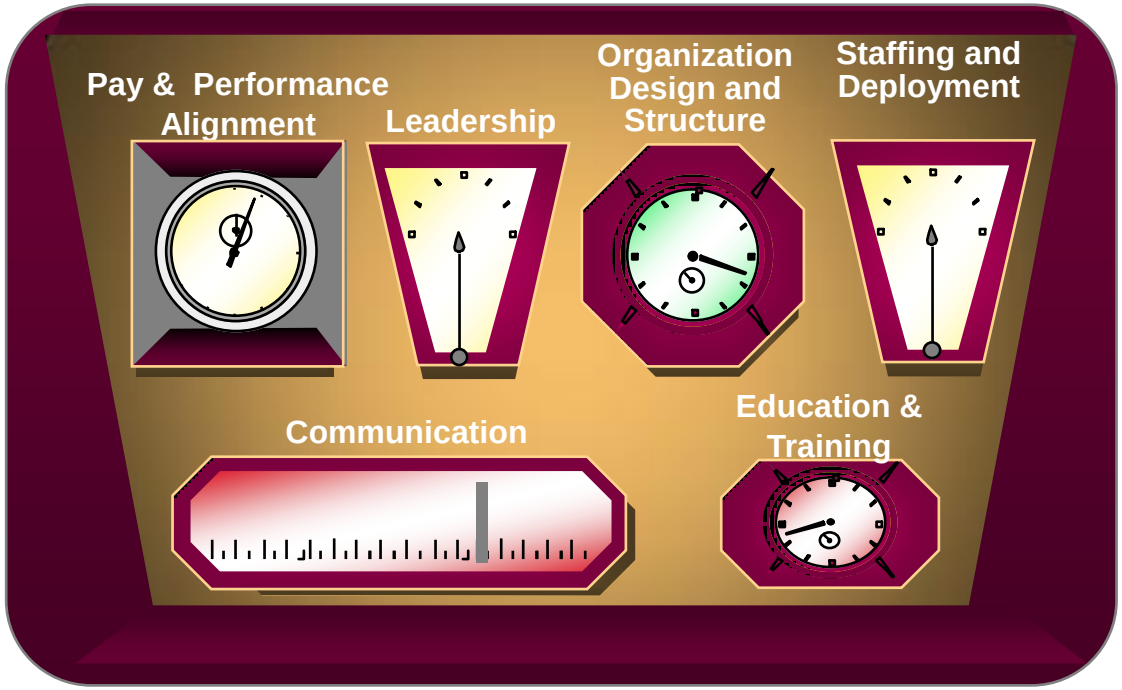
The ability to absorb changes without crumbling.

And that's what Resilience is all about.

New Thoughts on Safety

Traditional System	Complex System
Machines (control behaviour)	Humans (feedback)
Controlling and predictable	Unpredictable
Rigid	Flexible and creative
Repeat the Past	Offer alternatives
Find comfort in control	Find comfort in evolving

