

Complex Adaptive Systems as a Model for Evaluating Organisational Change Caused by the Introduction of Health Information Systems

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PhD Scholarship funded by ARC Linkage Grant held by Dr Ping Yu:

*Introducing computer-based nursing documentation into residential aged care:
A multi-method evaluation of success*

Study Focus:

Introduction of electronic nursing documentation
into residential aged care facilities

Residential Aged Care (RAC)

- Physically and emotionally demanding work
- Most carers have limited computer experience
- Humanitarian/vocational occupation
 - not a way to get rich!

Study Sites

- One management group (so far ...)
 - High Care
 - Low Care
 - Mixed Care

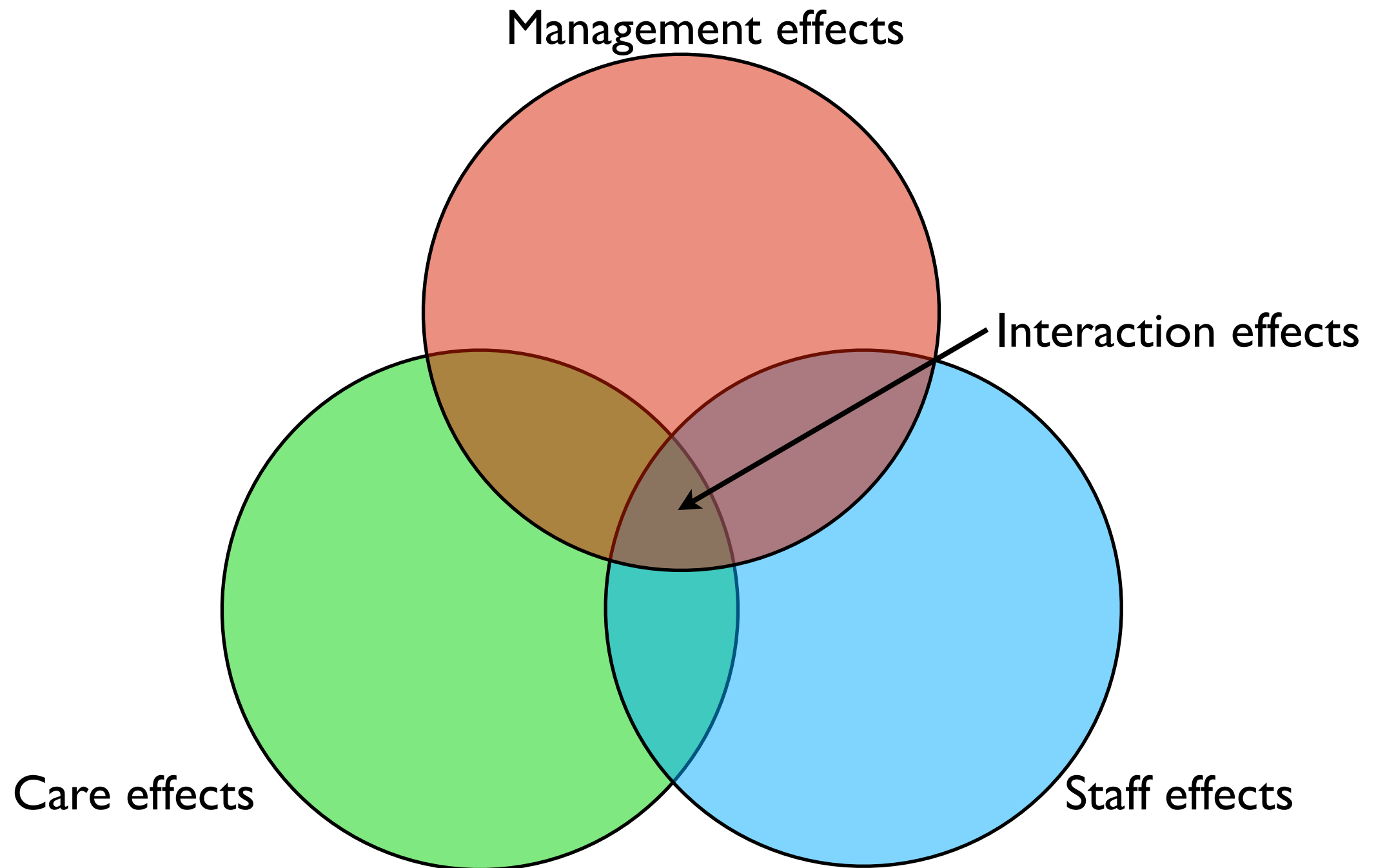
● 58 Interviews

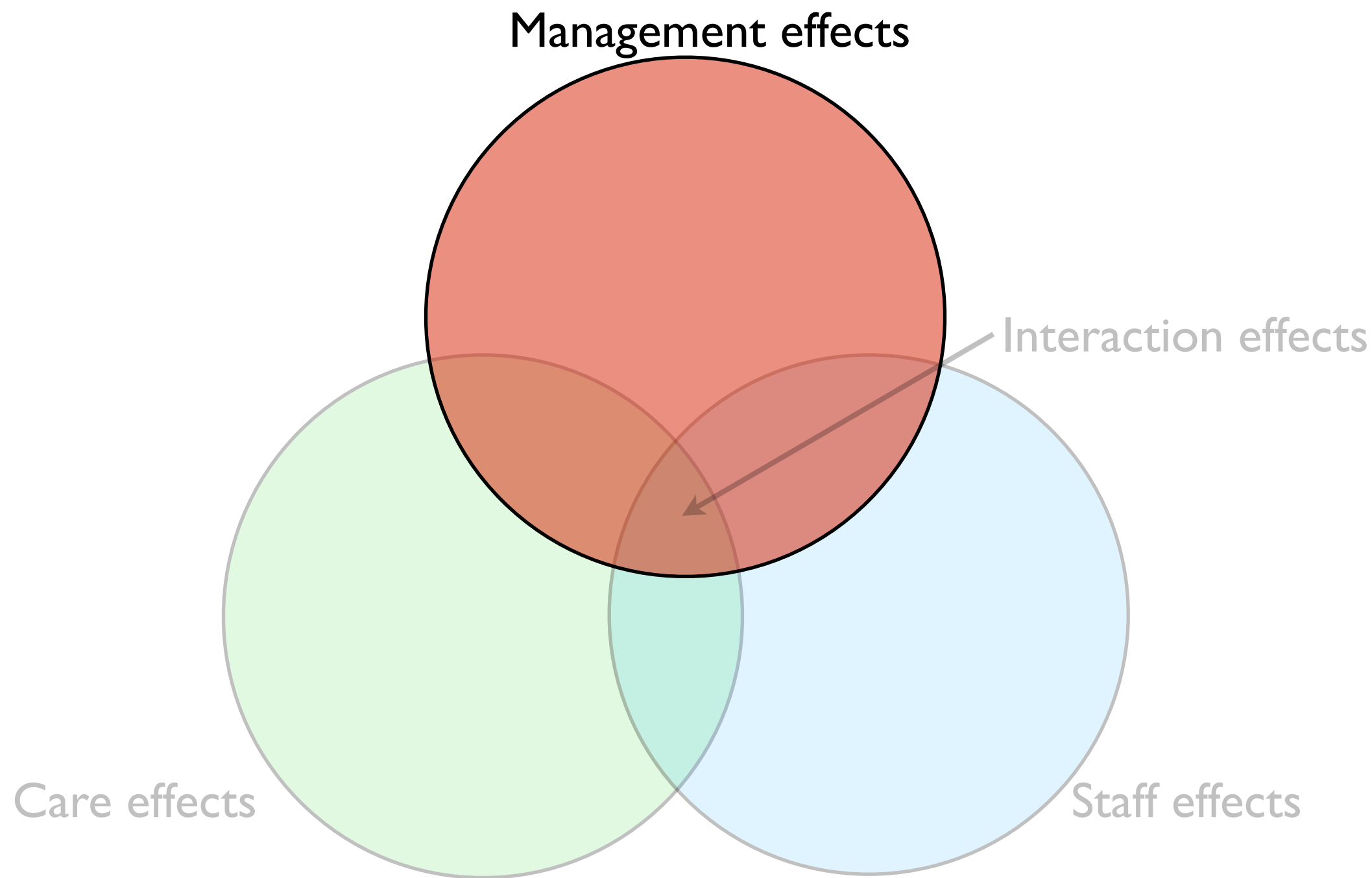
- Managers / Deputies (N=10)
- Registered Nurses (N=9)
- Enrolled Nurses (N=6)
- Personal Care Workers (N=25)
- Others (N=8)
 - Recreation Officers (N=5)
 - Physiotherapy Assistants (N=2)
 - Carer “promoted” to administration (1)

