

Introduction

Efficiency ratios offer an easily calculated, simple to understand, neutral, cross organisational method to review key SCE performance metrics. They can be used to review operational efficiencies in a number of circumstances where traditional metrics may not perform optimally.

Efficiency Ratio

Task efficiency ratio e_{tsk} is defined as

$$e_{tsk} = a_{tsk} / p_{tsk}$$

where p_{tsk} is the planned task value, and a_{tsk} the actual task value. For example:

- dataset development efficiency (versions) ^[q]

$$e_{ds} = a_{ds\text{-versions}} / p_{ds\text{-versions}}$$

$$= 3 \text{ versions required} / 2 \text{ versions planned} = 1.5$$

- specification time estimation (task-hours) ^[c]

$$e_{spec} = a_{spec\text{-hrs}} / p_{spec\text{-hrs}}$$

$$= 20 \text{ hours to complete} / 16 \text{ hours planned} = 1.25$$

- task-completion efficiency ^[t]

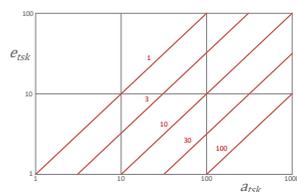
$$e_{spec2ds} = a_{spec2ds} / p_{spec2ds}$$

$$= 14 \text{ days elapsed} / 7 \text{ days planned} = 2$$

Target Efficiency Ratio

In all cases the optimum target ratio (best operational efficiency) is 1 (or <1), regardless of the absolute values or the units of measurement.

Approaching-Exceeding 1.0



Graph of e_{tsk} vs a_{tsk} showing the relationship between the rate of approach to $e_{tsk} \leq 1$ for values of p_{tsk} between 1 and 100

Example-1: Training Progress

Metric:

Planned vs Actual No. of Code Reviews
or
Expected vs Actual Completion Time

ER Ranges:

$$e_{\text{initial}} = 1.4 - 1.6, e_{\text{target}} = 1.2 - 1.3$$

ER Example:

$$e_{\text{initial}} = 6/3 = 2, e_{\text{week1}} = 4/3 = 1.25$$

Example-2: Study Programming

Metric:

Planned vs Final No. of Study TFLs

ER Example:

Study 1: $p_{\text{TFL}} = 42$ (from Protocol & SAP)

$$a_{\text{TFL}} = 57$$

$$e_{\text{TFL}} = 57/42 = 1.36$$

Study 2: $p_{\text{TFL}} = 98$ (from Protocol & SAP)

$$a_{\text{TFL}} = 135$$

$$e_{\text{TFL}} = 135/98 = 1.37$$

Example-3: Combination Ratios

Ratios can be combined to give overall efficiencies e.g:

Combine a Quality,
Cost & Duration measure



ER Example:

CRO Efficiency

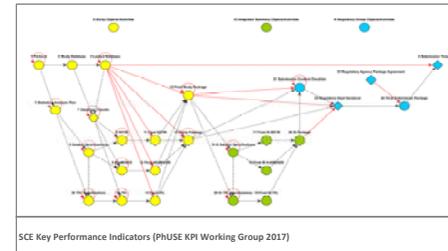
Required vs Accepted Datasets (Quality)

Contract vs Invoiced Value (Cost)

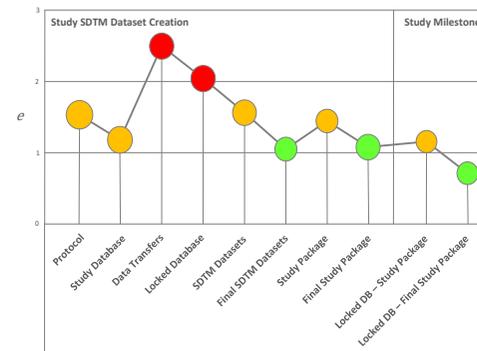
Planned Duration vs Time to Signoff (Time)

$$(36/30 + \text{£}15200/\text{£}15000 + 42\text{d}/28\text{d})/3 = 1.24$$

Example-4: Process Efficiencies



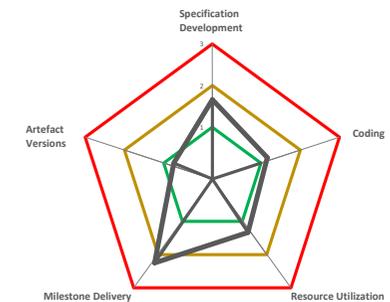
The schematic above shows the proposed phase-I metrics development by the KPI Working Group to support SCE operations, and shows the set of key artefacts and relationships required to report and submit a clinical study. The diagram shows quality and time metrics (as 'versions', and 'from-to' for products)



An example of the overall individual efficiencies of each task providing input to, and subsequent of SDTM datasets, is shown. In this case, it shows that many more data transfers then were planned occurred, and that the database had to be unlocked to, presumably, resolve data issues found during the SDTM step, however study package work thereafter was not significantly compromised.

Example-5: Department Operations

The radar chart below shows an example of how efficiency ratios might be presented to support SCE operations. Five related but independently measured metrics are shown giving an immediate overview of the 'state of the union'. Here it would appear coding, final outputs and programmers' time is optimal, weaker specification efficiency may be the cause of the poor milestone delivery.



Discussion

Efficiency ratios offer a useful alternative to standard performance metrics for reviewing the operational effectiveness of the SCE. They can be applied ubiquitously, are easy to interpret, and provide a neutral method to compare between operations or organisations.

In combination they can be used to summarise efficiencies based on otherwise disparate measures, for example, to review effectiveness over the whole study lifecycle using a common set of metrics such as those being developed by the PhUSE KPI initiatives.

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