Measures of Efficiency and Effectiveness as Indicators of Quality – A Systems Approach

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Abstract
The focus of this paper is to examine the systematic use of benchmarks for evaluating educational efficiency and effectiveness and a good practice model for system implementation. Put in the simplest terms, ‘Efficiency’ is a measure of the work-rate of a process by which system inputs are turned into system outputs. ‘Effectiveness’ on the other hand is considered to be a measure of the ‘quality’ of the outcomes being achieved by the system. This paper argues that effectiveness can really only be defined through the application of some qualitative ‘fitness-for-purpose’ criteria – and that together with some key efficiency measures, these indicators can be used as proxies for the measurement of quality. The paper looks at work being done at Swinburne University of Technology Australia, which uses a combination of ‘criterion reference’ and ‘quantitative’ benchmarks to measure both efficiency and effectiveness, in a planned program of institutional self-review.

Definitions


Benchmarking
A process of assessing performance against some stated criteria or a known measure (benchmark). Benchmarks may be quantitative or qualitative.

Efficiency
The relationship between the results achieved and the resources used. Refers to the cost in relation to the outcomes achieved. It is rarely possible to describe in absolute terms. One process is ‘more efficient’ than another if it achieves the same outcomes at lower cost.

Effectiveness
The extent to which planned activities are realised and planned results achieved. A process is effective if its outcomes match the stated goals. Effectiveness is therefore similar to ‘quality’.

Quality
The degree to which a set of “inherent” characteristics fulfils requirements. This is usually defined in a more shorthand way by the term ‘fitness-for-purpose’.

Note 1
The term “quality” can be used with adjectives such as poor, good or excellent.

Note 2
“Inherent”, as opposed to “assigned” means existing in something, especially as a permanent characteristic.
System
Is a set of related or interacting elements. But not just any aggregation of elements will do - a 'system' must be more than just the sum of the parts; and it must serve a purpose that is useful from a system user’s point of view. This is why a good quality system is a feedback-controlled system.

Several years ago I was involved in a benchmarking project entitled: ‘Benchmarking for Educational Effectiveness in VET’ (Vocational Education and Training i.e. TAFE - Technical And Further Education).

We had completed the measurement part of the benchmarking by comparing various ‘at-start’ and ‘at-finish’ measurements of student satisfaction between different Electronics training providers. The results were very encouraging for my organisation. Not only did it indicate that overall student satisfaction with the quality of teaching was higher at Swinburne than our benchmarking partners, but our ‘at-finish’ performance improved, while that of our main competitor actually went backwards!

I took this as proof of us achieving greater educational effectiveness – ‘quality’. When I proudly showed the benchmarking results to the then Director of the TAFE Division, he said, ‘yes, that’s all very well and good, but that’s not how you measure quality – you measure it by looking at the module completion rate, because that is how we are funded.’

How could it be that we both had totally different definitions of what constituted quality?

It turned out that our TAFE Electronics teaching area had a much lower module completion rate (throughput) than our main competitor. It then struck me that what the Director called ‘quality’ was a measure of ‘institutional efficiency’, but what I had defined as ‘quality’ was really a measure of ‘educational effectiveness’!

The language of quality is always slippery, and especially so in the area of its measurement and assessment. ‘Efficiency’ and ‘Effectiveness’ are commonly used as if they were completely interchangeable terms, and are often used as proxies for the more holistic concept of ‘quality’ - but that’s not exactly how it should be either. If you haven’t already done so, please read and reflect on the technical definitions of these terms at the start of this paper. It is perhaps self-evident that ‘Efficiency’ lends itself to quantitative measurement, while ‘Effectiveness’ requires the application of some qualitative criteria, but I will argue that evaluation of the holistic concept of ‘quality’ requires that we do both, and more.

In a paper presented to ‘The End of Quality’ seminar held at Birmingham, UK in May this year, a Swedish academic (Giertz 2001) made the observation that on ‘quality’, there were in fact:

‘Three perspectives: (1) intrinsic quality, (2) extrinsic quality, and (3) politically correct quality (that) are related to the three groups of key stakeholders – the academic community, the market and the state. Each perspective has to be well defined and clearly described in order to reveal points of agreement and disagreement, thus providing a useful starting point for negotiations about a common platform for quality work.’

