

QI TALK TIME



Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Quality Improvement Division



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

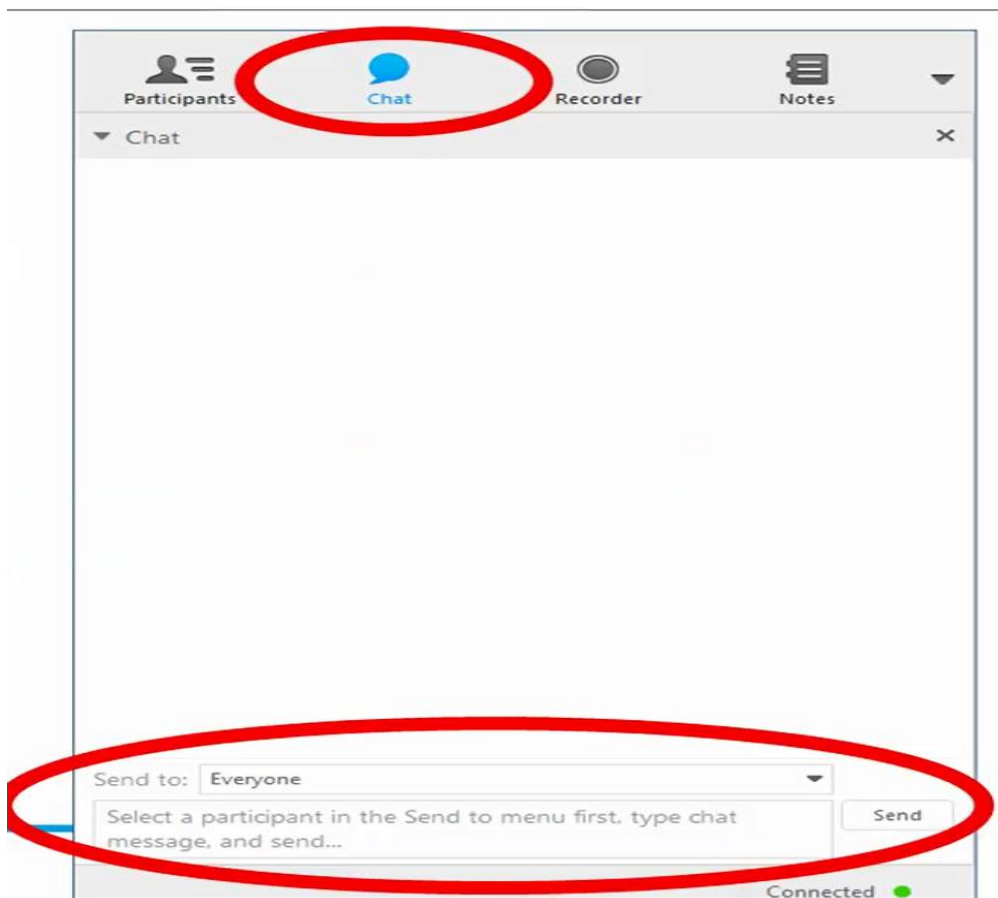
Mr David Smyth

- 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 Perioperative 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



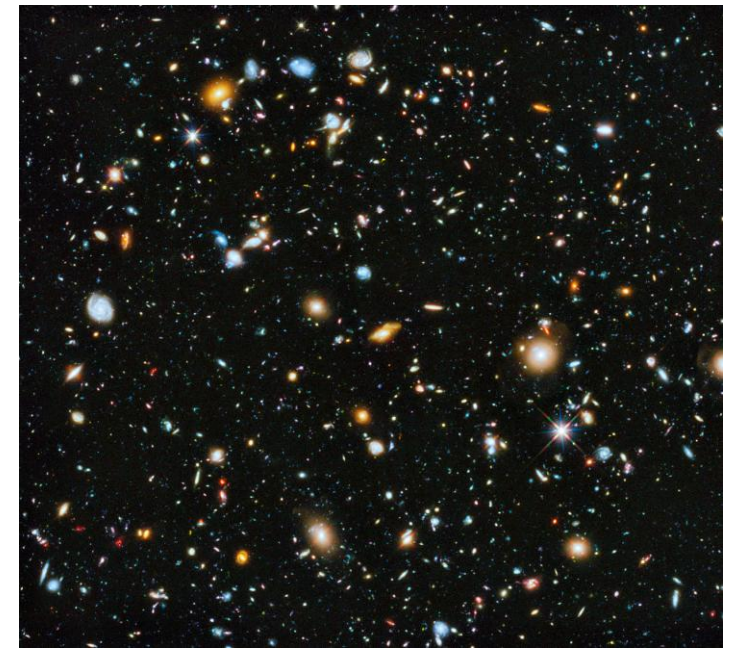
“Essentially all
models are
wrong, some are
useful”

GEORGE BOX

MECHANICAL WORLDVIEW



Clockwork Universe



• [CC BY-SA 3.0](#)

MATERIALISTIC AND ATOMIC

CAUSE AND EFFECT

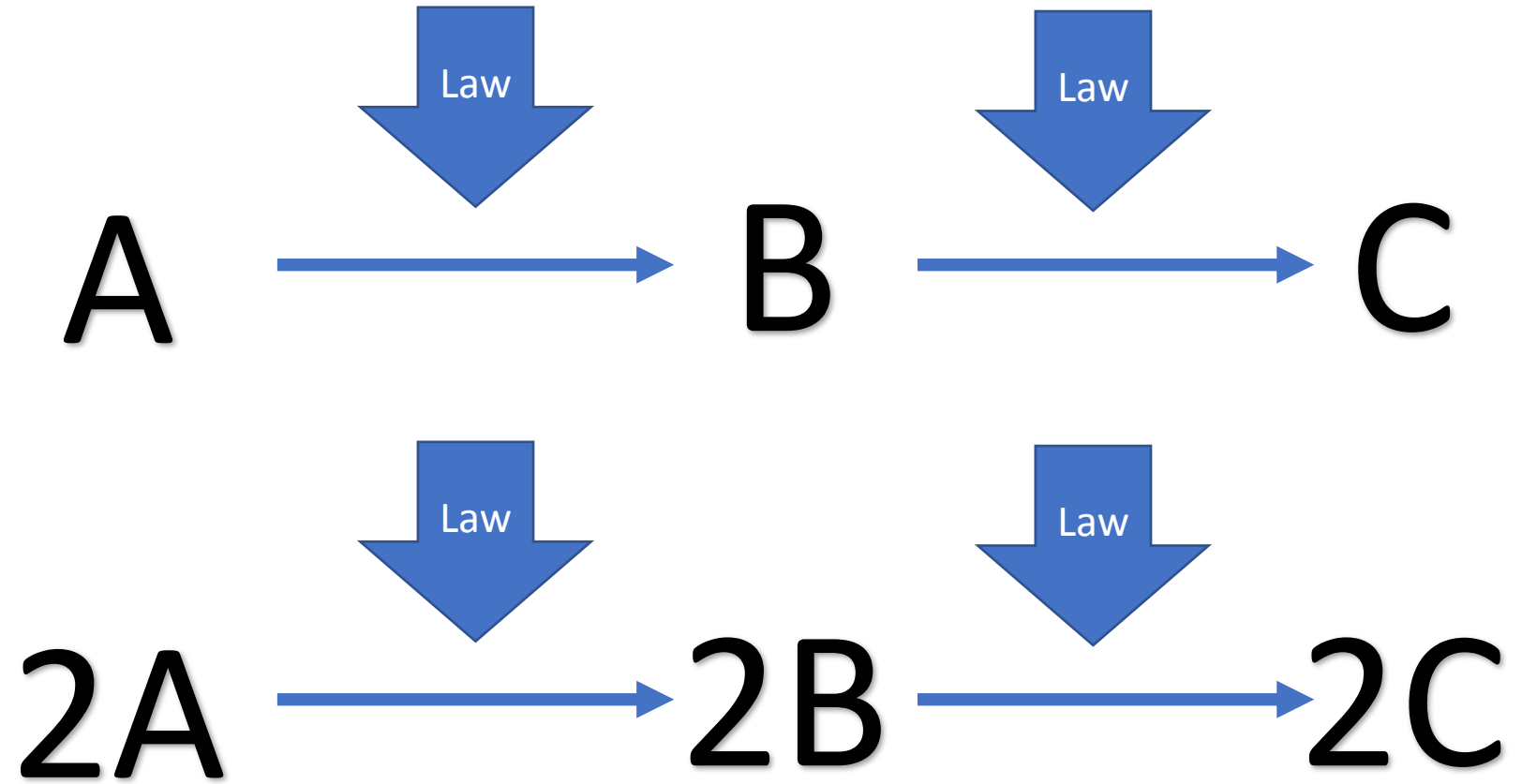
LINEAR INTERACTION

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, ln)

