QI TALK TIME

Building an Irish Network of Quality Improvers

How can you use Complex Adaptive System Model in advancing Quality Improvements in your work place?

Speakers: Mr David Smyth
18th April 2017 1-2 pm

Connect    Improve    Innovate
Mr David Smyth

- Mr David Smyth is a Consultant Otorhinolaryngologist /Head and Neck Surgeon (ORLHNS) and Clinical director for Perioperative Services in University Hospital Waterford.

- He is a graduate of RCSI (1988), trained in ORLHNS in Dublin, Belgium and work as a consultant in the UK before taking up a consultant post in Waterford in 2001.

- In July 2015 he was appointed Clinical Director for Perioperioperative services in UHW to lead a directorate which was being established for the first time in Waterford.

- Executive lead of the Theatre Quality Improvement Program (Formerly TPOT) in UHW.

- Co-leading on Quality Improvement strategic development within UHW.
Tips for successful webex

• Interactive

• Sound

• Chat box function
  • Comments/Ideas
  • Questions

• Q&A at the end

• Attendance certs

• Twitter: @QITalktime
How can you use Complex Adaptive System Model in advancing Quality Improvements in your work place?
Complex Adaptive Systems as a useful model for organisational change
David Smyth

ENT Surgeon UHW 16 yrs

Clinical director 2015

TPOT programme 2016

UHW QI strategy
Curator of Ideas

Complexity Evangelist

Wannabe Theoretician

Neophyte experimentalist
Introduce Complexity
Discuss systems thinking
Discuss complex adaptive systems
Healthcare organisations as CAS
Principles of harnessing complexity for QI
COMPLEXITY

COM...WITH, TOGETHER

PLECTERE....TO WEAVE BRAID
ENTWINE
COMPLEXITY
PARADIGM
WORLDVIEW
‘IF YOU TAKE ON BOARD WHAT IT MEANS TO SAY THE WORLD IS COMPLEX, THIS WILL CHANGE THE WAY YOU THINK, FEEL AND ACT.”

BOULTON ET AL. Embracing Complexity: Strategic Perspectives for an Age of Turbulence
WORLDVIEWS ARE MODELS

MODELS ARE REPRESENTATIONS OF REALITY

SCIENCE IS ABOUT DEVELOPING AND TESTING MODELS

GOOD MODELS ARE TESTABLE AND PREDICTIVE
“Essentially all models are wrong, some are useful”

GEORGE BOX
MECHANICAL WORLDVIEW
Clockwork Universe

MATERIALISTIC AND ATOMIC

CAUSE AND EFFECT

LINEAR INTERACTION
LINEAR SYSTEMS THEORY

REDUCTIONISTIC

CAUSE AND EFFECT/PHYSICAL LAWS

HOMOGENEITY PRINCIPLE: OUTPUT PROPORTIONAL TO INPUT
ALLOWS USE OF STANDARD MATHEMATICS TO MODEL

Interaction between small number of variables

Closed and static systems
MECHANICAL WORLDVIEW OF MANAGEMENT

Predictable

Linear

Control & command
MACRO SYSTEMS/MULTIPLE VARIABLES

Statistics and probability

Statistical mechanics

Gaussian (iid, clt, lln)

Mean field theory
NEWTONIAN PARADIGM FOR SOCIAL SYSTEMS
HENRI POINCARE
1887
Three body problem
Framework for chaos theory
Warren Weaver

“Science and Complexity”
American Scientist (1948)

Problems of simplicity

Problems of disorganised complexity

Problems of organised complexity
EDWARD LORENZ
CHAOS THEORY 1961

LUDWIG VON BERTALANFFY
GENERAL SYSTEMS THEORY 1968

ILYA PRIGOGINE
“LE FIN DE CERTITUDE” 1996
“Our researchers endeavor to understand and unify the underlying, shared patterns in complex physical, biological, social, cultural, technological, and even possible astrobiological worlds”.

"COMPLEX ADAPTIVE SYSTEM"

Multidisciplinary group 1984
"a set of elements or parts that is coherently organized and interconnected in a pattern or structure that produces a characteristic set of behaviours, often classified as its 'function' or 'purpose'” Meadows 2009
SYSTEM

ENERGY/INFORMATION
SYSTEM TAXONOMY

Simple system (small number of entities with limited connections)

Complicated system (large number of entities but with linear interactions)

Complex systems
  - Complex physical system
  - Complex adaptive system
SYSTEM TAXONOMY

Complex system (large number of entities with non-linear interactions)

Complex physical system

Complex adaptive system
Complexity science goals

Cross disciplinary insights into complex systems

Develop general theory of complexity?
Complexity disciplines

Dynamics  study of change
Cybernetics  study of control systems
Information  study of representation, symbols and communication
Computation  study of information processing
Evolution  study of how systems adapt
Complexity science methodologies

