
Designing performance measures: a structured approach

Designing
performance
measures

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Introduction

The design of performance measurement systems which are appropriate for modern manufacturing firms is a topic of increasing concern both to academics and practitioners. The problems with existing systems, particularly those based on traditional cost accounting principles, have been widely documented[1-4]:

A... major cause of companies getting into trouble with manufacturing is the tendency for many managements to accept simplistic notions in evaluating performance of their manufacturing facilities... the general tendency in many companies is to evaluate manufacturing primarily on the basis of cost and efficiency. There are many more criteria to judge performance[4].

As the above quote suggests, one of the key problems with performance measurement systems is that they have traditionally adopted a narrow, or uni-dimensional, focus. Kaplan and Norton[5], among others, argue that this problem can be overcome if a firm adopts a balanced set of measures which enables managers to address the following questions:

- How do we look to our shareholders (financial perspective)?
- What must we excel at (internal business perspective)?
- How do our customers see us (the customer perspective)?
- How can we continue to improve and create value (innovation and learning perspective)?

Developing a balanced scorecard is a complex process and is now the subject of considerable research[6-9]. One of the key questions that has to be considered during this process is how should specific measures of performance be designed. It has long been recognized that inadequately designed performance measures can result in dysfunctional behaviour. Often because the method of calculating performance – the formula – encourages individuals to pursue inappropriate courses of action. Designing a performance measure, however, involves much more than simply specifying a robust formula. For issues such as the purpose of the measure, the frequency of measurement and the source of data all have to be considered.

Despite the high level of academic and industrial interest in performance measurement, no one appears to have addressed the simple, yet fundamental

question, what does a well-designed performance measure constitute? This paper seeks to answer this question.

The remainder of the paper is divided into four main sections. In the first, the relevant literature is reviewed. In the second, the main themes raised in the literature are drawn together and a framework for specifying performance measures is proposed. In the third, the practical application of this framework is demonstrated using data gathered during various action research studies in the automotive and aerospace industries. The studies demonstrate how the framework can be used to: ensure that a given measure stimulates appropriate improvements in business performance; and identify the reasons why past performance shortfalls have occurred. The fourth section – the discussion – focuses on the lessons learned during these applications and explores how the framework might be enhanced.

Literature review

Traditionally performance measures have been seen as a means of quantifying the efficiency and effectiveness of action[10]. Flapper *et al.*[11], for example, state that:

A good manager keeps track of the performance of the system he or she is responsible for by means of performance measurement. His/her staff carrying responsibility for certain activities within the system, need performance measurement to see how well they are performing their tasks. This also holds for the employees actually executing the various process steps. So performance indicators are important for everyone inside an organisation, as they tell what has to be measured and what are the control limits the actual performance should be within[11].

Fry describes measures as a means of tracking[12]. Globerson asserts that “the lack of well-defined performance criteria, through which performance of individuals and the organization may be evaluated, make it hard to plan and control”[13]. Nanni *et al.* use the analogy of a thermostat to explain how performance measures are part of a feedback loop, which “controls operations against a specific value”[14].

As is evidenced by these quotations the traditional view is that performance measures are an integral element of the planning and control cycle. It is assumed that measurement provides a means of capturing performance data which can be used to inform decision making.

This somewhat mechanistic view is complemented by the widespread recognition that performance measures also have a behavioural impact. Systems, especially systems involving humans, respond to performance measures. People modify their behaviours in an attempt to ensure a positive performance outcome even if this means pursuing inappropriate courses of action[15].

Fry and Cox[16] describe a plant where the performance of the plant manager was assessed on the basis of return on investment, the performance of the product group managers was assessed on the basis of whether or not product was delivered on time and the performance of the shopfloor

supervisors and operators was assessed on the basis of production output versus standard. The behaviours that these measures induced, while not startling, were certainly dysfunctional. The shopfloor supervisors and operators responded to the measure of production output versus standard; hence they sought to ensure that output at least matched, and preferably exceeded target.

In a manufacturing environment there are several ways in which production output can be increased. One option is to reduce cycle times, either through product or process innovation. Another is to eliminate the causes of unproductive time, perhaps through the introduction of a preventive maintenance programme, which reduces the risk of machine breakdowns. A third is to seek to eliminate the time wasted in producing poor quality product, possibly through the introduction of fail safing, or Poka Yoke devices. In this particular plant the shopfloor supervisors and operators decided to try and reduce unproductive time by decreasing the amount of time spent on set-ups. Rather than implementing a set-up time reduction programme, however, they decided simply to eliminate the need to set-up machines as frequently by increasing batch sizes.