Additional Data

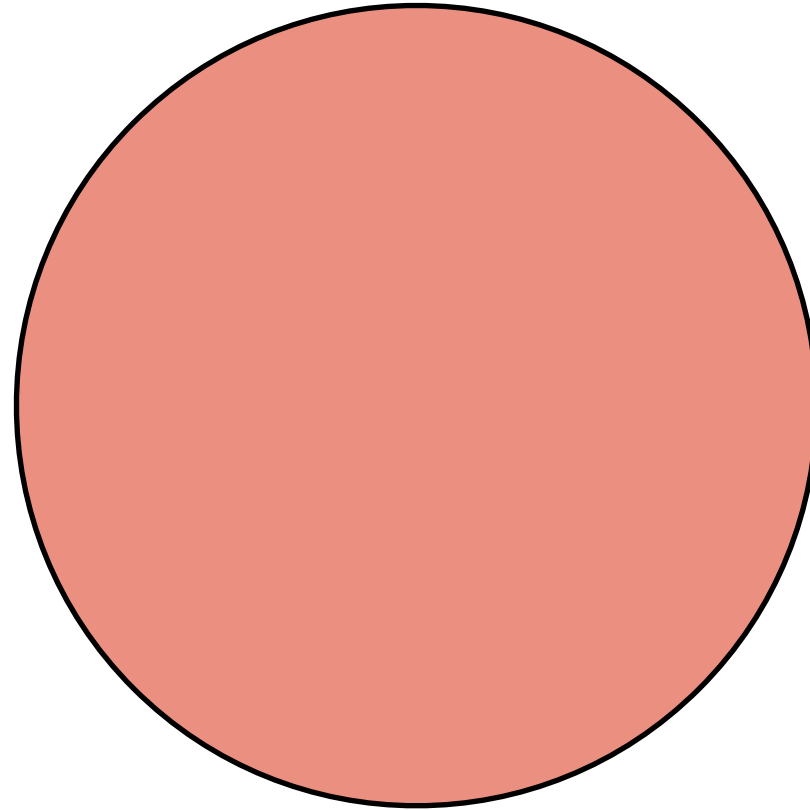
- Management meetings
 - Working group meetings
 - Research reporting meetings
 - RAC Software Industry
- Collaborative research

Evaluating Organisational Change In the Nursing Home





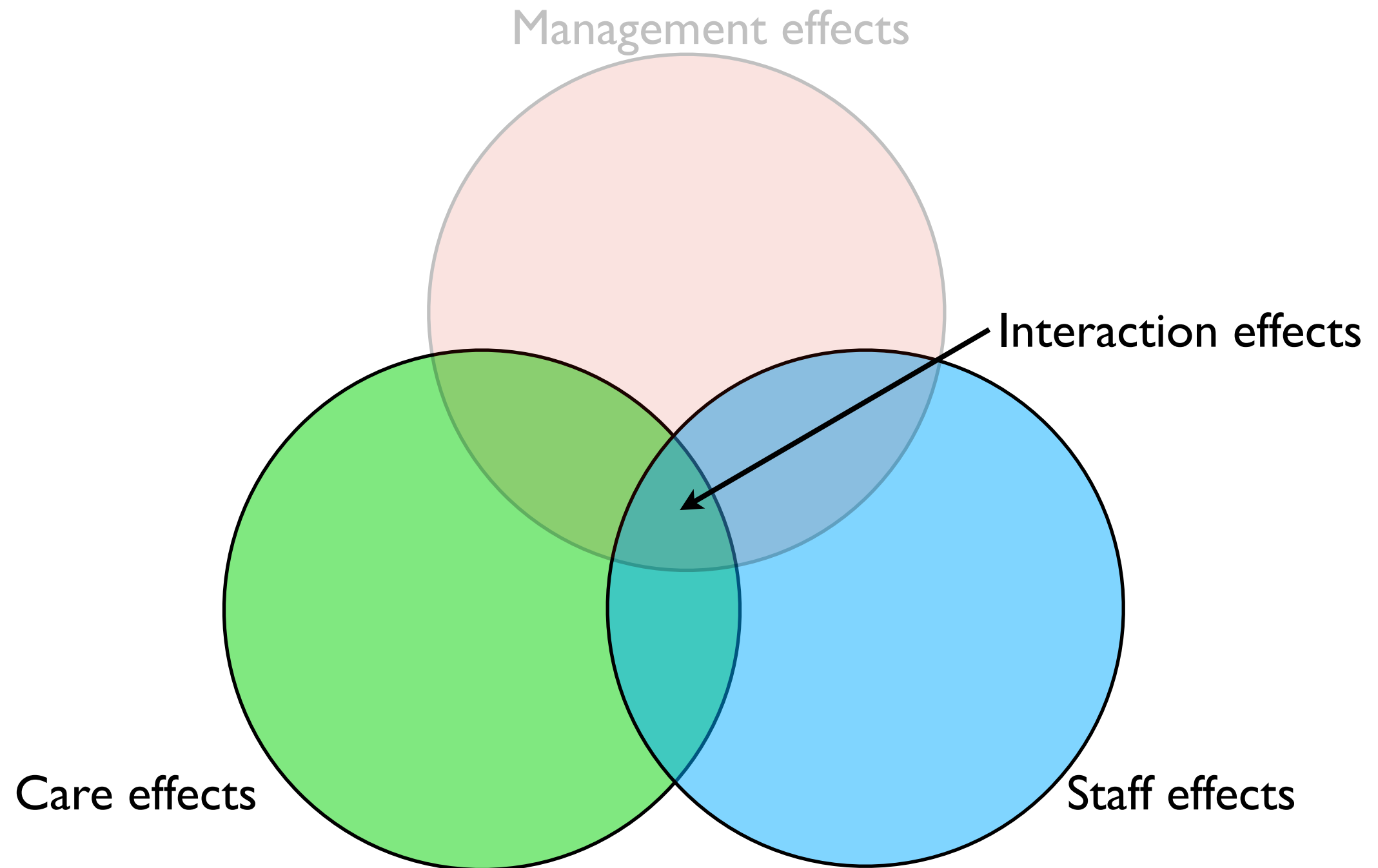
Understanding management effects are relatively straightforward



