Why don’t information industries make a greater impact on care delivery?

Professor Terry Young, Brunel University

Almaden Institute, April 2010
How are we going to tackle this?

- History of Industry
- History of Healthcare
- History of Military

Scope opportunity for healthcare

Analysis & conclusions
Some background to the puzzle...

Sun Tzu

Stephen Rosen

Wallace Hopp & Mark Spearman

Gene Kranz

Florence Nightingale (e.g. biography by Mark Bostridge)

http://www.amazon.com/Art-War-Tzu-Sun/dp/0340276045#noop
http://www.amazon.co.uk/Failure-Not-Option-Thorndike-Bestsellers/dp/0425179877
http://www.amazon.co.uk/Winning-Next-War-Innovation-Military/dp/0801481961
http://www.amazon.co.uk/Florence-Nightingale-Woman-Her-Legend/dp/0670874116
“8. It is the rule in war, if our forces are ten to the enemy’s one, to surround him; if five to one, to attack him; if twice as numerous, to divide our army into two.”

(The Art of War p24)
By 1919 the Royal Navy had the first operational aircraft carriers in the world,” (Winning the Next War, p 96) BUT saw “its carriers sunk without gain in World War II.”

US War gaming 1920s/30s showed need for:

- Several carriers per fleet
- Lots of aircraft per carrier
- Engagement over hundreds of miles.
Doctrine & technology: An example

Sun Tzu

Codification & development of doctrine

Invention

Gaming

Doctrine & HR

Battle of Midway June 4-7, 1942

Doctrine & new technology: simulation & modelling are frequently used. Examples include:

- The tank
- The US Moon missions

Eventually process becomes embedded i.e. implicit

http://en.wikipedia.org/wiki/Aircraft_carrier
A potted history of process control

1911: FW Taylor’s 4 principles: (Factory Physics, p 29)

1908: Model T Ford

1950: WE Deming in Japan

Statistics-driven process improvement (Lean, 6Σ...)

Embedded process

Now

Years ago
A potted history of process control

- Sun Tzu
- Aircraft carrier
- Space race
- Military
- Business & commerce
- Healthcare

Years ago:
- 1962: EDS Founded
- 1972: SAP founded
- 1977: Oracle founded

Now:
- 1952: TJ Watson Jr president of IBM

Statistics-driven process improvement (Lean, 6σ...)

Embedded process

External links:
A potted history of process control

1850s: Florence Nightingale: statistics drive change after Crimean War

Years ago

Now

Embedded process

Military

Business & commerce

Healthcare

Statistically-driven public health

1850s: Florence Nightingale: statistics drive change after Crimean War

1,000

10,000

Sun Tzu

Aircraft carrier

Space race

10

100

Embedded process

Ford

Taylor

Deming

Watson

EDS

SAP

Oracle

Why do we need information?
A potted history of process control

- Sun Tzu
- Aircraft carrier
- Space race
- Embedded process
- Military
- Ford
- Taylor
- Deming
- Watson
- EDS
- SAP
- Oracle
- Embedded process
- Business & commerce
- Richard
- Nixon’s HMO Act
- 1973
- Evidence-based medicine
- Statistically driven public health
- 1948: Richard Doll & Bradford Hill – first RCT
- F Nightingale

http://www.bbc.co.uk/schools/famouspeople/standard/nightingale/index.shtml

Years ago

Now

10,000

1,000

100

10

Now
A potted history of process control

Years ago

- Sun Tzu
- Aircraft carrier
- Space race

10

Embedded process

Military

1,000

- Ford
- Taylor
- Deming
- Watson
- EDS
- SAP
- Oracle

10,000

1991: IHI (US)

Now

Statistically-driven public health

- F Nightingale
- R Doll & B Hill
- HMOs

2001: Modernisation Agency (UK)

Evidence-based medicine

Health

Why do information systems...?
1. How did healthcare lose a century’s lead in terms of statistically driven process management?

2. Why aren’t the information industries more productively engaged in the nascent healthcare process-management movement?

3. What role will silicon and simulation play in codifying practice?
Where are we?

Why don’t information industries make a greater impact on care delivery?

What?

How did healthcare lose a century’s lead?

Why aren’t information industries more involved in process?

What role for silicon & simulation?

Moving on...

First finding:

Silicon & simulation – in other sectors – developing, embedding & running processes
Why should the information & process control industry be interested?

Embedding & managing process as code, is where the community excels.

The concept of process is still emerging and so the dialogue is difficult.
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Process is a significant piece of the puzzle – tens of percent – of $2+T$!

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Why don’t information industries make a greater impact on care delivery?

Drivers

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Why aren’t information industries more involved in process?

Barriers

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History shows it is hard

How did healthcare lose a century’s lead?

What role will silicon & simulation play?

Nothing else on the horizon offers anything like the same impacts as process.
If this is right...

Things on the periphery

- Gisms
- Records
- Prescriptions
- Appointments
- Sensors
- Alarms
- Patient monitoring
- Self-diagnosis
- Getting rid of doctors
- Getting rid of staff

Ease up investing in

Core processes

- Clinical tools
- Scheduling
- Simulation
- Service tools
- Training systems
- All-party communications
- Process control & management
- Support systems for doctors...
- ...and other staff

"Why don’t information...?"
Example – National Joint Registry

Funded by product levy
Could have been bought by clinicians
Might have let an IT company into care provision

2002: Call for NJR.
2003: First data collected.
2010: Now managed by HQIP.