Mean field theory

NEWTONIAN PARADIGM FOR SOCIAL SYSTEMS

HENRI POINCARÉ

1887

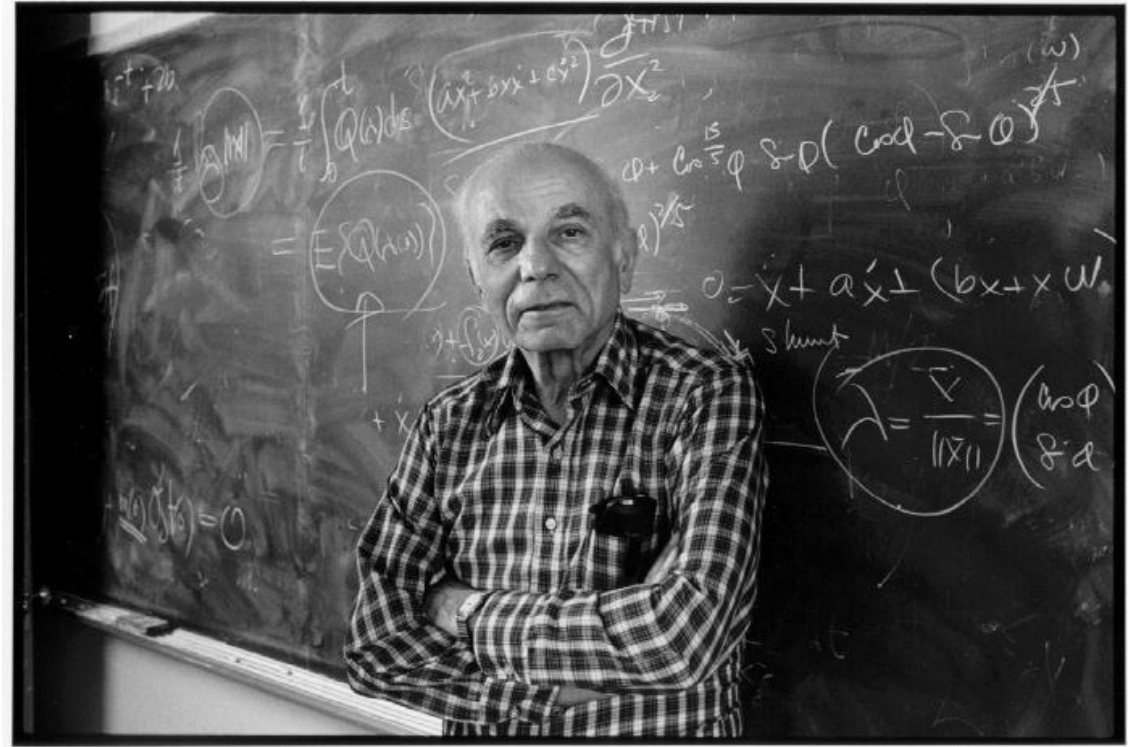
Three body problem

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





SANTA FE INSTITUTE

Multidisciplinary group 1984

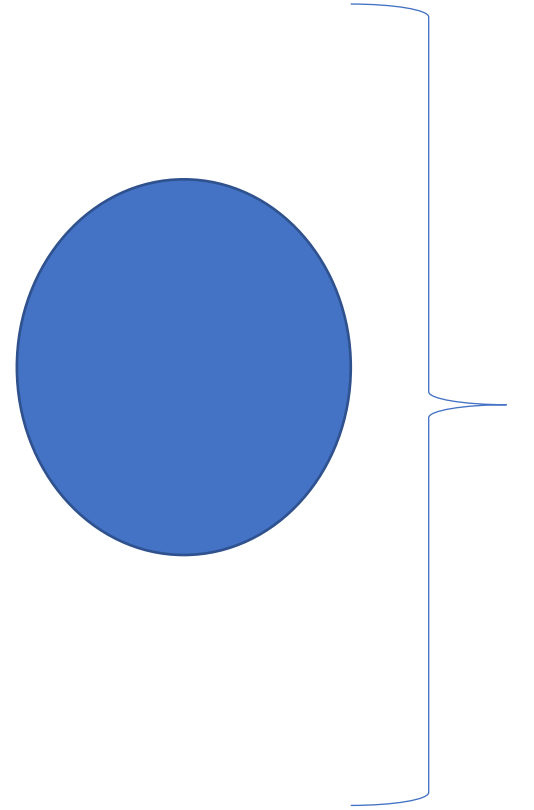
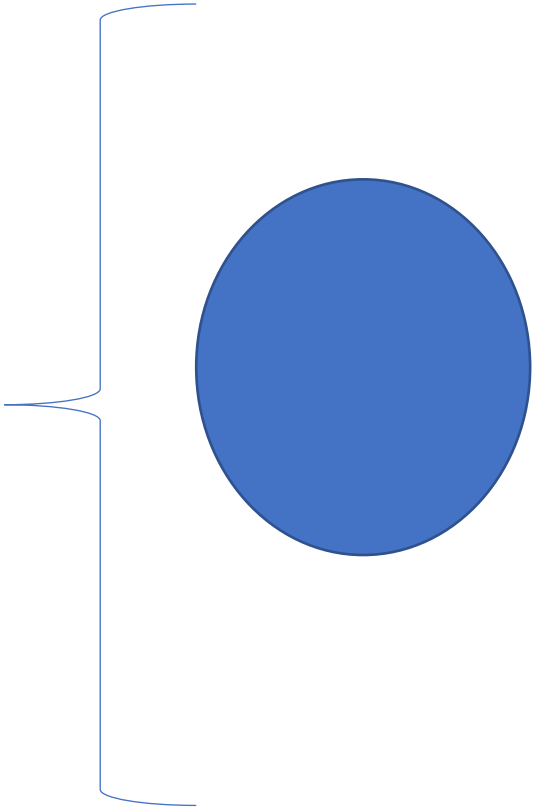
“COMPLEX ADAPTIVE SYSTEM”

“Our researchers endeavor to understand and unify the underlying, shared patterns in complex physical, biological, social, cultural, technological, and even possible astrobiological worlds”.

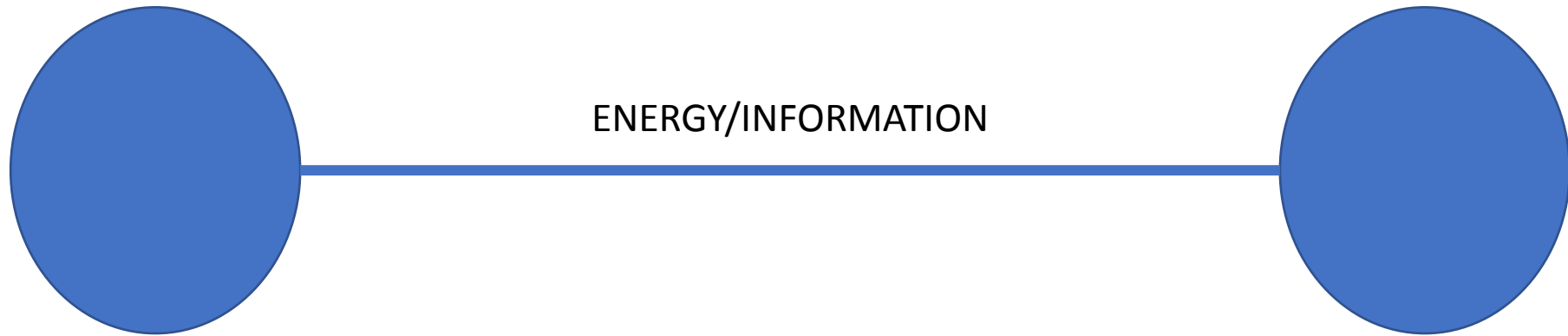
BASIC SYSTEMS THEORY

"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

SET



SYSTEM

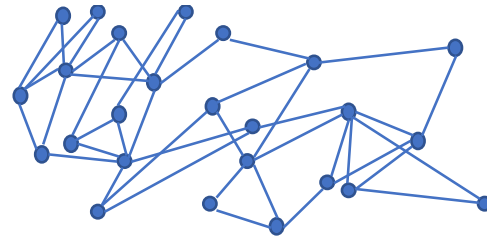


SYSTEM TAXONOMY

Simple system (small number of entities with limited connections)



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



Complex systems



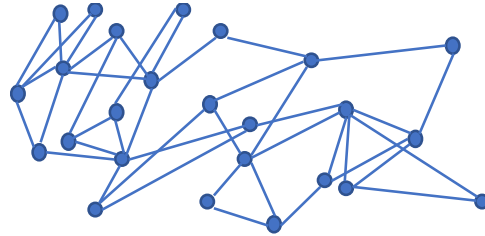
Complex physical system

Complex adaptive system



SYSTEM TAXONOMY

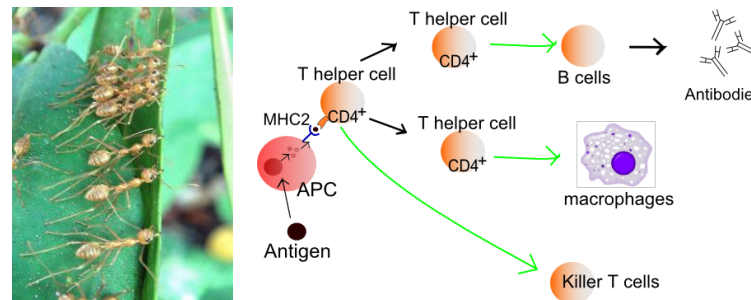
Complex system (large number of entities with non-linear interactions)