Management's relationship with nursing documentation:

- Need to retrieve information
- Need complete information
- Concern with resource use and availability

Other effects less so ...



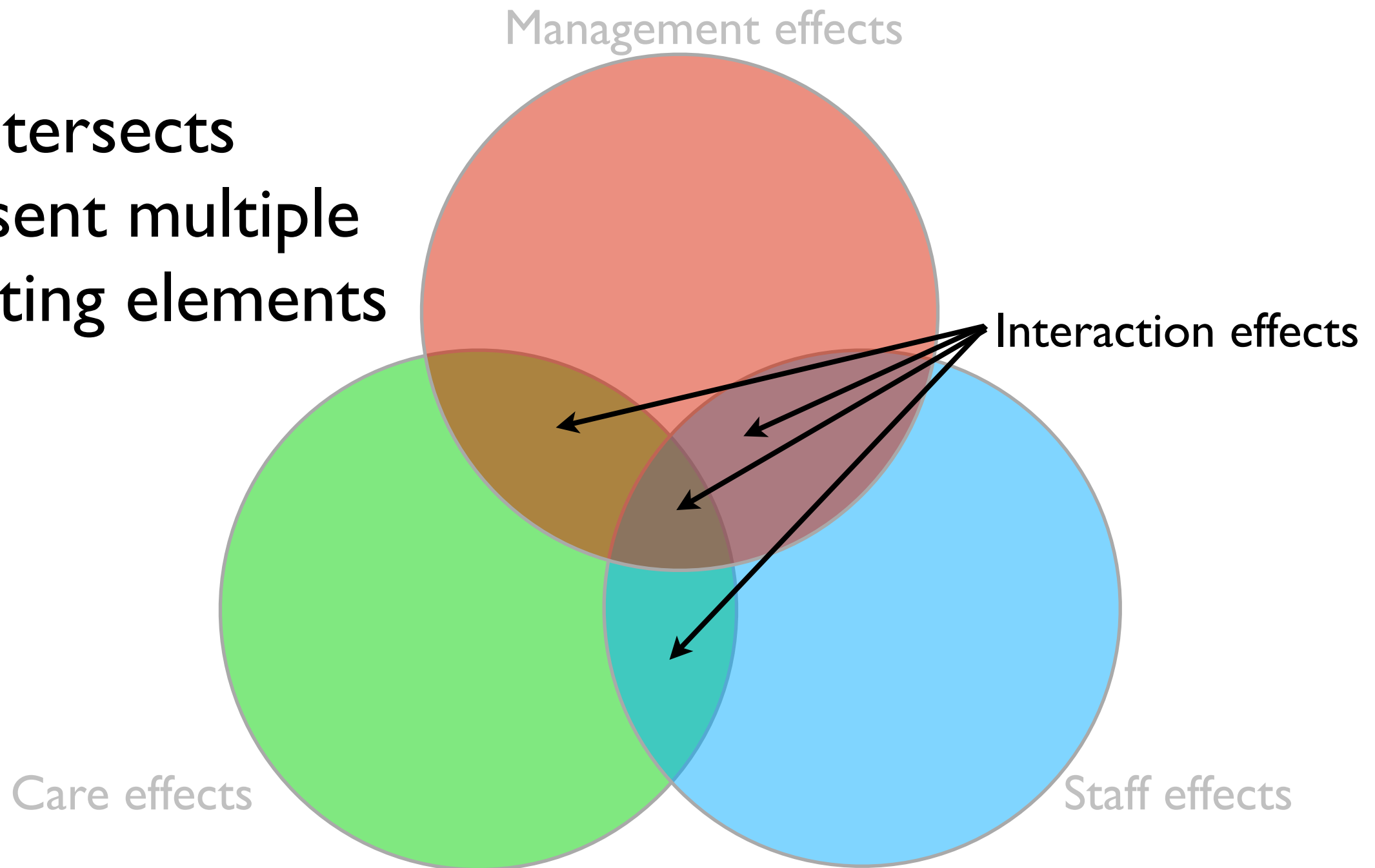
Complex Adaptive Systems

- “Systems with multiple elements adapting or reacting to the pattern these elements create.”¹