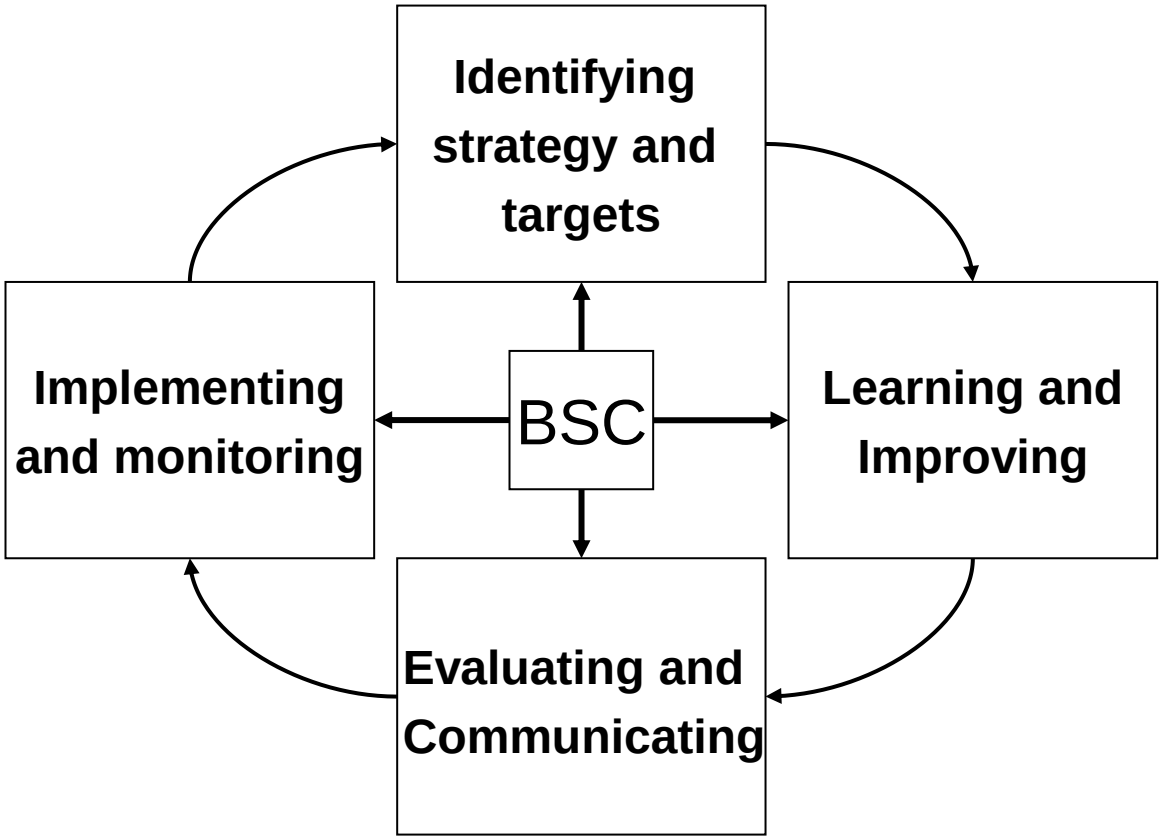
What Research Tells Us…..



Alolah, T., Stewart, R.A., Panuwatwanich, K. and Mohamed, S. (2014) Developing a comprehensive safety performance evaluation framework *Int. J. of Productivity and Performance Management.* **63**(4), 446-76

What Research Tells Us…..

Top-down driven strategy is the reference point
for the entire safety management system



Bottom-up approach is the source
for operational feedback and evaluation

Mohamed, S. (2003) Scorecard approach to benchmarking organizational safety culture in construction. *J. of Construction Engineering and Management*, American Society of Civil Engineers, **129**(1), 80-88.

What Research Tells Us…..