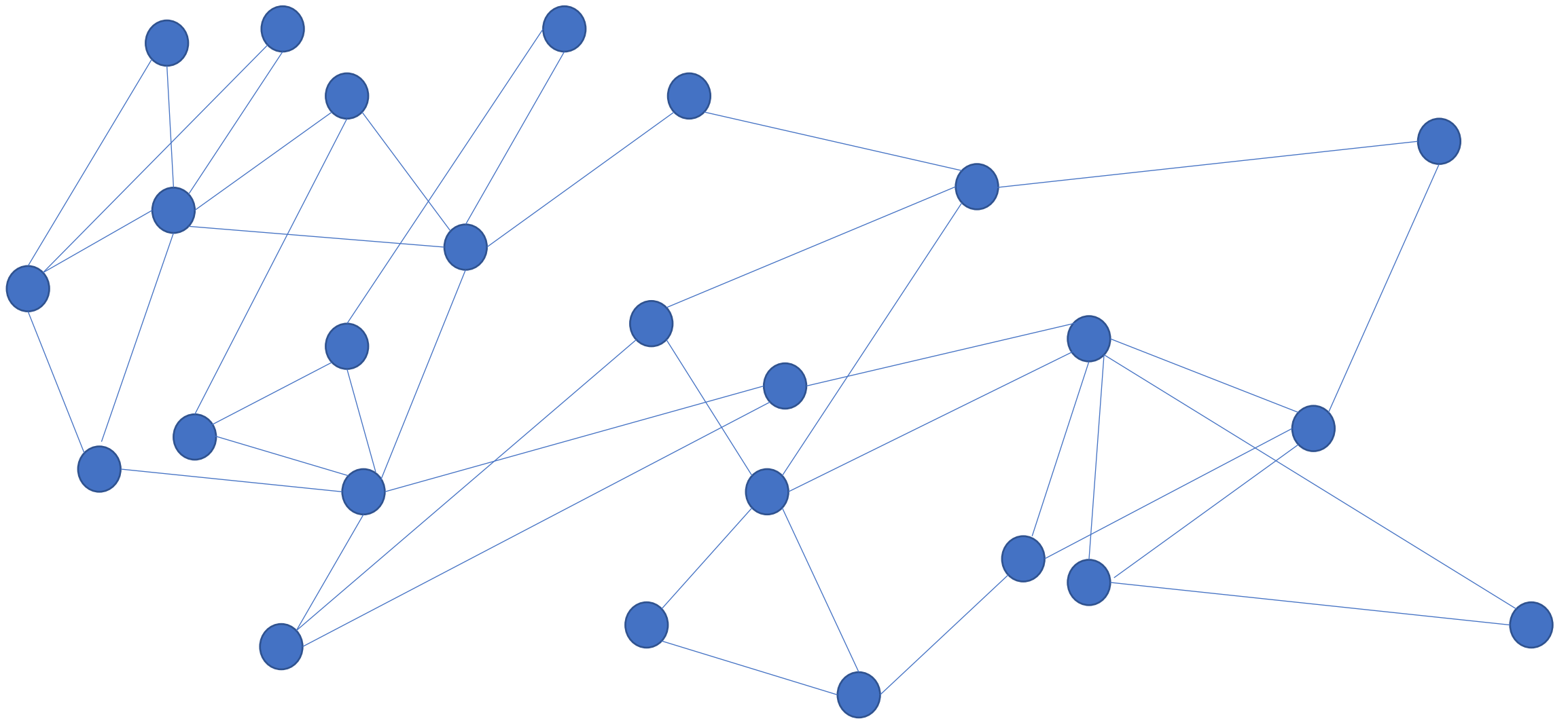


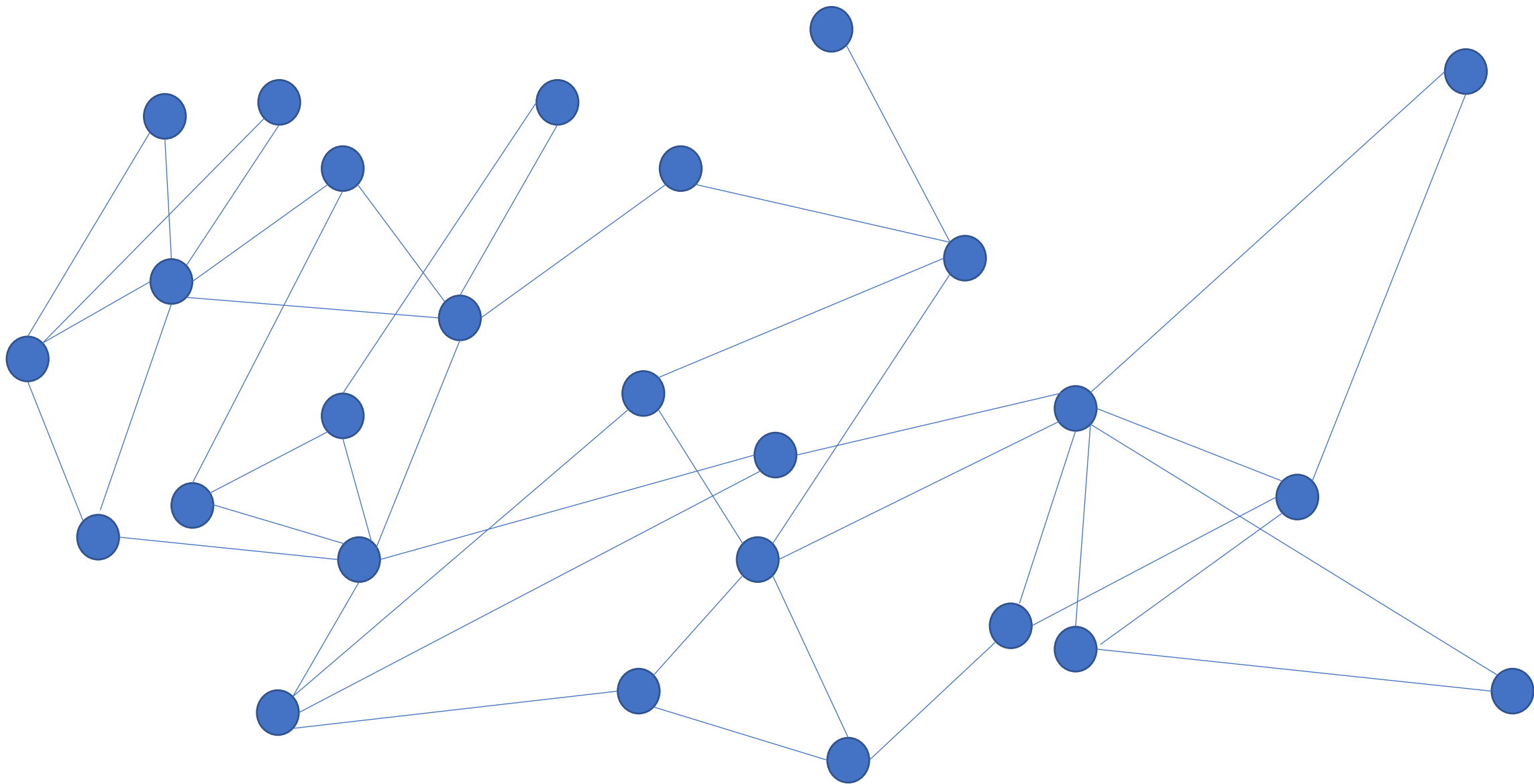
Complex physical system

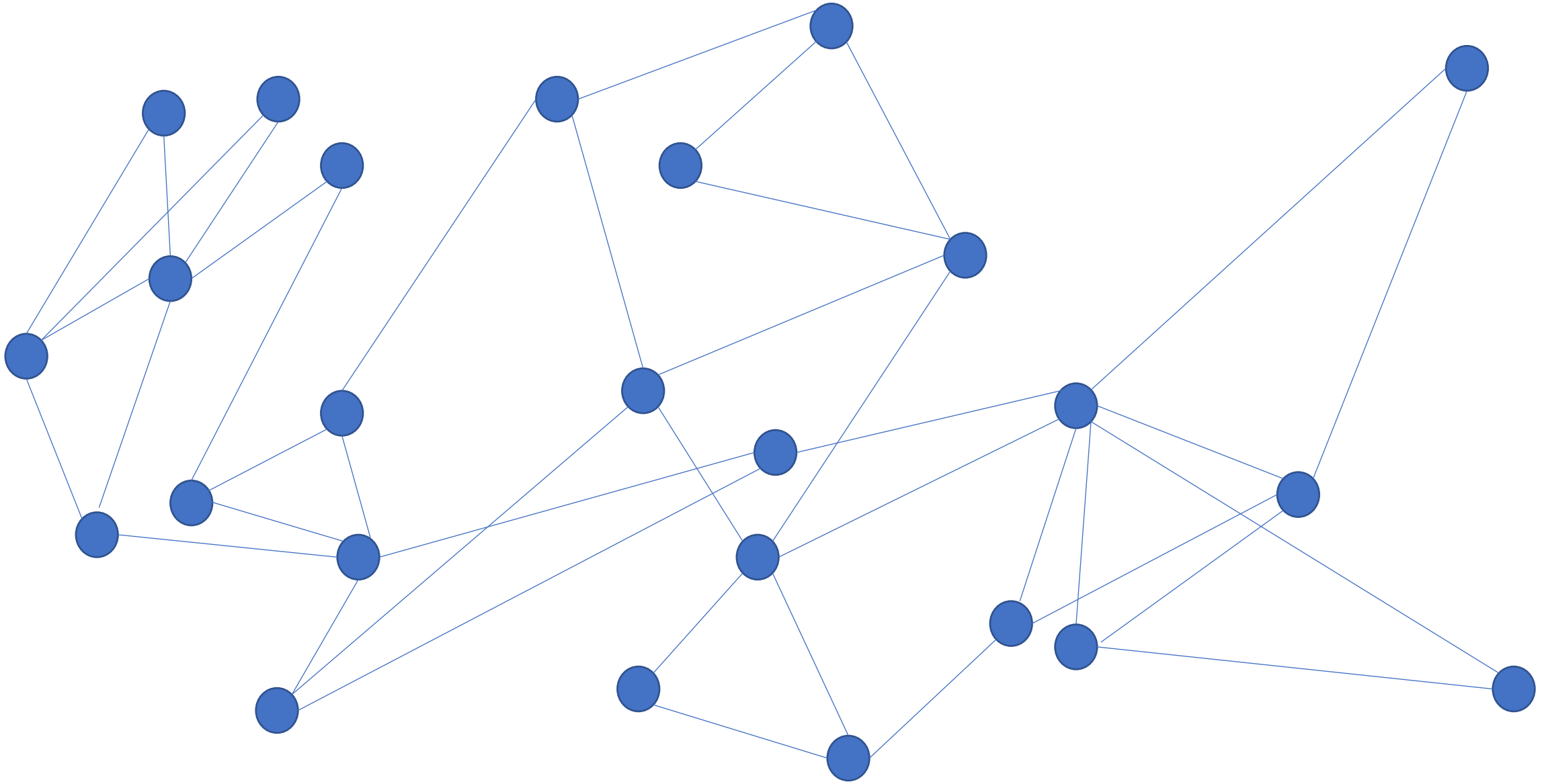


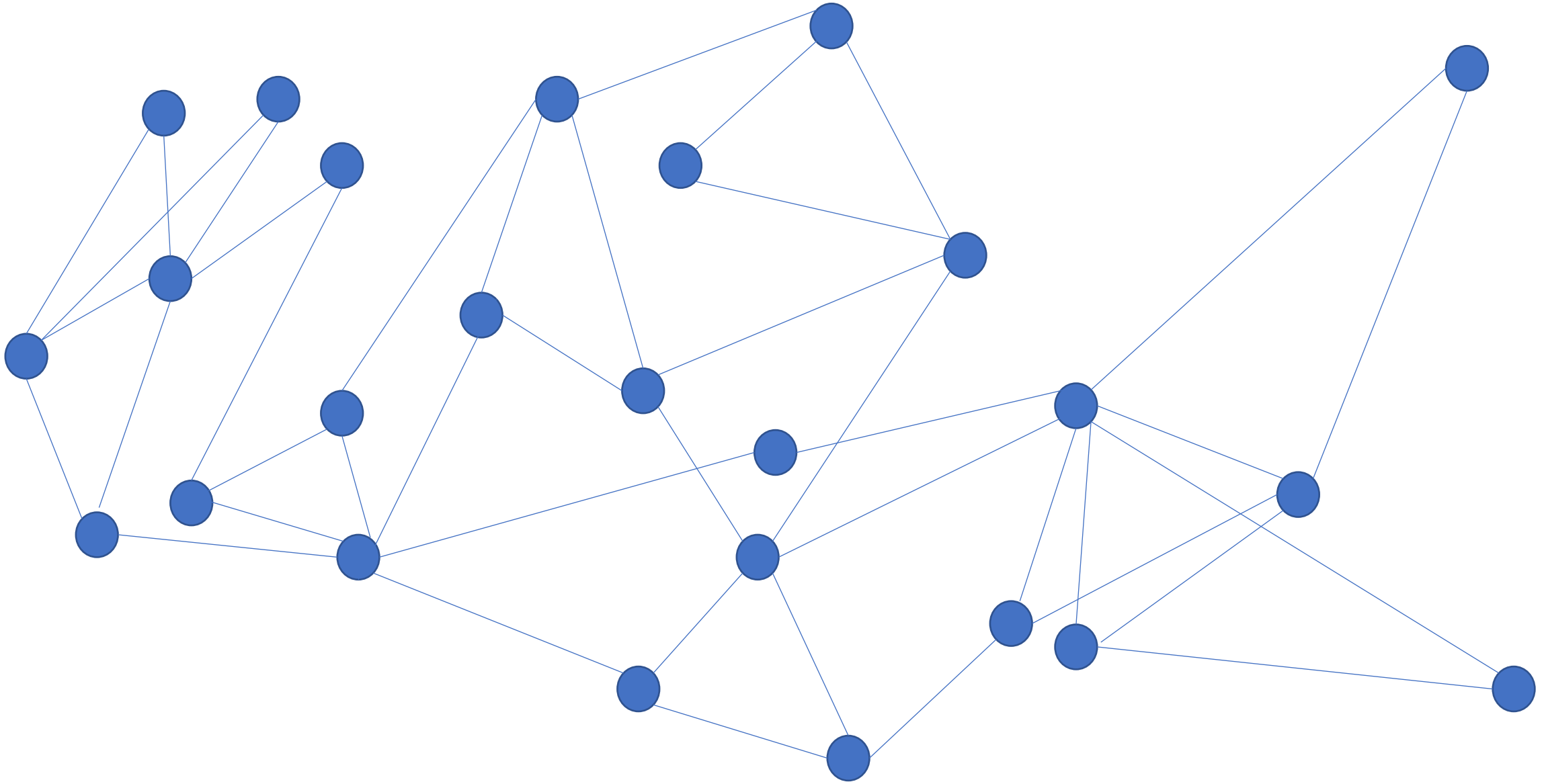
Complex adaptive system

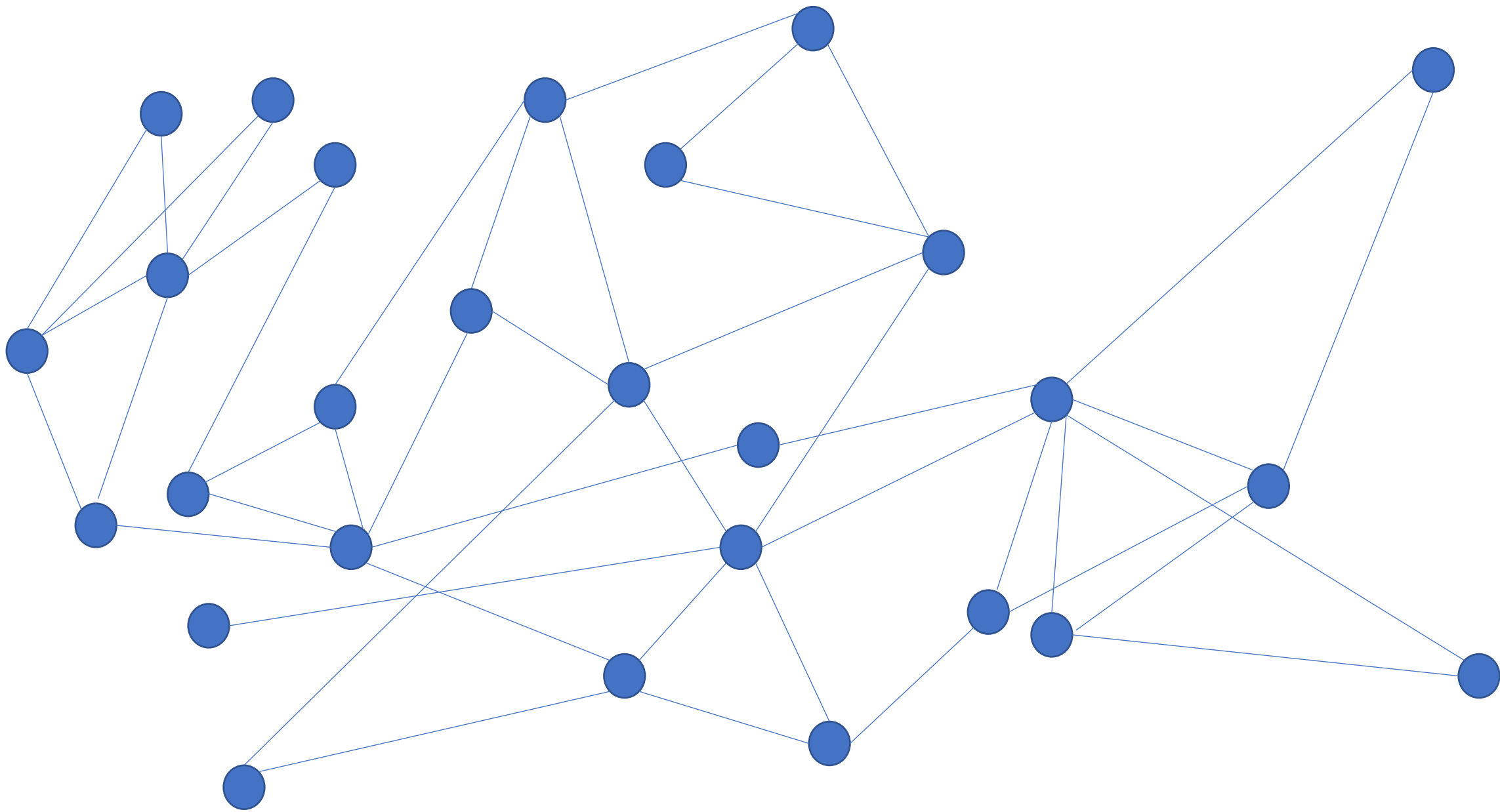


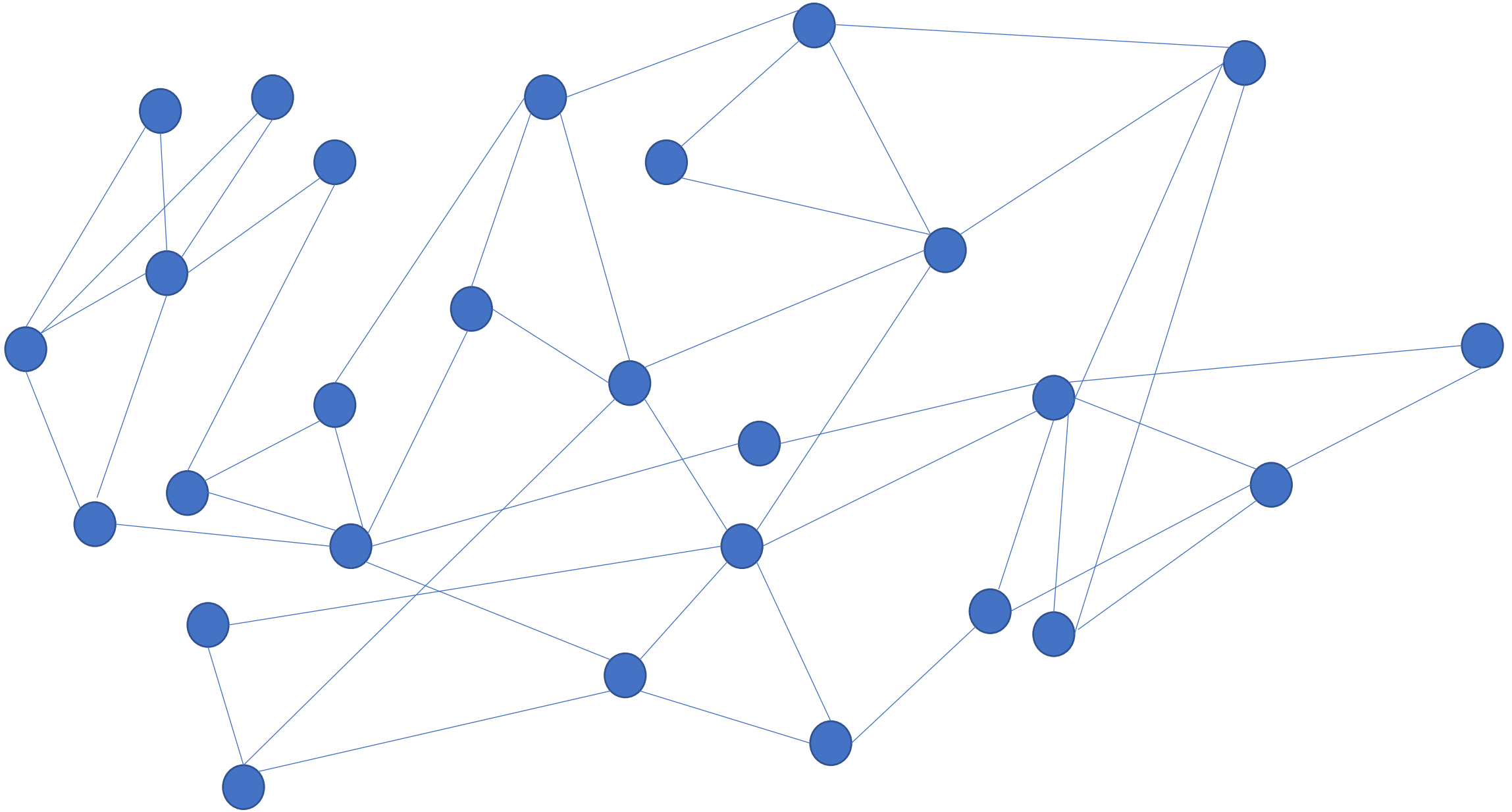












Complexity science goals

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