This might appear to be an appropriate strategy if the performance measure – production output versus standard – is viewed in isolation. The strategy eliminates costly set-ups without requiring major investment or process improvements. It allows the operators to work on the same product for longer periods of time, thereby exploiting the benefits of the learning curve. As is widely acknowledged, however, such actions cannot be viewed in isolation as they often have secondary ramifications.

Increasing batch sizes in the plant meant that more product than required was manufactured. As the extra product was not called for on the production schedule the shopfloor supervisors and operators felt they should not release it. So the excess product was hidden until it was called for on a later schedule. The net effect of this was that a proportion of the factory's output spent far longer in the system than was necessary. The company had paid its suppliers and had added some value to the raw material, but had received no return on its investment.

The fact that the operators were working on larger batches than were scheduled also meant that they ran out of time to complete the production schedule. This meant that the product group managers found themselves without the necessary product to fulfil particular orders. They responded by sanctioning overtime and Saturday working, which once again adversely affected return on investment.

The story could be further developed. Fry and Cox[16] explain how the build up of work-in-progress in the plant convinced the plant manager that he had capacity constraints and resulted in him buying new, and unnecessary capital equipment. The question that the case raises, however, is what was going wrong?

When the scenario is described as starkly as it is here, it is easy to believe that the root cause of the problem is that the performance measure that the shop floor supervisors and employees were subject to was inappropriate. Indeed, many authors have fallen into this trap and suggested that standard efficiency measures are obsolete in today's manufacturing environment[2,17]. Such sweeping generalizations are inappropriate because they fail to explore the rationale underpinning particular measures. In the case described above, the three measures that existed could have resulted in harmonious behaviour had the workforce understood the value of small batches and been encouraged to identify ways in which the actual set-up times could be reduced. With single minute exchange of dies, for example, the shopfloor supervisors and operators could have achieved their efficiency targets and followed the schedule. The product group managers would then have had no need to sanction overtime and the production manager's return on investment figures would have improved. The problem in this business was not that the measures were wrong *per se*, but that the behaviours they were likely to induce in this particular setting had not been considered.

Organizations that have borne in mind the behavioural ramifications when designing performance measures are few and far between. One such company is Tektronix, a manufacturer of portable measurement instruments[18]. Faced with increasing competition from Japanese imports, Tektronix was forced to adopt a strategy of continuous improvement. The results were impressive:

Cycle time dropped from an average of twenty-five weeks to seven days. Inventory levels dropped by 80 percent, while sales increased. The number of instruments in work-in-progress dropped from 1,500 to 125. Floor space occupied by the division dropped by more than 50 percent. Five products that had previously been built on separate lines were now built on one line. The number of vendors dropped from 1,500 to fewer than 200. Quality was up, and more than 70 percent of sales were delivered within two days of the customer order. Above all, market share was maintained, and profitability was excellent[18].

When they first embarked on their strategy of continuous improvement, Tektronix recognized that one of the major barriers to its successful implementation was the existing accounting system. Overheads were allocated on the basis of direct labour which resulted in management attention being focused on the wrong things. Effort, for example, was put into redesigning products in an attempt to reduce direct labour costs, despite the fact that they accounted for only 3 to 7 per cent of manufacturing costs. The use of labour standards to evaluate the efficiency of direct labour encouraged the shopfloor staff to build inventory whether or not it was needed.

Tektronix decided that more appropriate measures for their new strategy would be – output rate, output per person, output per salary dollar, cost of sales ratio, floor space, cycle time, cycle time efficiency, pass rate, field failure rate and service level. Some of these measures may appear to be no better than the traditional ones. Output per person, for example, might still encourage individuals to work alone rather than in teams, but Tektronix defined the measures and how they were to be used carefully:

Output per person is calculated as the cost of output achieved per person per day. The measure is calculated for all manufacturing personnel, including indirect as well as direct labour. It is used to gauge the impact of problem-solving programmes, cross training, and other measures aimed at improving the productivity of the manufacturing team. It is an average measure and is not used to evaluate individual performance[18].

Such changes not only encouraged the desired behaviours, but also contributed directly to the continuous improvement programme.

There are, of course, examples of other organizations that have also thought through these issues. Analogue Devices uses a measure of the half-life of improvement to keep its continuous improvement process on track[1]. Hewlett-Packard and Westinghouse have developed “return maps” which are used to encourage negotiation between finance, sales, development and manufacturing at the start of new product introduction programmes[19,20]. Even measures that are often criticized can be appropriate in certain contexts. Machine utilization, for example, is an essential measure for the process industry. Labour productivity can be valuable in organizations with human capacity constraints, as long as staff are making products that can be sold. The key issue in designing measures of performance is that they have to be matched to the organizational context. The question that this raises is what advice is given in the literature with regard to matching measures to organizational context?