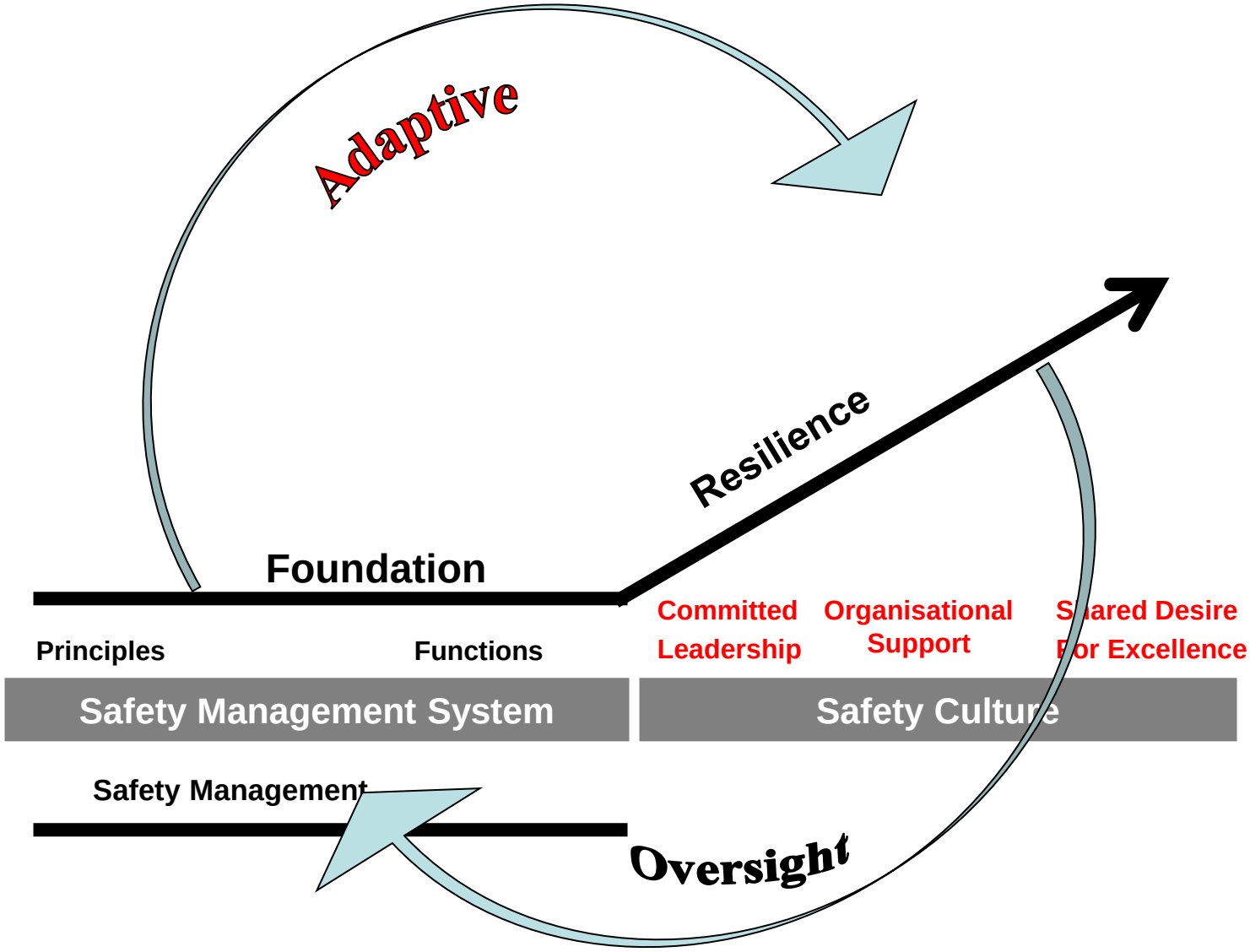


Figure adopted from: Jim Collins, Good to Great; HarperCollins Publishers, NY; 2001.

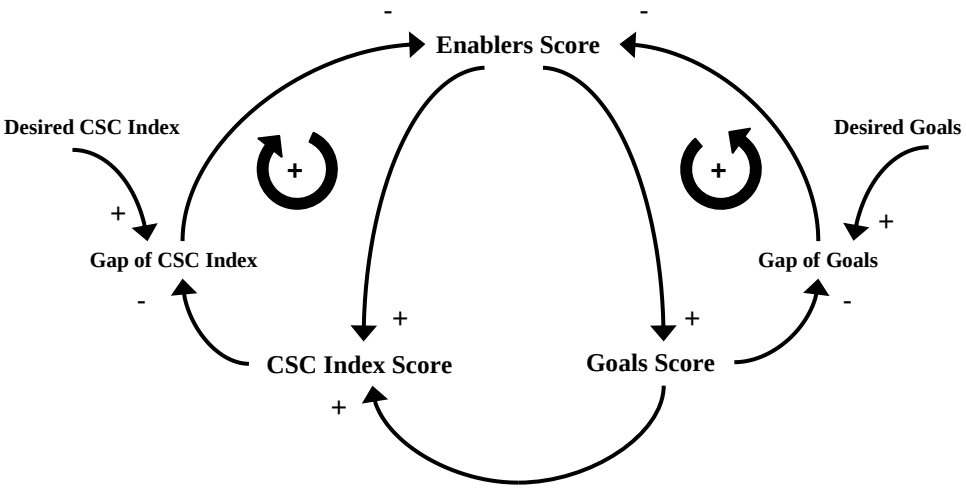
What Research tells us …..

- The Invisible asset
- You can not see it
- You can not touch it
- You can not taste it
- You can not hear it
- You can not smell it
- But it is There!



What Research Tells Us…..





Mohamed, S. & Chinda, T. (2011). System dynamics modelling of construction safety culture. *Engineering, Construction and Architectural Management*, *18*(3), 266-281.

What Research Tells Us…..

	Leading Indicators	Increase over 12 months
Learning	Agreed responsibilities and accountabilities	+12%
	Perception of a caring organisation	+26%
	Improvement shared between sites	+14%
	Effectiveness of visible felt workers leadership	+33%
	Feedback on +ve and –ve issues	+28%

Productivity (on average) increased by 7.5%

SAFETY **RESILIENCE**



Absence of negative events? **Presence of positive capacity?**

NO IT'S NOT THE END

IT'S JUST THE BEGINNING