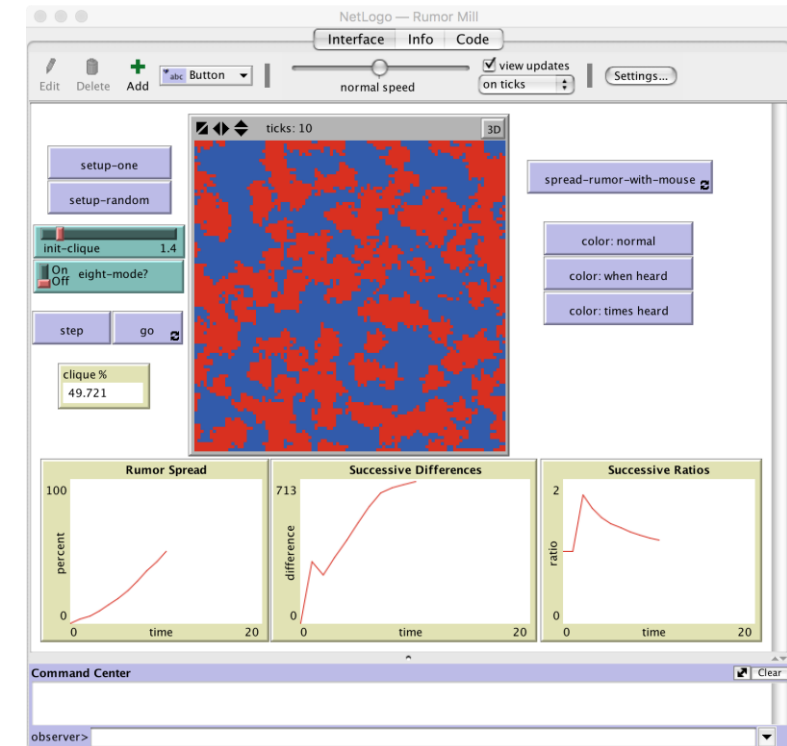
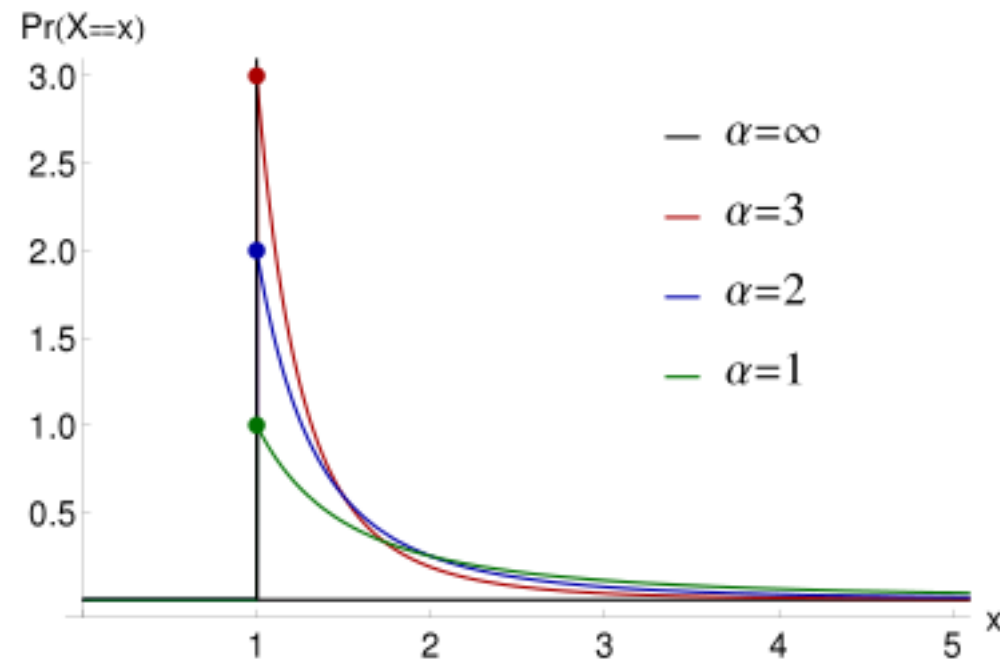
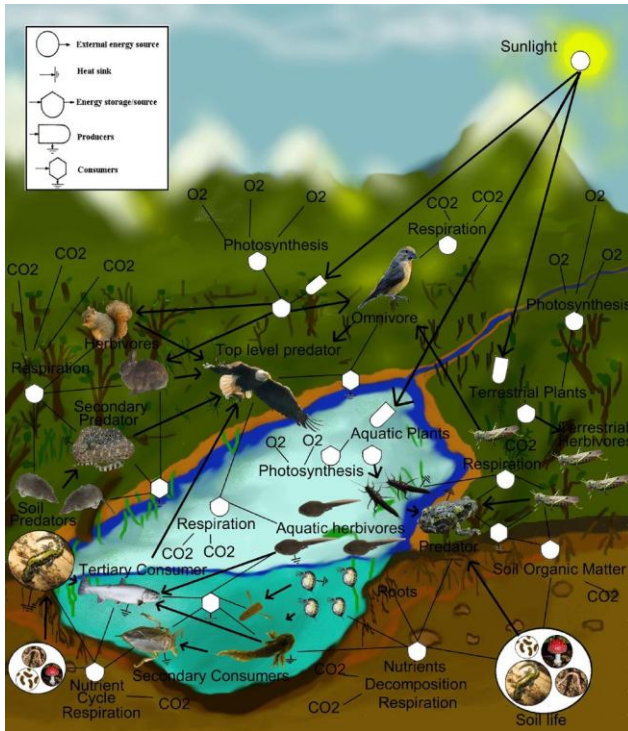
Complexity science methodologies

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

Emergence

Culture

Path dependence

Usually can't build from scratch

Phase shifts

Possible but rare

Resilience

Common goals/Groupthink