In other words, according to Giertz, what I was really interested in was ‘intrinsic’ quality, but what the TAFE Director was interested in was ‘extrinsic’ or even ‘politically correct’ quality.

The academic community, though mostly interested in ‘intrinsic’ quality, and less so in the others, sometimes find the contending concepts of ‘Efficiency’ and ‘Effectiveness’ to be just as problematic. Take for example this comment by an Australian academic (Sawyer 2001):

‘Because university performance indicators focus on throughput ratios there are significant incentives to graduate students in minimum time. Low failure rates are seen to represent efficiency rather than a decline in standards.’
So, according to Sawyer, a supposed measure of system efficiency, it is argued, may even mask what is really happening in terms of system effectiveness!

Can we ever hope of really coming fully to terms with these problematic concepts?

Put in the simplest terms, ‘Efficiency’ is a measure of the work-rate of a process by which system inputs are turned into system outputs (i.e. ‘the relationship between the result achieved and the resources used’). ‘Effectiveness’ on the other hand is considered to be a measure of the ‘quality’ of the outcomes being achieved by the system, when quality is defined as ‘the degree to which an inherent set of characteristics fulfils requirements’ – or, is ‘fit-for-purpose’, (i.e. ‘the extent to which planned activities are realised and planned results achieved.’). But I reckon quality has got even more to it than that.

For example, just as in a motor car, the fuel consumption (performance) figure is used as a proxy for ‘engine efficiency’ [i.e. fuel used (input) versus distance travelled (output)], in an educational system, an ‘institutional efficiency’ indicator would be the measurement of ‘throughput’ or ‘student wastage,’ IE a measure of attrition or non-completion - the ‘student drop out rate’, with enrolments as the input, against graduations as the output, giving (say) the ‘module completion rate’ as a purely quantitative measure of system efficiency!

But as important as it may be for judging a car engine’s efficiency, such efficiency measures by themselves tell us nothing, or next to nothing, about the actual quality (inherent nature) of ‘the journey’, i.e. The ‘journey’ as planned, and as experienced by those involved. How much did the occupants ‘enjoy’ looking at the scenery on the way? What did the car’s suspension ‘ride’ like? How ‘comfortable’ were the seats? How ‘tired’ or ‘refreshed’ they felt at journey’s end? Etc. All the words in parenthesis are words about the concept of ‘qualia’ – that is, of our direct experience, of our perception of the essential nature of things. It is this dimension that distinguishes the concept of ‘quality’ from mere performance measurement, and ensures that efficiency measures, no matter how useful they may be can only ever be proxy measures for quality.

After all, a car (or ‘automobile’) is really nothing more than a relatively simple system developed for the purpose of transporting people (a fitness-for-purpose definition). But the same basic principles apply when trying to measure the ‘qualia’ of a student’s ‘educational journey’ through the much more complex systems of a university or an educational system. But, complex systems create problems of their own for university managers and academics alike, as the following indicates (Harrington et al, 2001):

‘Research indicates that systems with an order of complexity as small as just three elements, with two interconnections per element, can produce chaotic behaviour. In terms of product or organisation, this means unexpected behaviour, (good or bad), unintended consequences, and unpredictability.’

In the article, the authors go on to make the following insightful observation:

‘Most managers today are singularly ill equipped to deal with complex systems, whether that system is the organisation or the products it produces. The root of the problem is the way we are trained to think about problems. Our basis for solving problems is reductionism and analysis. In other words we break the system down into smaller elements that can be easily analysed, rather than into a larger entity that cannot. There is a small problem with that approach: the very interrelationships and connections that make the system behave as a system are lost in the breaking down. You can analyse tyres, engines and transmissions forever and not come up with the system “automobile” or its emergent property of transportation. Without an overarching way of looking at the system, there is little possibility of understanding it’.
So, a systems view of quality is much more than just the drive to achieve certain outcomes at a lower cost. It is a complete way of thinking that invites us to consider the effects of complexity theory, the likelihood of chaos, and to even embrace the prospect of any ‘unintended consequences’ and ‘unpredictability’. In some quality circles I know of, these ideas would be taken as heresy!

Evaluating ‘educational effectiveness’ therefore must involve the measurement of educational outcomes through the application of some stated ‘qualia’ or quality criteria to give it a qualitative dimension. To identify the factors that caused students to discontinue their studies. To measure the level of graduate employment or further study resulting (i.e. the level of ‘positive’ graduate outcomes); to measure student ‘satisfaction’ with the quality of the teaching that they experienced in their chosen course; or to ask how ‘enjoyable’ they found their experience of campus life to be.