Real world observation empirical & experimental

Theoretical study (including mathematical)

Computer simulation
Complexity science methodologies
COMPLEX ADAPTIVE SYSTEM
Nature of Complex adaptive systems

Agents
Diverse
Connected
Interdependent
Adaptive
Complex systems features

Emergence
Path dependence
Phase shifts
Resilience
Non linear with pockets of isolated linearity
Self organisation/hierarchy/scaling
Health care organisations as Complex adaptive systems

Agents
Diverse
Connected
Interdependent
Adaptive
Health care organisations as Complex systems

<table>
<thead>
<tr>
<th>Emergence</th>
<th>Culture</th>
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<tr>
<td>Path dependence</td>
<td>Usually can’t build from scratch</td>
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<tr>
<td>Phase shifts</td>
<td>Possible but rare</td>
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<tr>
<td>Resilience</td>
<td>Common goals/Groupthink</td>
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<td>Non linear with pockets of isolated linearity</td>
<td>Assumed causality</td>
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<tr>
<td>Self organisation</td>
<td>Non apparent</td>
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<tr>
<td>Hierarchy/scaling</td>
<td>Professional groups</td>
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QI & Complex adaptive systems

Interference with system
Using diversity
Utilising connections
Interdependence/Non linearity
Managing adaptation
Interference with system

Requires knowledge of system’s current state

Requires knowledge of system’s dynamics
Problems with Command and control systems

Information bandwidth

Unpredictability

Non linearity

Adaptive agents
Hierarchy

Information bandwidth

Unpredictability

Non linearity

Illusion of control

Adaptive agents
“The temptation to lead as a chess master, controlling each move of the organization, must give way to an approach as a gardener, enabling rather than directing. A gardening approach to leadership is anything but passive. The leader acts as an “Eyes-On, Hands-Off” enabler who creates and maintains an ecosystem in which the organization operates.”

“Gardening” in complex system

Constant monitoring

Tending and reacting appropriately

Allow natural development

Creating environment
“Battlefield circulation”

Increase understanding of situation

Communicate guidance to force

Lead and inspire
Using Diversity

Teams

Multiple knowledge domains

Cognitive diversity
Using Connections

Networks

Random
Scale free
Small world
Social Networks

Diffusion

simple vs complex contagion
Identify networks

Understand connections

Build relationships

Identify individuals with high influence within groups
Linearity/Non-linearity

Unpredictability

Build in slack

Experimentation

Measurement
- What changes are to be made
- Next cycle?

- Objective
- Questions and predictions (Why?)
- Plan to carry out the cycle (Who, what, where when)
- Plan for data collection

- Complete the analysis of data
- Compare data to predictions
- Summarize what was learned

- Carry out the plan
- Document problems and unexpected observations
- Begin analysis of data
PDSA

Act   Plan
Study Do

Act   Plan
Study Do

Act   Plan
Study Do
Managing adaptation

Psychology

Personal motivation

Influence

Frontline ownership
People

Cognitive

Motivation

Resource

Institutional Politics

Relationships
Influence

Reciprocity

Social proof

Commitment/Consistency

Liking

Authority

Scarcity

Bob Cialdini
Frontline Ownership

Case Studies in Quality Improvement using Front-Line Ownership

Dr Michael Gardam
UHN, Toronto, Canada
W E Deming’s profound knowledge
UHW experience

Experiment is ongoing

Establish & Maintain TPOT/TQUIP

Twin track approach to QI in UHW

Being complex, the endpoint is unpredictable
Summary

Complexity is a worldview

It has a scientific basis

Complexity pervades healthcare

Complexity cannot be controlled but it can be harnessed

Complexity needs consideration for organisational change

Complexity should inform QI interventions
RECOMMENDED
COMPLEXITY
RESOURCES

RED SURROUND HIGHLY RECOMMENDED
BOOKS
Video resources

http://complexityacademy.io

https://www.complexityexplorer.org

http://www.thegreatcourses.com
Web sites

http://complexityacademy.io

http://plexusinstitute.site-ym.com

http://www.necesi.edu

https://www.santafe.edu
Free modelling/simulation tool

The desktop version of NetLogo is recommended for most uses

See here for more information on how to use NetLogo Web
“I think the next century will be the century of complexity”

Stephen Hawking Jan 2000

Thank You
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Next Webinar:
Tues 9th May 1-2 pm:
Measurement for Improvement.
Speaker: Quality Improvement Division Measurement Team
Thank you and stay tuned......

- Thank you from all the team @QITalktime
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