Non linear with pockets of isolated linearity

Assumed causality

Self organisation

Non apparent

Professional groups

Hierarchy/scaling

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

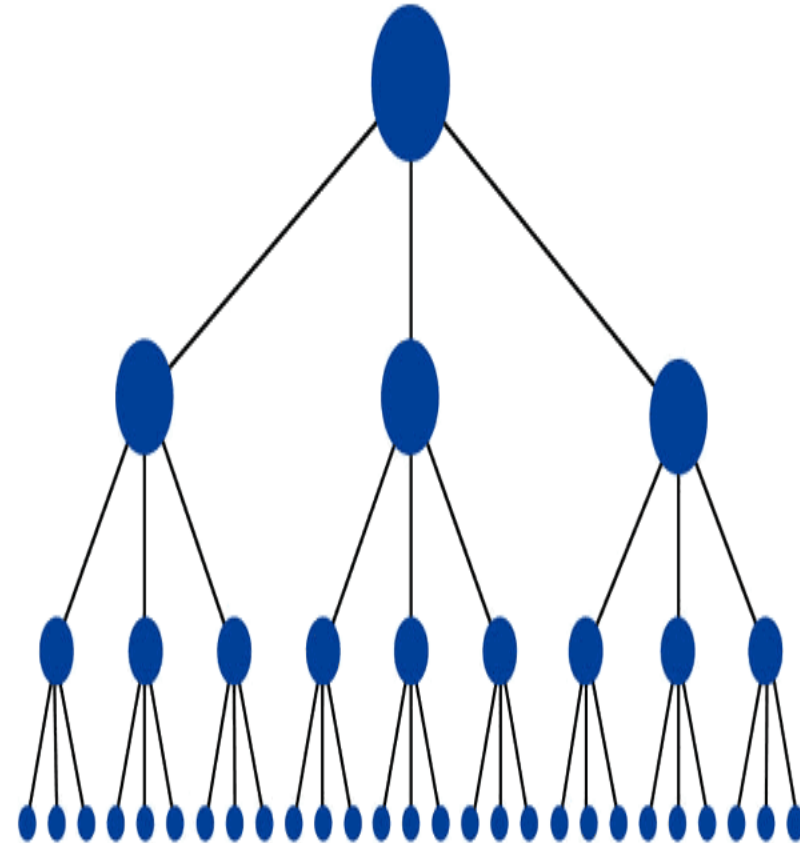
Information bandwidth

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.”

— [Stanley McChrystal, *Team of Teams: New Rules of Engagement for a Complex World*](#)