1. Arthur, W. B. (1999). Complexity and the economy. Science, 284(5411), 107.

Understanding complexity

**Intersects
represent multiple
interacting elements**



Part of an Open System

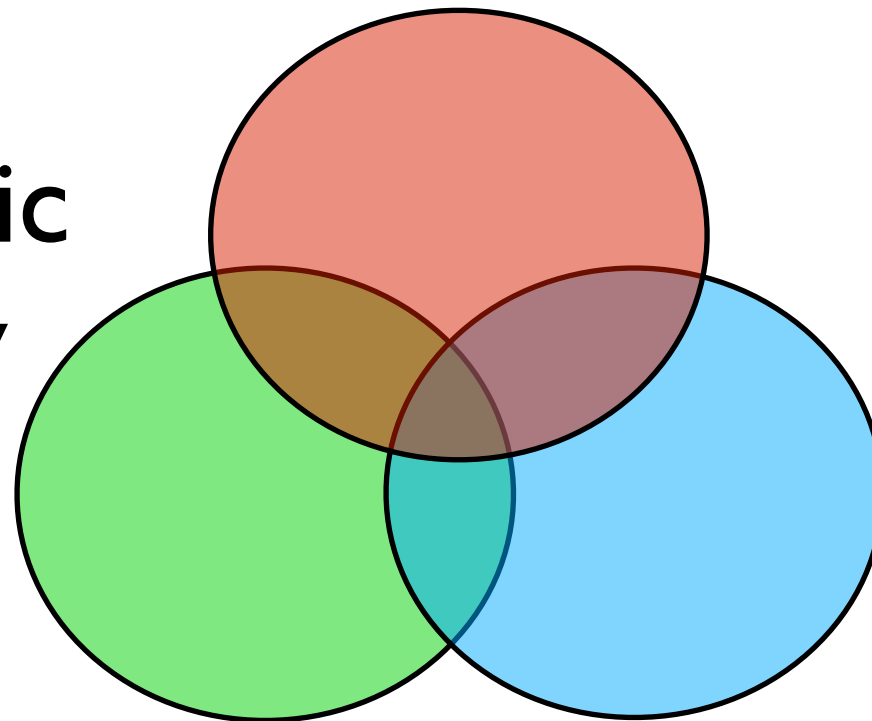
External forces*:

Political

Economic

Demographic

Regulatory



*In no particular order

Part of an Open System ...

External forces:

Political

Economic

Demographic

Regulatory

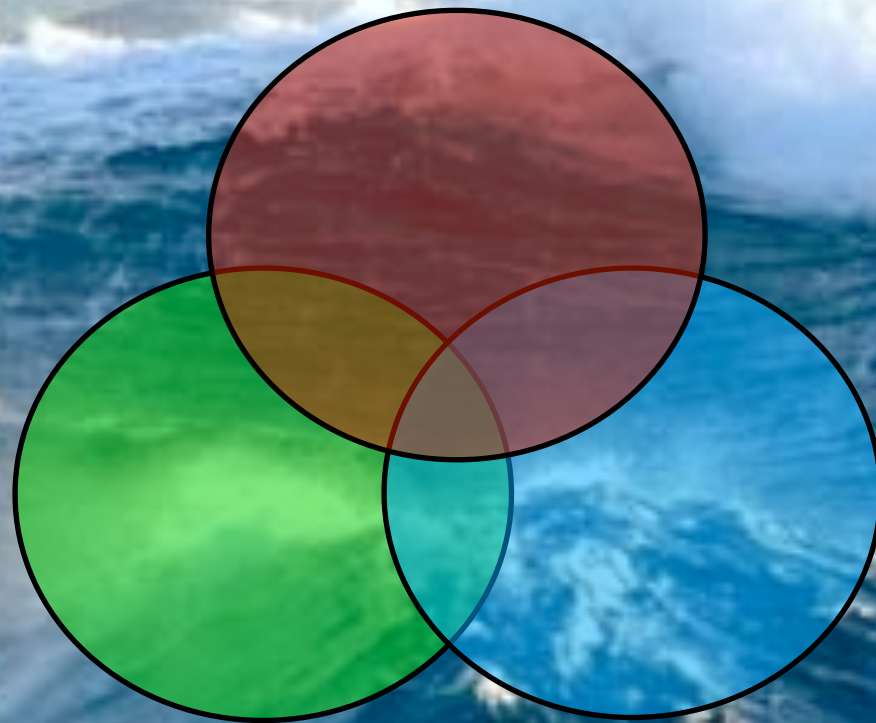


Image © National Geographic
Society

Constant inputs from somewhat unpredictable external forces

Part of an Open System ...

External forces:

Political
Economic
Demographic
Regulatory

Autonomous system
reacting to its environment



Image © National Geographic
Society

Constant inputs from somewhat unpredictable external forces

Complex systems are not in equilibrium

- Require a constant input of energy (aka resources) to retain their function
- Change introduction will increase resource use
- Energy use should plateau to an optimum post-change

Complex systems are not in equilibrium

- Understanding the flow of energy/resources
 - Helps us to optimise decision making

Is Aged Care eDoc Implementation complex?

- Is the process rational (i.e. purely governed by logic?)
 - i.e. Do we have a predetermined, optimum, logically derived set of objectives?¹
- Content versus Process - what we do versus how we do it?

1. After Macintosh, R, & Maclean, D. (1999) Conditioned emergence: A dissipative structures approach to transformation. *Strategic Management Journal*, 20(4), 297–316.

Examples of management systems governed by content:

Assembly lines
(Many) Call centres

Content driven systems:

Tasks are clearly defined

Tasks are determined by fairly rigid scripts

Outcomes are deterministic (Newtonian)

Some aspects of RAC are mechanistic.

Many are not.

RAC Duties

- Although tasks are clearly defined, the high level of personal contact with clients and colleagues introduces complexity
- Busy, demanding high productivity environment
- Residents are in final years
 - Frail and in pain.
 - Will die (“pass on”) at end of care.
 - Introduces requirement for high levels of sensitivity to workers’ environment.

RAC Duties

High levels of sensitivity require attention to
process *as well as* content
This introduces complexity and unpredictability.

Entropy?

- In thermodynamics, entropy is the measure of the uniformity of distribution of energy in a system.
- In information theory, entropy is a (statistical) measure of the content of a communication (and has a unit called *surprisal*!)

Entropy?

- Non-equilibrium system requires input of resources (energy).
- Nursing homes require input of resources through funding, staffing and resident throughput.

