Statistics and Performance Measurement

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1. Introduction

It is a commonplace that almost *all* forms of enterprise now find themselves in a competitive environment. Management responses take the form of adopting specialized methodologies such as Six Sigma, which vigorously pursues process improvements with measurable financial benefits, and Balanced Scorecard, which quantifies performance in selected key areas. However, this article contends that sustainable long-term prosperity requires a holistic approach to performance measurement. Such an approach would necessarily delineate and accommodate strategic, tactical and operational requirements, and balance the competing needs of all groups with a vested interest in the success of the enterprise.

This paper describes a *system* for performance measurement, with two key elements:

- a *model* for performance measurement, comprising a set of principles, a paradigm for measurement, and a structure for organisational performance measures; and
- an *enabling methodology*, that helps define specific measures, and provides a crucial linkage between measurement, business process and continuous improvement.

Neither of these elements is novel in itself: indeed, each has proved very effective in practice. However, it is only in combination that they can furnish the 'quantitative engine' needed to power an enterprise towards prosperity. The ultimate aim is to provide the leadership of an enterprise with the quantitative information they need to understand how the enterprise is currently performing and, more importantly, how it is likely to perform in the future, in all aspects of its endeavours. A reporting format is presented that purports to address both these criteria.

The whole area is replete with fascinating challenges for statisticians, and provides an opportunity for them to have significant impact at the highest levels of an enterprise, provided that they are prepared to take a *Pan*, rather than a *Normal* or *Zoom*, view of Statistics.

2. Desiderata for a performance measurement system

At a minimum, it seems reasonable to require of a useful performance measurement system that it

- quantifies the meaning of 'Long-term success' for the enterprise.
- provides a measure of how the enterprise is performing against requirements, for all groups with vested interest in the success of the organisation
- provides timely and actionable management information to people at all levels of the enterprise
- helps align operational activities with tactics and strategy
- links with process and system improvement

In addition, one might hope that the general approach is applicable to different types of enterprise – public companies, private companies, government and semi-government agencies.

3. A model for performance measurement

The OPM $^®$ (Organisational Performance Measurement) model has been developed over the last several years, and validated in a variety of enterprises in Australia. Details of the model have been published elsewhere (Dransfield, Fisher & Vogel, 1999). The key elements are summarised in the Appendix.

4. An enabling methodology

Customer Value Analysis (CVA), as developed by R.E. Kordupleski (see *e.g.* Gale & Wood 1994 and Laitamäki & Kordupleski 1997) is a proven process for (i) developing an understanding of the key drivers of market satisfaction with *Quality of Products or Services Provided* and with *Price Paid*; (ii) regular monitoring of **competitive** performance in these areas; (iii) selecting priorities for improvement; and (iv) linking measurement to business process. The thinking underlying this approach can be adapted to monitor, control and improve the relationships between the enterprise and its other key stakeholder groups, as shown in the table. This leads to tantalizing new possibilities for managing relationships in a variety of areas, ranging from working with influential Government officials to recruiting new staff.

MARKETS				
Business	**Customers**	**People**	**Community**	**Strategic Partners**
Satisfaction with Return	Satisfaction with Products & Services	Satisfaction with Remuneration & Benefits	Satisfaction with Benefits of Presence	Satisfaction with Pricing & Payment Arrangements
Satisfaction with Risk	Satisfaction with Price	Satisfaction with Work	Satisfaction with Cost of Presence	Satisfaction with Relationship
Enterprise of choice for investment	Supplier of choice	Employer of choice	Enterprise of choice for presence in region or industry	Customer or partner of choice

*For each of the 5 markets in which an enterprise competes, it seeks to provide **superior value**, in terms of the 'investment' made and the 'return' received. The last row of the table represents the preferred position for the enterprise in each market.*

5. Informative and actionable Board and Senior Executive reports

This is, in a sense, the Holy Grail of a Performance Measurement System: to provide the Board and Executive with a concise and actionable report on

- how the enterprise is currently performing in all aspects of its activities; and
- how it is likely to perform, in these areas, leading to identification of what actions need to be taken next, to gain or sustain competitive position

A reporting format will be presented that purports to address both these criteria and, at the same time, to communicate the uncertainty inherent in the information.

6. The opportunities for statisticians

The area of performance measurement provides statisticians not just with some interesting and difficult technical challenges, but also with the opportunity to influence an organization at the highest levels. I consider these in reverse order.