“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

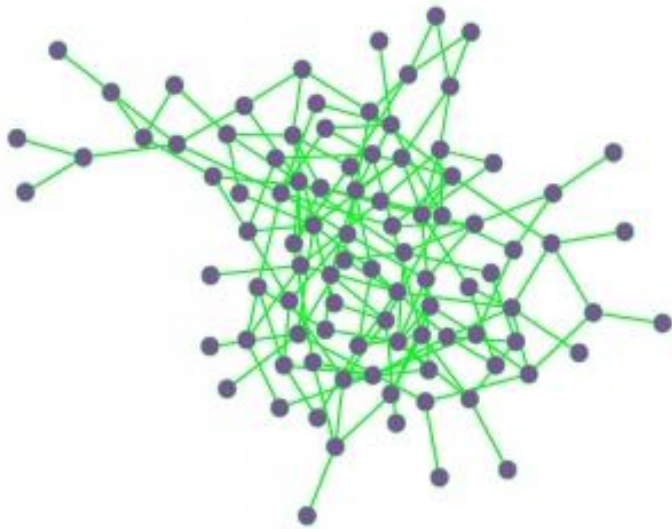
Multiple knowledge domains

Cognitive diversity

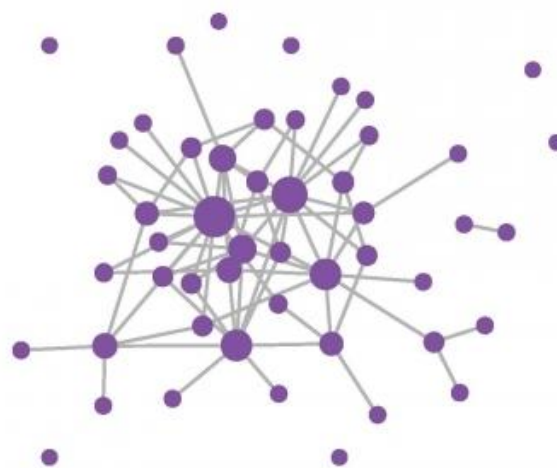
Using Connections

Networks

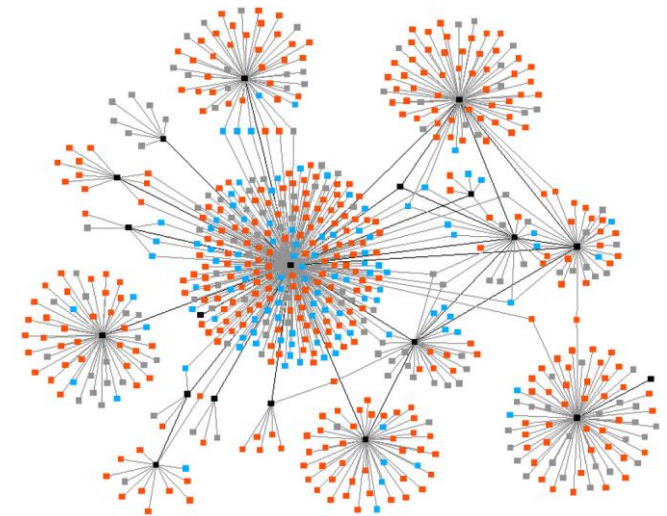
Random



Scale free



Small world



Social Networks

Diffusion



simple vs complex contagion

Identify networks

Understand connections

Build relationships

Identify individuals with high influence within groups

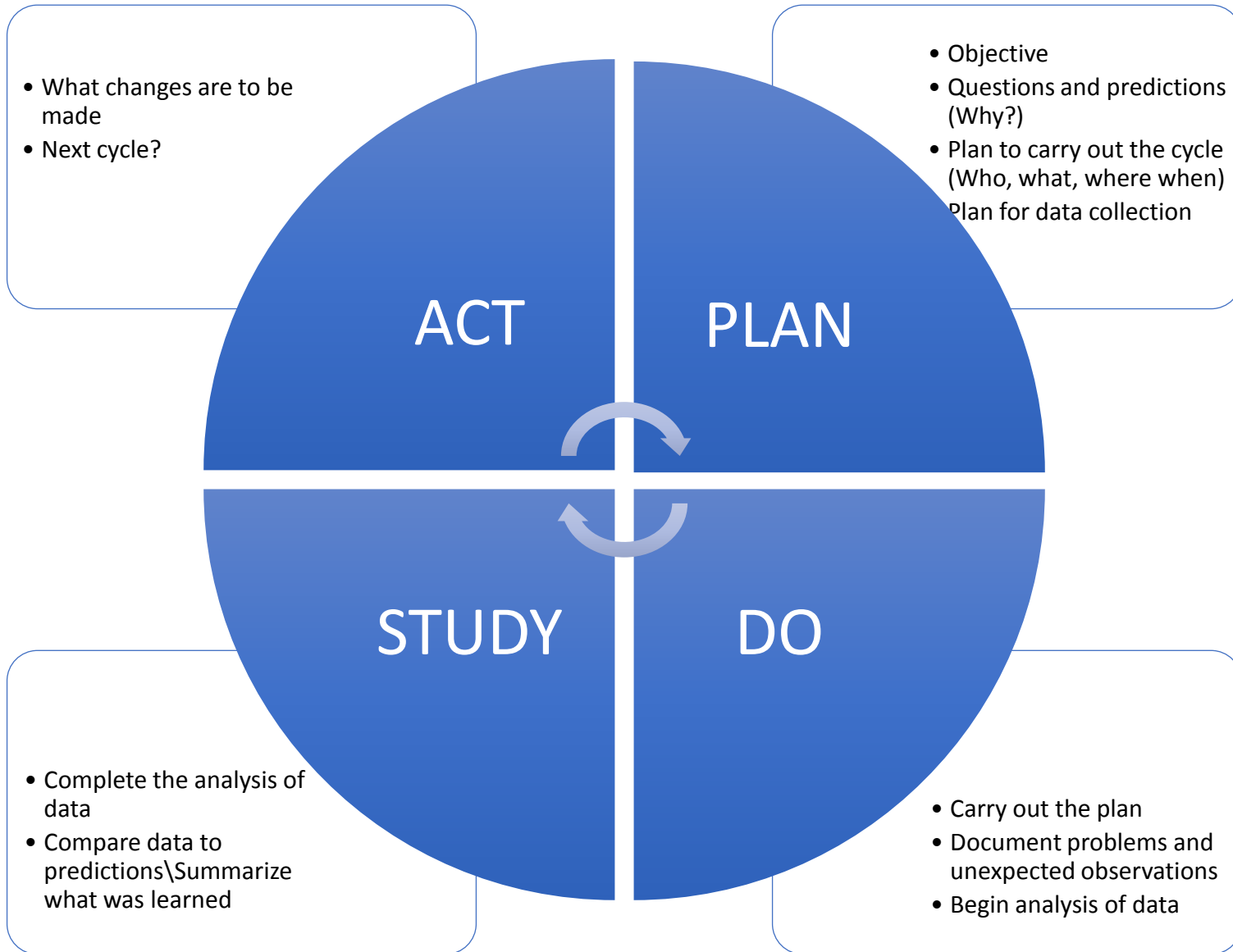
Linearity/Non-linearity

Unpredictability

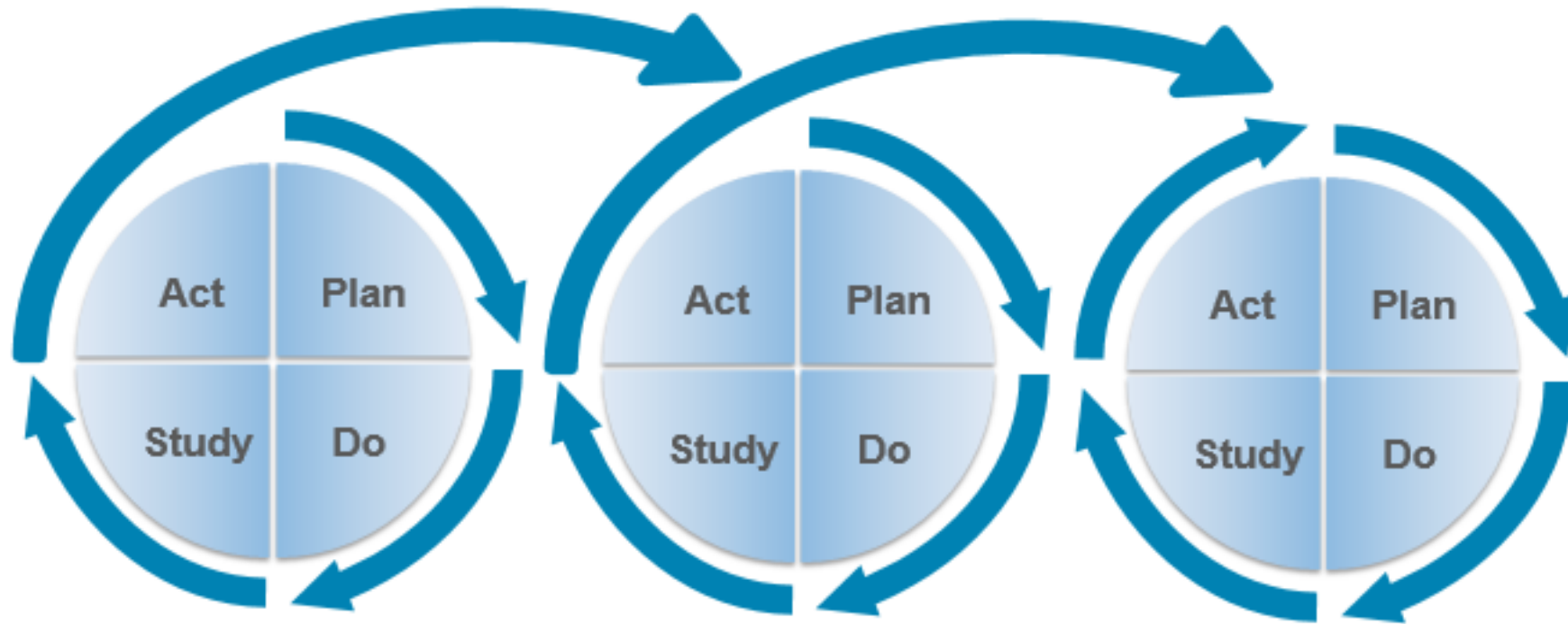
Build in slack

Experimentation

Measurement



PDSA



Managing adaptation

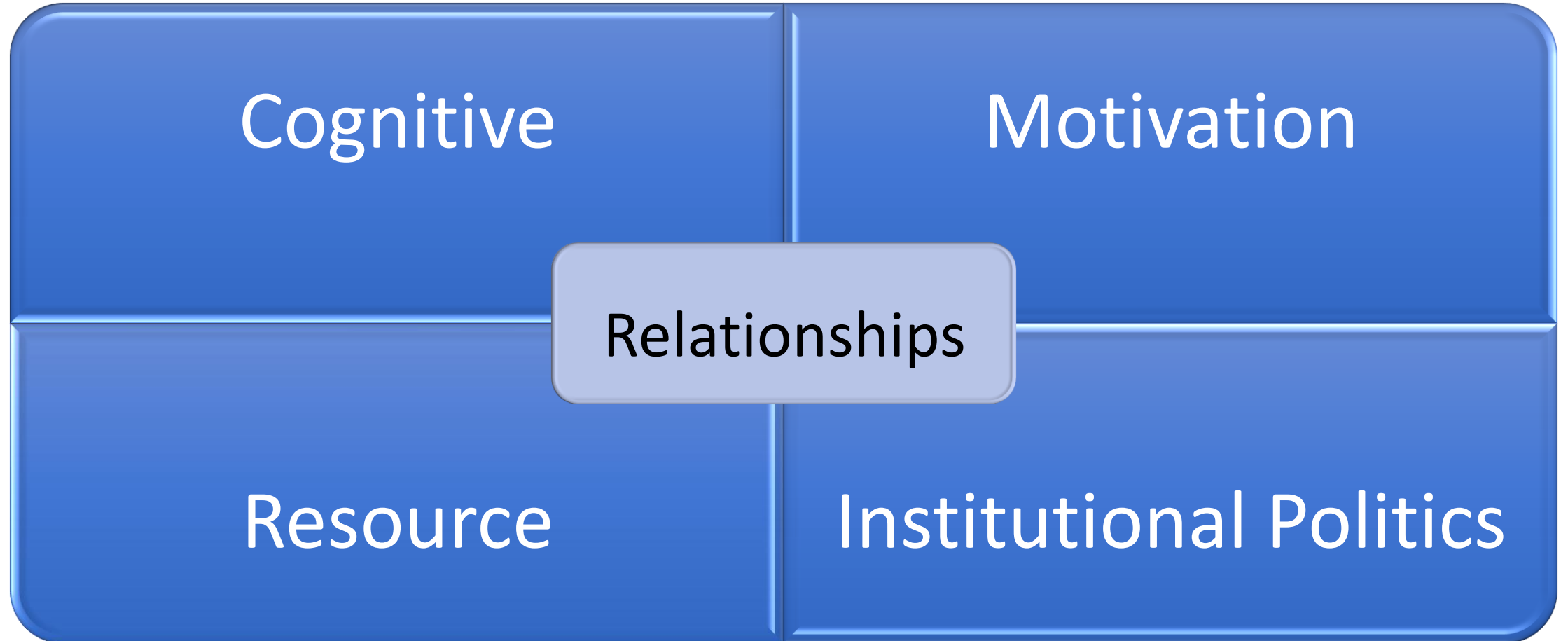
Psychology

