Performance Efficiency and Productivity: key issues and some case studies

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Performance Management

• Simple view
  – Measures
    • Data
    • Rules and definitions
  – Analyses
  – Evaluation and management

• Both internal and external influences
  – Decision on the performance area
  – What’s inside and what’s outside
Most of my work focuses on a Basic Process or Activity

Find that this basic process is fundamental to many areas including performance measurement and management accounting
Basic building block – the process
Control system

Performance
Norms

Inputs → Activities → Outputs

Measurement
The Evaluation system

- Plans
  - Performance Norms
    - Resource Utilisation
      - Inputs
        - Activities
          - Outputs
            - Outcomes
              - Measurement
                - Evaluation
Types of performance measures

- Measures of the process
- Inputs, outputs and outcomes
- Environmental or contextual factors
- Decomposition of the B/C ratio

\[
\frac{B}{C} = \frac{B}{OC} \times \frac{OC}{O} \times \frac{O}{I} \times \frac{I}{C}
\]
Value for money and the three E’s—back to outcomes, outputs and inputs
The problem of outputs

• “What, then, are the products of a large hospital, whether in the forms of healed wounds, healthy babies, faithful nurses, promising young surgeons and physicians, or in the more abstract forms of original ideas on pathology or treatment, model methods of administration, or such intangible things as enthusiasm and ideals?”

“The original goal was to facilitate hospital management and financing by providing a system for classifying acute care patients that would allow hospital performance to be measured and evaluated.”
Case Mix:

• Commenced in 1967 and continued into the 70’s
• Some major criteria
  – Clinically meaningful
  – Homogeneity of resource consumption
• In New Zealand in earlier work, we used AN-DRGs and the Victoria Case weights
• Have since developed NZ case weights for purchase units
Some selective dates

• 1988 Gibbs Report – a principal deficiency was lack of price information
• 1989 Public Finance Act
  – Around this time purchaser provider split
• 1990’s RHAs => THA => HFA
• 1997 Deficit switch
• 1998/99 Pricing framework
• 2001 National Pricing Framework (2003/4)
• 2008 Business Roundtable Report
Business Roundtable Key results

• Real cost per unit of output increased 18% over 1998 – 2006 (11% if use DRGs only)
• Ave labour productivity declined 8% over the period– (15% medical, 11% nursing)
• Ave personnel cost increased 16%
• *The indicators of productivity in NZ’s public health sector are reason for concern . . . . .” – Scott*
Can we ignore productivity, performance and the three E’s?

• No!
  – If we do ignore them, someone else will do it, e.g.
    • Business Roundtable
    • Treasury

• We need to set the rules of our game and define and measure performance in our models and in our terms

• But some areas do not currently have well specified outputs (and outcomes)
Homecare Research

Three stages

• I – identify products
• II – cost products
• III – calculate case weight index based on relative costs
Supplier attributes
Two clients – different needs
Product concept

• Product is the nexus or intersection of client and supplier attributes

• Some client needs not met by supplier – opportunities for co-creation

• Some supplier offerings not needed by client
  – Possible education (e.g. Software)
  – Re-evaluation of supplier offerings (value and non-value added)
Homecare Preliminary Results

• 5+1 products for non-complex
• Still working on the complex with between 12 to 18 products
• Will probably move to merging these into smaller groups making use of similar notions such as CCL in DRGs.
• Can now look into measuring productivity using products and investigating standardised packages of care
Productivity and efficiency

• Productivity = ratio of a producer’s output to its input
  – Easy if only a single input and output
  – If multiple inputs and outputs then need an economically sensible method of aggregating
• Can then examine possible reasons for fluctuations in productivity
  – But there is a conflict between conventional theory and those who seek to measure (in)efficiency.
• Efficiency – max output or min input given respective inputs and outputs
Graph single output ($Y$) & input ($X$)
Regression (Average) – fluctuations are noise

Regression line note average performance
Can distinguish between constant (CRS) and variable returns to scale (VRS)
Or we allow for inefficiency

Best performance – not average
See firms below / above these curves
Organisation A in time 1 and time 2. How has performance changed?
A has become more efficient under CRS
Due to:
- better process efficiency
- change in environmental factors
- other??

A is technical efficient under VRS in both years but has moved to become scale efficient

The frontier has shifted due to changes in technology
Major types of efficiencies

• Technical efficiency – most productive scale size - CRS
• Scale – increasing, decreasing
• Allocative efficiency – if you know the output prices or input costs can calculate the
  – Maximum revenue mix
  – Minimum cost mix
Technical and Allocative Efficiency

Technical and Allocative Efficiencies from an Output Orientation
Methods (TFP)

• Total Factor Productivity

\[
\frac{\sum \text{Output}_i \text{Input}_j}{\sum \text{Input}_j} = \frac{\text{Output}_1 \text{Input}_1 + \text{Output}_2 \text{Input}_2 + \cdots + \text{Output}_n \text{Input}_n}{\text{Input}_1 + \text{Input}_2 + \cdots + \text{Input}_n}
\]

– Need to have prices of outputs \((p)\) and costs of inputs \((w)\)

– Doesn’t give you inefficiencies

– Very commonly used method
**Methods: Stochastic Frontier Analysis (SFA)**

\[
\ln y_i = \alpha + \sum_{k=1}^{k=K} \beta_k x_{ik} + [v_i - u_i] \quad i = 1 \ldots n
\]

Have a decomposed error term

\[
\varepsilon_i = v_i - u_i
\]

\(v\) is an identically distributed conventional two-sided error term with zero mean.

\(u\) is an identically distributed one-sided error term with a non-zero mean. It stands for inefficiency.

\(u\) is typically assumed to be exponential, half-normal or truncated normal.
Methods: Data Envelopment Analysis (DEA)

\[
\begin{align*}
\text{max} \quad z_0 &= \frac{y_0^x u}{x_0^x v} \\
\text{s.t.} \quad \frac{y u}{Xv} &\leq 1 \\
&\quad u, v \geq 0
\end{align*}
\]

- Non-parametric method
- The unknowns to be solved are the weights \( u \) and \( v \) (comparable to \( p \) and \( w \) in TFP)
- Solve it using linear programming
- Each unit evaluated can have different weights
Cost and performance can be complementary

• Activity based costing (ABC) models can inform production models about appropriate inputs and outputs

• Production models can provide composite scores which can be explained by reference back to the detailed ABC models

• Study on immunisations found
• Size effect on efficiency and time taken in primary activities
• More inefficient practices associated with lower levels of deprivation
• More efficient practices spend less time in claims and GP time
  – Late immunisations are a pain!!
Summary

• Sector must control its own destiny
  – Can’t ignore productivity and performance measures and measurement
  – Take ownership of these activities
    • Bottom up efforts plus top down support
• Lots of good tools plus lots of data equals some new and powerful insights into potential opportunities
• Work needed on developing meaningful measures for more non-inpatient areas