Chambers (1993) defines *Greater statistics* as " …everything related to *learning from data*, from the first planning or collection, to the last presentation or report", and *Lesser statistics* as " … the body of specifically statistical methodology that has evolved within the profession - roughly, statistics as defined by texts, journals and doctoral dissertations." I think it is appropriate to add a third category, and to re-label them as *Zoom* (= *Lesser*), *Normal* (= *Greater*) and *Pan*, by which I mean a far broader role, encompassing facilitation of workshops for the leadership team, liaiasing with major external contractors (particularly market research agencies), and strategic activities of the sort described by Hoerl in the discussion of Dransfield *et al.* (1998). This aspect will be elaborated further in the oral presentation. I regard the question of *why* statisticians would, or should, seek to exert influence at this level in an enterprise as rhetorical.

Technical statistical problems arise in various forms. Those relating to business process improvement are familiar to statisticians. However, those relating to modelling and analysis of the tree-structured data that arise from Value Surveys are relatively unknown. Traditional approaches rely on simple hierarchical regression modelling of the data, thereby retaining simplicity of reporting and interpretation at the cost of significant waste of information in the data. The work by Clark *et al.* (1997) is the first serious attempt to tackle such problems in a comprehensive fashion. However, the results of their work are difficult to translate into a format suitable for direct interpretation and action by management. By re-defining the basic design of the survey, a fascinating new class of statistical models appears, with the potential to provide significant gains over both approaches.

References

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Appendix. The OPM model

The Organisational Performance Measurement (OPM) model proposed by Dransfield, Fisher & Vogel (1999) has three key elements.
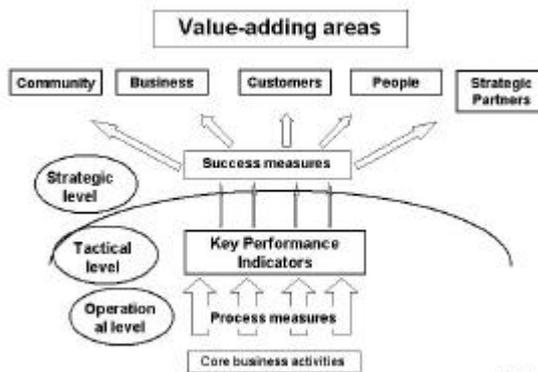
Three Principles are discussed at some length, relating to **Alignment** (*The organisation's approach to measurement encourages alignment of people and systems with the organisation's mission, vision and goals*); **Process and systems thinking** (*Measurements should be linked appropriately with system and process monitoring, control and improvement*); and **Practicability** (*At any level in the organisation, there is a straightforward procedure for identifying the sorts of measurements that need to be collected, and what needs to be reported*).

A paradigm for identifying measures, due to Myron Tribus, can be used at any level of an enterprise (*What products or services are produced and for whom? How will 'quality', or 'excellence' of the product or service be assessed and how can this be measured? Which processes produce these products and services? What has to be measured to forecast whether a satisfactory level of quality will be attained?*)

Performance Measures are structured in a particular way, to reflect three qualitatively different three Zones of Measurement (*cf*. Figures a and b). **Strategic Measures**, or Success Measures, capture the value of a stakeholder's investment (resources, money, labour, ...) in your enterprise, compared with an alternative investment. **Tactical Measures**, or Key Performance Indicators, are a set of enterprise-level measures that collectively capture the overall performance of the enterprise and act as predictors of future success, that is, of future values of the Success Measures. **Operational Measures**, or In-process and Output measures, are used for monitoring, control and improvement of the basic work processes of the enterprise
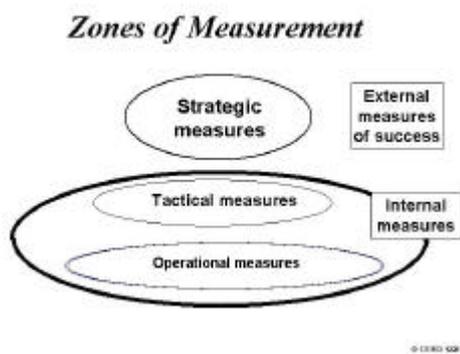
(a) Three basic Zones of Measurement   (b) Detailed structure of measures in each zone.

RESUME

What can we measure about an enterprise, on an ongoing basis, that will allow us to assess whether it is likely to prosper in the long term? This question goes to the heart of the general subject of Performance Measurement, a subject that has evolved largely independently of Statistics and good statistical practice. Yet it is hard to find a non-natural system with more diverse and complex forms of variation in its every aspect than an enterprise, or *human* system. The purpose of this paper is to introduce some of the basic statistical issues and current lines of research in Performance Measurement, and to reflect more generally on opportunities for statisticians to tackle a variety of technical and non-technical problems.