My suggestion: build a process tool for clinicians

http://www.njrcentre.org.uk/njrcentre/default.aspx
http://www.hqip.org.uk/national-joint-registry-njr
What have we been up to?

Funding: £12.4M (EPSRC + DH) + £1.2M from industry and other government.

Research into the value of medical technology to:
• Service providers
• Patients & users
• Industry

RIGHT: 2½ years from 2007
Funding: £1.1M (EPSRC). Now bidding for a ~£20M follow-on.

It looks at the role of simulation and modelling in service provision.
Tools for service improvement

If healthcare workers used simulation & modelling – how would they know what to use?

https://www.clinique.co.uk/wrfu/index.tmpl
I have a **QUALITY MANAGEMENT** problem which is at the **DEMAND FORECASTING** stage, and for which I now need to make some predictions that will provide me with a **STRATEGIC OVERVIEW**, and we are only looking for **TRENDS** at this stage. I have about **A MONTH** to design a nurse-led community service in support of people with diabetes. I have **NO BUDGET**, but our team of five is **EXPERT** in delivering this service. In terms of numbers, we can furnish some **GUESTIMATES** and we have some **RAW DATA**.

Modelling and Simulation Techniques for Supporting Healthcare Decision Making: A Selection Framework

6 Discrete Event Simulation

The operation of a system is represented as a chronologically-linked sequence of events in order to describe flows of people and/or material and explore the effects of any changes.

Discrete event simulation is best suited to analyzing systems that can be modelled as a series of queues and activities, for example, an Emergency Department or clinic. Individual patients are modelled as they pass through the system, allowing for variability and uncertainty in behaviour. This allows potential impacts to the system or patients to be estimated, and can help answer “what if” questions, before changes are made to the real system.

Main applications include:
- Systems design at operational strategic levels
- Scheduling, resource allocation, staffing, waiting list management and patient pathway design

Simulation Techniques

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<th>No.</th>
<th>Description</th>
<th>Time</th>
<th>Money</th>
<th>Knowledge</th>
<th>Data</th>
<th>Level of Insight</th>
<th>Type of Output</th>
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On Sale: http://www-edc.eng.cam.ac.uk/books/right/
Tools for service improvement

Eatock, J., Clarke, M., Picton, C. and Young, T. (Accepted Poster). Using simulation modelling to assist A&E departments in meeting the 4-hour target. HSRN / SDO Network annual conference: Delivering Better Health Services. Manchester Central, Manchester, NHS Confederation. 2nd-3rd June 2010

A model of A&E (ER)

Minors

Majors

Paediatrics

Resus

“Why don’t information...?”
Some insights

Process engineers would drive this back.

Clinicians focus on 4-hr glitch.

Managers fret over 4-hr breaches.

Length of stay (all patients)

- 0.00%
- 2.00%
- 4.00%
- 6.00%
- 8.00%
- 10.00%
- 12.00%
- 14.00%
- 16.00%
- 18.00%

- 00:00
- 00:30
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- 03:30
- 04:00
- 04:30
- 05:00
- 05:30
- 06:00
- 06:30
- 07:00
- More

- actual
- model
Tools for service improvement

Cost to healthcare provider (£)

Health Benefit (Extra QALYs)

Willing to pay a lot for more benefit

Willing to pay a little for more benefit

Cheaper but worse

More expensive and worse

Cheaper and better

An economic view of the clinical value of technology

Tools for technology providers


The interface between business service & technology

Girling A, Young T, Brown CA and Lilford R (accepted) Early-stage valuation of medical devices: the role of developmental uncertainty Value in Health

New go-to-market strategies

Supply side

Investment, pricing, etc

Demand side

Bayesian framework for evidence gathering

Early routes to market

One-off decision (NICE, reimbursement, licensing?)
The key challenges

- Data conundrum – loads collected, little of use
- How would users really use it?
- Wrap-around business models & RoI:
  - for healthcare providers
  - for vendors
  - for all payors

- New methods as needed (boundary conditions tricky)
- Trial products & services.

(New global market: $10-100Bn pa?)

 “…and we’re recruiting professors”
Some contributions

Why don’t information industries make a greater impact on care delivery?

How did healthcare lose a century’s lead?

Why aren’t information industries more involved in process?

What role will silicon & simulation play?

We’ve created some tools to see

There is a lot more research to do!
How did healthcare lose a century’s lead?

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Clinico-business & service models

Let’s work together!

We’ve created some tools to see
Thanks to MATCH & RIGHT teams & others for help

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Thomas Jun
Jonathan Klein
Jasna Kuljis
Richard Lilford
Jo Lord
Bo Lu
Jen Martin
Arthur Money
Steve Morgan
Zoë Morris
Aisha Naseer
Brijesh Patel
Sally McClean
Brian Meenan
Steve Morgan
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Sarah Sharples
Sarwar Shah
Jeshika Singh
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Simon Taylor
Peter Wells
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Hywel Williams
Lily Yao
JiHee Youn

Sadly, the mistakes are mine!