What then would be a useful set of proxy measures to systematically evaluate an educational system’s efficiency and its effectiveness - to try to measure the achievement of ‘quality’ as described above?

At Swinburne University of Technology Australia we have developed a systematic approach to reviewing quality on a ‘whole-of-organisation’ basis. In essence the Swinburne Quality Review System (SQRS) involves:

- Putting the review of quality into a strategic planning framework (see Attachment A)
- Developing a strategic quality review program (see Attachment B)
- Having a set of 20 (twenty) process standards, and 70 (seventy) quantitative and qualitative benchmarks for the measurement of quality (see Attachment C for a complete list of the benchmarks for each Process).

The majority of the SQRS benchmarks were drawn from ‘Benchmarking – A manual for Australian universities’, but some were produced locally following the ‘McKinnon’ model. McKinnon et al (2000) distinguished between two basic categories of benchmarks in Tables 1 and 2. There are three types of benchmark in each category: ‘Lagging’, ‘Leading’; and ‘Learning’.

Table 1 - ‘Quantitative’ – which distinguish normative and competitive levels of achievement by purely quantitative means. For example:

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<tr>
<th>Process / Element</th>
<th>Measure</th>
<th>Type of Benchmark</th>
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<tbody>
<tr>
<td>Financial Management / External Debt</td>
<td>Ratio of annual principal &amp; interest repayments to total annual revenue – a ratio of 5-10% is considered ‘average’ and below 5% considered ‘good practice’.</td>
<td>‘Lagging’ – i.e. is a measure that tells us about past performance</td>
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</table>

These kinds of benchmarks are suitable for measuring institutional efficiency. ‘Lagging’ benchmarks tend to predominate in this category.
Table 2 - ‘Criterion Reference’ – which defines the attributes of good practice in a functional area, usually by combining a quantitative measure with a qualitative description - the specification of some criteria or a standard. For example:

<table>
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<tr>
<th>Process / Element</th>
<th>Measures</th>
<th>Type of Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Teaching / Student Satisfaction</td>
<td>A profile of course experience questionnaire scores in most fields of study equal to the average in each dimension, and reaching higher scores in some. Evidence of support and remedial action to improve low scores. Sub-set information extracted for international students and acted upon in international student program. (‘Average’)</td>
<td>‘Learning’ – ie is a measure of the rate of change of performance</td>
</tr>
</tbody>
</table>

These kinds of benchmarks are more suitable for measuring educational and administrative effectiveness. ‘Leading’ and ‘Learning’ benchmarks are particularly useful in this category.

Lindsay (1992) distinguished between two distinct approaches to quality:
- ‘Production-measurement’; and
- ‘Stakeholder-judgement’.

The ‘production-measurement’ approach treats quality as a synonym for ‘performance’ and discussion revolves around the definition and measurement of resources and outcomes (note the similarity to the definition of efficiency).

> ‘Whatever variant of a systems model is employed, the notion of “performance” or “quality” that is employed usually relates to measures of those elements of the transformation of production process that can be readily quantified. Measures may be simple magnitudes such as “the numbers of graduates” or complex indicators such as completion rates, student staff ratios, or publications per staff member.’

The ‘stakeholder-judgement’ approach on the other hand involves a more holistic concept of quality, with different and sometimes competing discourses, and with a variety of different stakeholders involved in the making of judgements about quality – about what actually constitutes ‘poor’, ‘good’, or ‘excellent’. These characteristics lead Lindsay to conclude:

> ‘In this approach any equating of simple quantitative measures with quality is rejected and instead, reliance is placed on a wide variety of measures and in reaching global assessments from a diverse array of information, both quantitative and non-quantitative’.

Lindsay goes on to disparage the value of us using simple ‘systems models’ in higher education because they usually involve using the ‘production-measurement’ or ‘quantitative’ approach. But, remember a characteristic of ‘a system’ (and especially a complex one) is that it is more than just the sum of the parts, and that it must serve some good purpose from the user perspective.