Personal motivation

Influence

Frontline ownership

People



Influence

Reciprocity

Social proof

Commitment/Consistency

Liking

Authority

Scarcity

Bob Cialdini

Frontline Ownership



Wednesday December 7th 2016

Case Studies in Quality Improvement using Front-Line Ownership

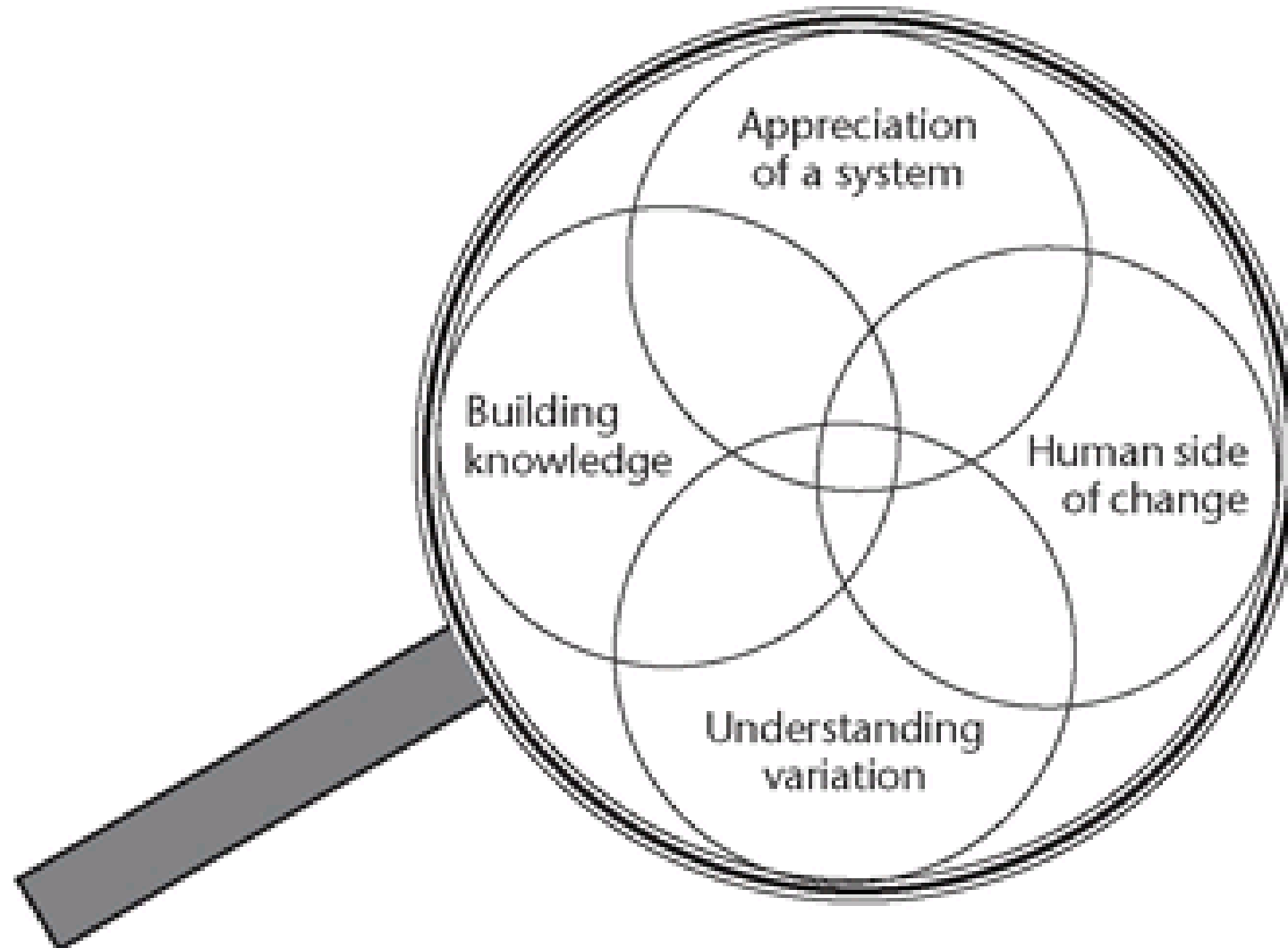
Dr Michael Gardam

UHN, Toronto, Canada

**NATIONAL
CLINICAL
EFFECTIVENESS
COMMITTEE**



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

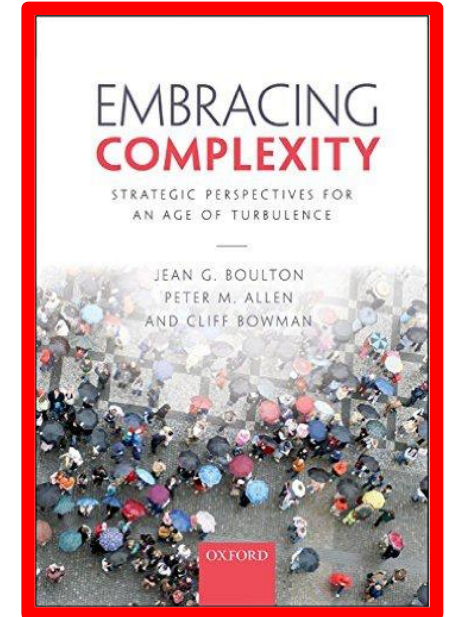
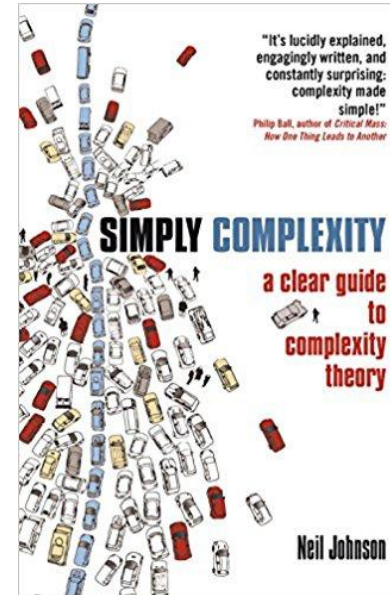
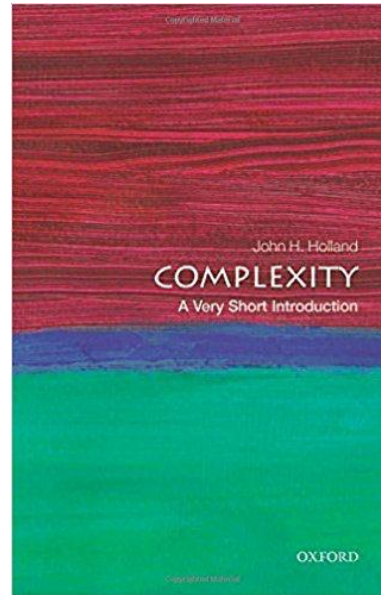
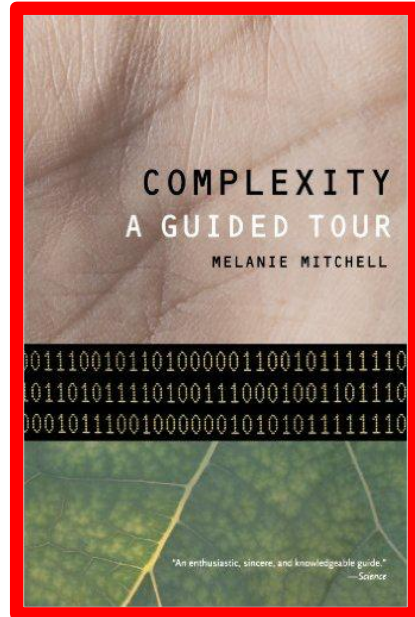
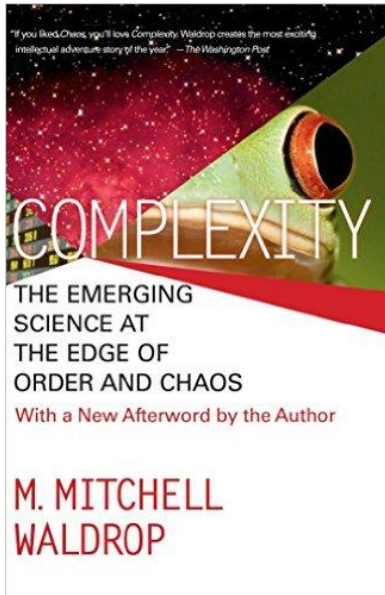
Complexity needs consideration for organisational change