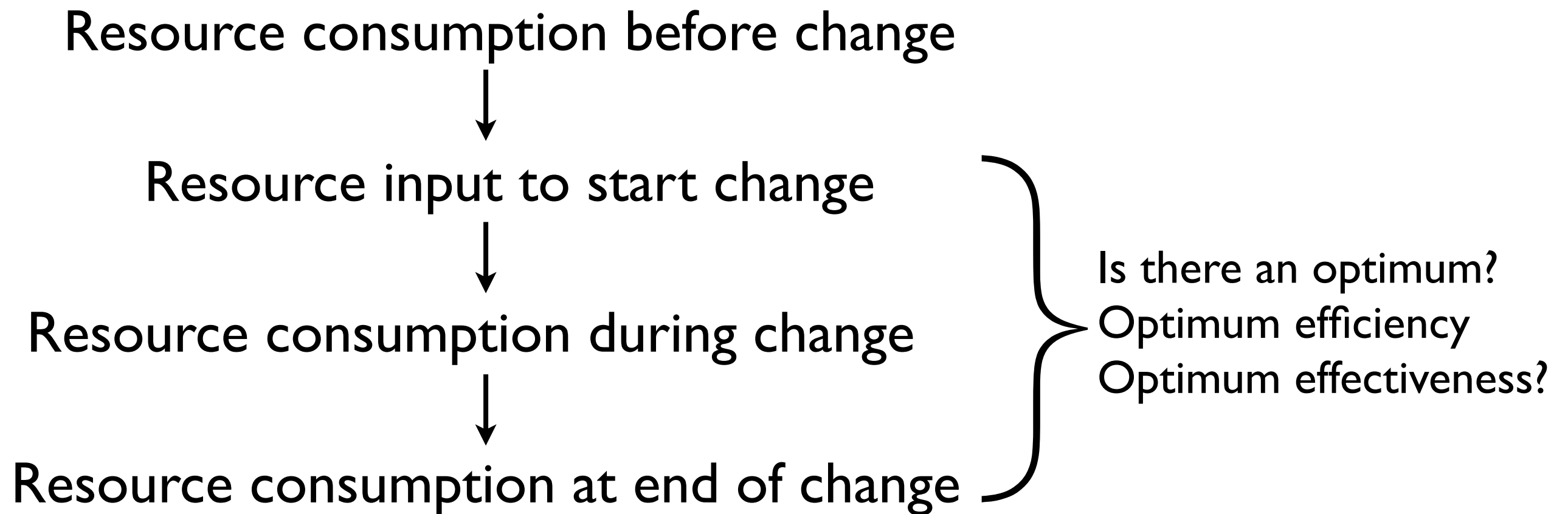
Entropy?

- Initial input of resources for implementation:
 - IT infrastructure
 - Training
 - Software use
 - Awareness
- } quasi-independent

Entropy?

- Resources are obtained from:
 - Funding
 - Staffing
 - Resident turnover
- Outputs:
 - Resident care

Entropy?



Why Entropy?

A useful metaphor/abstraction:

- As resources are consumed, results dissipate into the environment.
- The resources are consumed to a purpose
 - Not all resource allocation goes directly for intended purpose

Why Entropy?

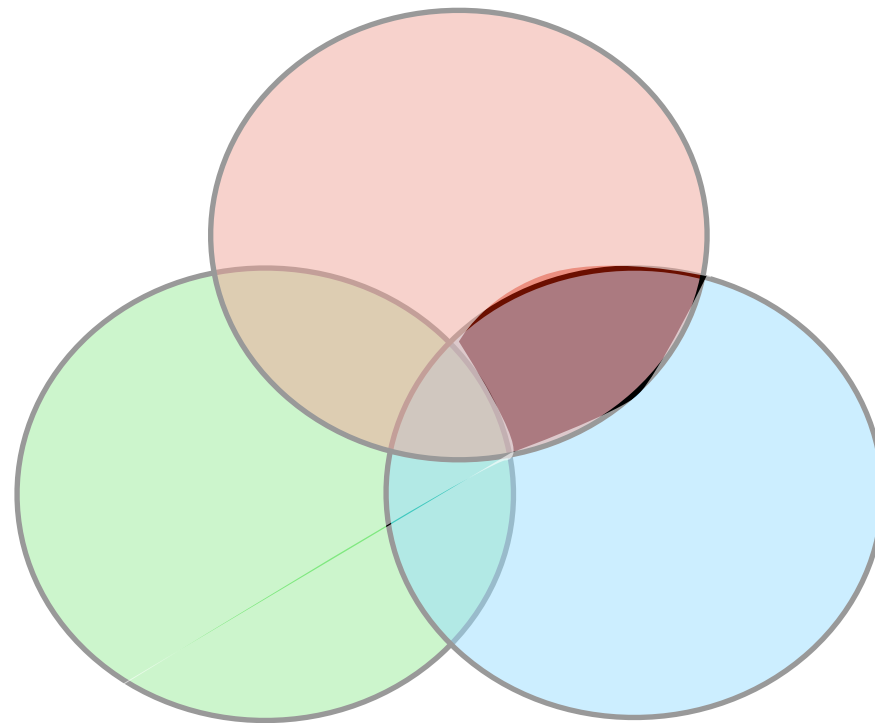
Can account for
phenomena before
during and after change.

Why Entropy?

A metaphor for use with the systems view.

An Example

Documentation strategy



Management/Carer interaction

Emergence of Nursing Documentation Specialist:

A change in resource use.

- Performs and co-ordinates assessments.
- Gathers data from electronic or paper system.
- Oversees and performs care planning.
- Reduces doc load on other staff.

Emergence of Nursing Documentation Specialist:

A change in resource use.