So, what if ‘the system’ itself is based on the very same principles as Lindsay’s ‘stakeholder-judgement’ approach to quality, and to use Lindsay’s own words, uses ‘a wide variety of measures to reach global assessments from a diverse array of information, both quantitative and non-quantitative’
I would argue that even at the risk of introducing an element of system complexity into the approach, such a ‘systems approach’ is infinitely superior to any that misses the most important point about what quality really is – the search for the essential (‘inherent’) character of things. In the interestingly titled work ‘The Case Against ISO 9000’ Seddon (2000) makes the following insightful observations about the importance of managers adopting a systems perspective:

‘People’s behaviour is governed by the system they work in. In turn, the system is governed by the prevailing management thinking. Interestingly, this helps us understand why so many programs of change fail. When they fail it is generally because the attempt was non-systemic —there was no change to the system and, by implication, no change to management thinking.’

And

‘A system is a whole made up of the parts. Each part can affect the way the other parts work and the way all parts work together will determine how well the system works.’

And

‘A systems view of an organisation starts from the outside-in. How does the organisation look to its customers? How easy is it to do business with? The focus is: how well does the system respond to the demands made on it by its customers?’

And, finally

‘Improvement begins with understanding the organisation as a system.’

**A Good Practice Model for Continuous Improvement of Quality**

Consistent with the description of a qualitative approach, I will close the paper with a brief description of the main features of a good practice ‘systems’ model. It’s one that uses a combination of quantitative measures and qualitative information to try to capture both institutional efficiency and educational effectiveness in a systematic manner.

The SQRS approach to continuous organisational improvement is characterised by the following features:

1. **Alignment of the review of quality with the organisation’s strategic mission** through its ‘five strategic themes.’ Each theme has a ‘Strategic Driver’ who is responsible for the selection of relevant processes for review. The strategic themes and their drivers follow:

   - The Entrepreneurial University – Vice-Chancellor & Deputy Vice-Chancellor;
   - The Research Intensive University – Pro Vice-Chancellor, Research;
   - Globalisation – Vice-President;
   - Flexible Learning & Teaching – Deputy Vice-Chancellor, Learning & Teaching;
   - The Intersectoral Advantage – Chair of the Intersectoral Advisory Committee. (a sub-committee of the University’s Joint Planning Committee).

2. **Integration of the review of quality with the University’s developing Foresight & Planning & Performance Reporting processes.** Together with 1 above, this encourages a more ‘global assessment’ of the University’s organisational performance.

   See Appendices A and B for diagrammatic representations, and note 3 below.

3. **Seeing the organization as ‘a system’, and having a ‘process-based’ approach to the review of quality**, relying on Self-Assessments by designated ‘Process Owners’, using a combination of quantitative and qualitative criteria and measures for each of the 20 Processes that comprise ‘the organization as system’, and validation of self-assessment outcomes. The value of having a ‘process-based’ approach to quality improvement is explained in the following excerpt from the AUQA Audit Manual (2001):
‘In order to check its own policies, procedures and practices, to learn whether it is achieving its objectives, and to determine how to improve its performance, an institution or agency must have in place appropriate measures and indicators of both quantitative and qualitative form. Measurements give information about individual items (i.e. ‘elements’), but also about processes. The process information is often more important because individual item information is about the past and present, whereas it is the process information that provides indications for the future. For this reason AUQA emphasises process-based audit, with outcomes providing information on the effectiveness of the processes’.

See Appendices B & C for details.

4. Harmonisation of the in-house quality review program for continuous improvement, and ‘self-review’ - as required for external audit by the Australian Universities Quality Agency (AUQA) for validation.

To conclude on this note, here is another statement drawn from the AUQA Audit Manual (2001):

‘A self-review is not an end in itself, but a means to an end, namely that of improving the institution. The Australian Quality Awards Criteria recognize this by explicitly including improvement as one of the four steps in self-assessment (Approach, Deployment, Results, Improvement: Australian Quality Council, 1998). Even when the proximate reason is preparation for external review, more comprehensive internal improvement can flow from it if explicit attention is paid to implementing the recommendations for improvement that arise from the self-review.

Furthermore, the self-review process is likely to be a learning activity for members of the committee and other members of the institution, resulting in a broader understanding of the institution’s activities in, and the environment for, the subject for the review. It is a common observation of those involved in planning that its main value results from the insights participants gained during the process, rather than from the documents produced. A self-review often reveals significant ignorance or differences in interpretation within the institution. If this occurs, discussing such differences and reaching a workable synthesis of views is an invaluable outcome of the self-review as an enhancement ‘side-effect’, regardless of the main purpose’.