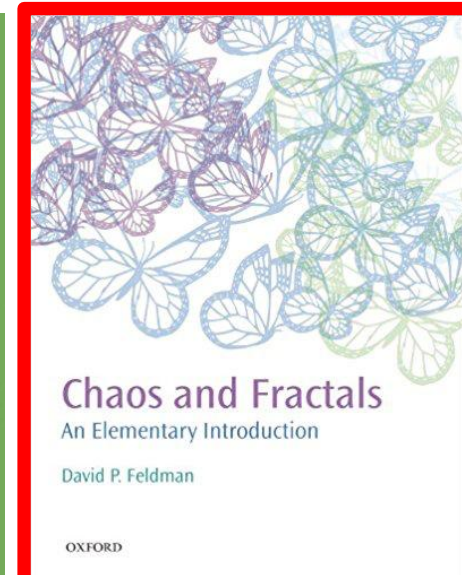
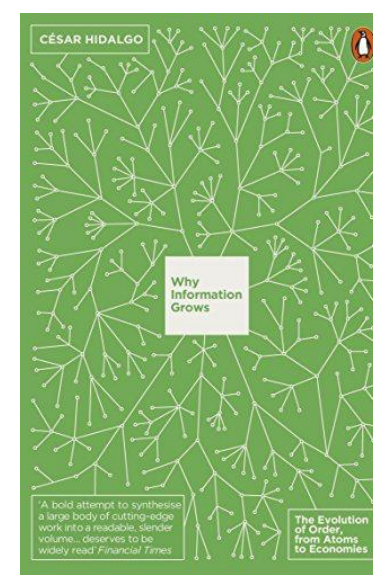
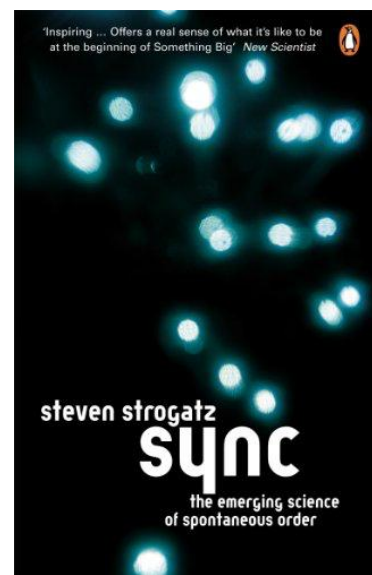
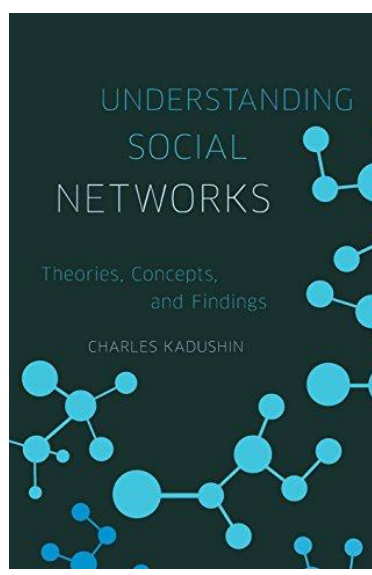
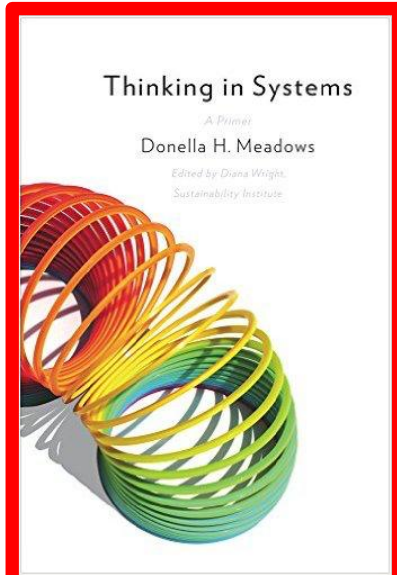
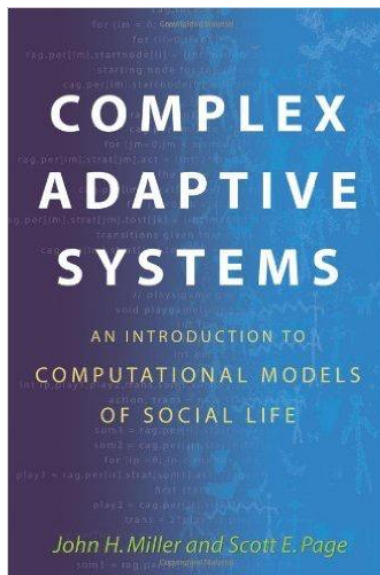
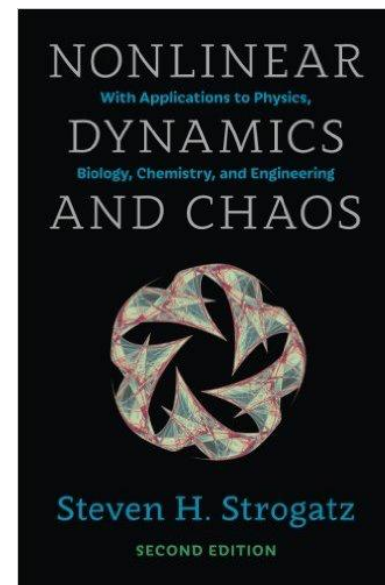
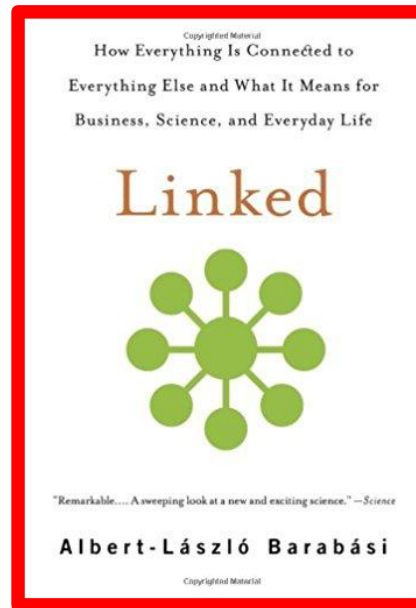
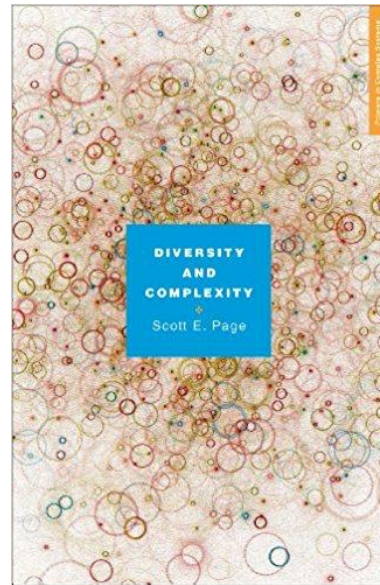
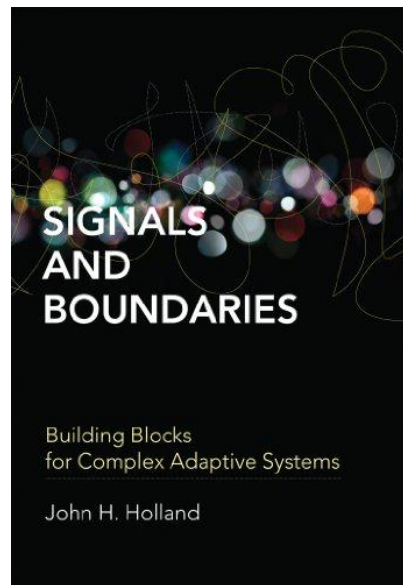
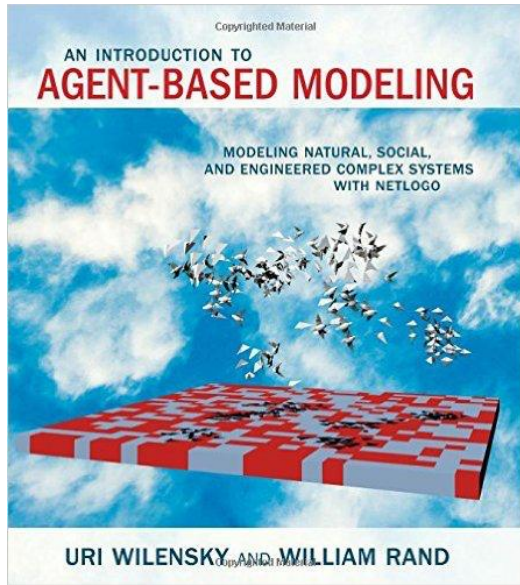
Complexity should inform QI interventions

RECOMMENDED COMPLEXITY RESOURCES

RED SURROUND HIGHLY RECOMMENDED

BOOKS





Video resources

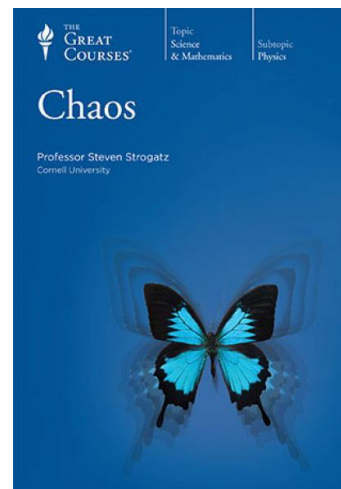
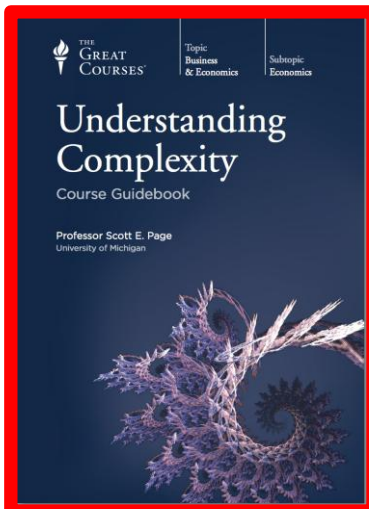


<http://complexityacademy.io>



COMPLEXITY
EXPLORER

<https://www.complexityexplorer.org>



<http://www.thegreatcourses.com>

Web sites



<http://complexityacademy.io>



<http://plexusinstitute.site-ym.com>



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solving problems of science and society

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Santa Fe
Institute

<https://www.santafe.edu>

Free modelling/simulation tool


NetLogo Web Launch What's New FAQ About NetLogo

NetLogo Web



Runs in Your Browser
Basic Feature Set
Functional on Mobile Devices

NetLogo



Desktop App (requires download)
Complete Feature Set
High Performance

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

Thank you and stay tuned.....

- Thank you from all the team @QITalktime
- Roisin.breen@hse.ie
- Noemi.palacios@hse.ie



Roisin Breen



Noemi Palacios