- Gathers data from electronic or paper system.
 - Requires other users' cooperation
 - And use of the system

Emergence of Nursing Documentation Specialist:

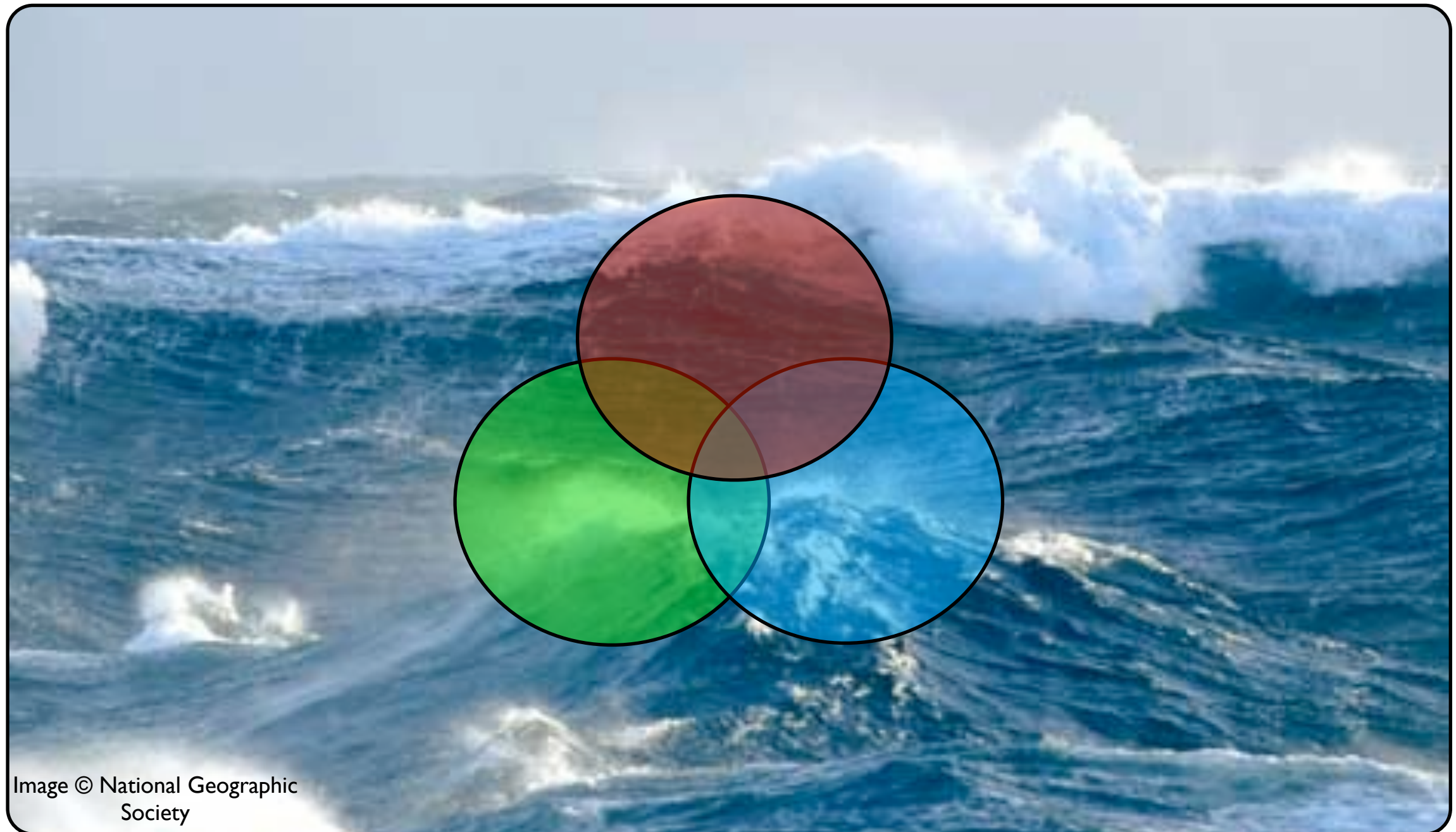
A change in resource use.

- Requires
 - working close to the floor
 - monitoring and delegation
- Alternative:
 - Can be split between managers and registered nurses.

Conclusion

- The complexity approach allows us to focus on the systems view of the organisation.
- Focuses on resource input required to maintain state.
- Allows us to identify and evaluate multiple competing factors
- May be amenable to scenario simulation.

Part of an Open System ...



Constant inputs from somewhat unpredictable external forces

Part of an Open System ...



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Understand how to maintain *appropriate* control
in an unpredictable environment

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