So, even within the strict ‘fitness-for-purpose’ definition of quality adopted by the AUQA, it appears that there is still some room for ‘unintended consequences’ and ‘unpredictability’ – and for serendipity (that is ‘the faculty of making fortunate discoveries by accident’ – Oxford Concise Dictionary). Sometimes when on a journey, a tangential view through a side window is much more interesting than just staring at the road ahead or constantly peering at the fuel gauge. But, if the driver takes their eyes off the road for too long, they are asking for trouble. Or if they run out of fuel, they won’t reach journey’s end either. Pity the poor passengers!

Finally, another of the characteristics of systems is that they are emergent. It is emergent properties that give a system life, and it is the character of the elements, and their interrelationships that give rise to emergent properties (Harrington et al). To get the most out of the quality process in our organisations, and to make the most of any ‘fortunate mistakes’ that we are bound to make in designing, developing, and operating our systems, we still need to tackle quality in a systematic way. But one that allows for, and indeed even embraces the human side of quality – after all, on our journey we are dealing with people - not cars.
References


Swinburne Quality Review System © Swinburne University of Technology, July 2001
Appendix A

Swinburne University of Technology
Quality Systems Integration with University Planning Framework (UPF)

University Strategic Themes
- The Entrepreneurial University
- The Research Intensive University
- Globalisation
- Flexible Learning and Teaching
- The Intersectoral Advantage

Plans (UPF)
- University Strategic Development Plans
- Divisional Triennial Plans
- Unit Annual Two Page Plans

TAFE Quality System
- QTAFE/ISO9000
  Australian Quality Training Framework

STRATEGIC MANAGEMENT AGREEMENTS (SLAs)

Swinburne Quality Review System (Higher Education and Corporate)
- Self-Assessment/Validation review
- Australian Universities Quality Agency

University Performance Reporting (UPF)
- Reporting on quality system activities during past year, including follow-up to ensure improvement actions incorporated into ongoing strategic planning through annual two page plans

UPF: University Planning Framework
Appendix B

How does the SQRS work?

A Standard, Indicators of the good practices required and Benchmarks are built into each of the above twenty processes. These form the criteria of assessment on the performance of these processes. The Swinburne Quality Review Program is the ‘implementation’ part of the SQRS. The program was developed to ensure that the University achieves improvement on those core business processes in the SQRS. The Swinburne Quality Review Program comprises of Organisational Self-Assessment and Validation Reviews.
## Appendix C: SQRS Processes & Benchmarks

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<th>L&amp;T Plan</th>
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<th>#4.</th>
<th>#5 + &gt;5. (see note*)</th>
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<tr>
<td>1</td>
<td>Program Planning &amp; Design</td>
<td>L&amp;T Plan</td>
<td>Course establishment</td>
<td>Course Goals &amp; Standards</td>
<td>Fitness of courses</td>
<td>Contribution. Academic review</td>
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<td>2</td>
<td>Guidance &amp; Support of Learners</td>
<td>L&amp;T Plan</td>
<td>STUDENT PROGRESS</td>
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<td>1st to 2nd year retention</td>
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<td>Scholarly Teaching</td>
<td>Teaching Environment</td>
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<td>Assessment</td>
<td>Fitness of courses</td>
<td>Timely feedback</td>
<td>Judge progress</td>
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<td>Appropriate Assessment*</td>
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<td>Research management plans</td>
<td>Research &amp; teaching staff</td>
<td>Provision of research support</td>
<td>Research income trends</td>
<td>Publications. Impact of research*</td>
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<td>PROVISION OF SUPPORT FOR RESEARCH</td>
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<td>FINANCING OF INTERNATIONAL STUDENT PROGRAM</td>
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<td>Management of workforce</td>
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<td>Large equipment utilisation</td>
<td>Corporate information systems</td>
<td>IT&amp;T infrastructure</td>
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<td>18 Information Resources</td>
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<td>Customer service</td>
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*‘Customer Service’ is a generic benchmark. If five or more benchmarks are listed for a particular process, then ‘Customer Service’ is to be added to the list for that particular process (these are marked*). Locally developed benchmarks are in italics all others are from McKinnon et al, Benchmarking - A Manual for Australian universities.