Matching measures with the organizational context

Various authors have discussed the design of performance measures. Lea and Parker[21], among others[2,19,22], suggest that measures of performance should be transparent:

- simple to understand;
- have visual impact;
- focus on improvement rather than variance;
- visible to all.

Lynch and Cross[23] take a slightly different stance and emphasize the link between strategies, action and measures, a theme which is echoed in the work of Dixon *et al.*[1], Kaplan and Norton[5,6], and others[8,9].

Globerson[13] adopts yet another approach, choosing to explore the issue of the formula – the way the measure is calculated, as well as the way it is used. He recommends that measures should:

- be derived from strategy;
- provide timely and accurate feedback;
- relate to specific, stretching, but achievable goals (targets);
- be based on quantities that can be influenced, or controlled, by the user alone or the user in co-operation with others;
- be clearly defined;

- be part of a closed management loop;
- have an explicit purpose;
- be based on an explicitly defined formula and source of data;
- employ ratios rather than absolute numbers;
- use data which are automatically collected as part of a process whenever possible.

Fortuin[24] adopts a similar stance, but also suggests that measures should:

- provide fast feedback;
- provide information;
- be precise – be exact about what is being measured;
- be objective – not based on opinion.

Table I summarizes these themes, showing which of the above recommendations are made in each of ten different papers and books on performance measurement[1,5,13,21,23-28]. It should be noted that these papers and books were not chosen at random, but identified following an extensive review of the performance measurement literature which has been published elsewhere[10]. In the next section these recommendations are used to construct a framework which seeks to encapsulate the elements which together constitute a “good” performance measure.

Framework – the performance measure record sheet

Table II shows the framework – the performance measure record sheet – which seeks to specify what a “good” performance measure constitutes. The framework ensures that the measures are clearly defined (Table I, recommendation 9) and based on an explicitly defined formula and source of data (Table I, recommendation 15). The framework consists of ten elements – title, purpose, relates to, target, formula, frequency, who measures, source of data, who acts on the data, what do they do, notes and comments. The rationale for each of these elements and their relationship to the recommendations summarized in Table I are explained below.

Element 1 – measure (recommendations 2, 9, 21)

The title of the measure should be clear. A good title is one that explains what the measure is and why it is important. It should be self-explanatory and not include functionally specific jargon.

Element 2 – purpose (recommendations 7, 14)

If a measure has no purpose then one can question whether it should be introduced. Hence the rationale underlying the measure has to be specified. Typical purposes include to:

- enable us to monitor the rate of improvement, thereby driving down the total cost;

Recommendation	Source	Designing performance measures
1 Performance measures should be derived from strategy	[1,5,13,23-27]	<p style="text-align: center;">1137</p> <hr/> <p style="text-align: right;">Table I. Recommendations with regard to the design of performance measures</p>
2 Performance measures should be simple to understand	[21,23-28]	
3 Performance measures should provide timely and accurate feedback	[1,13,24]	
4 Performance measures should be based on quantities that can be influenced, or controlled, by the user alone or in co-operation with others	[13,23,24]	
5 Performance measures should reflect the “business process” – i.e. both the supplier and customer should be involved in the definition of the measure	[13,23,24]	
6 Performance measures should relate to specific goals (targets)	[13,24,28]	
7 Performance measures should be relevant	[23,24,26]	
8 Performance measures should be part of a closed management loop	[5,13]	
9 Performance measures should be clearly defined	[13,24]	
10 Performance measures should have visual impact	[21,24]	
11 Performance measures should focus on improvement	[21,23]	
12 Performance measures should be consistent (in that they maintain their significance as time goes by)	[23,24]	
13 Performance measures should provide fast feedback	[24,25]	
14 Performance measures should have an explicit purpose	[13]	
15 Performance measures should be based on an explicitly defined formula and source of data	[13]	
16 Performance measures should employ ratios rather than absolute numbers	[13]	
17 Performance measures should use data which are automatically collected as part of a process whenever possible	[13]	
18 Performance measures should be reported in a simple consistent format	[23]	
19 Performance measures should be based on trends rather than snapshots	[23]	
20 Performance measures should provide information	[24]	
21 Performance measures should be precise – be exact about what is being measured	[24]	
22 Performance measures should be objective – not based on opinion	[24]	

- ensure that all delayed orders are eliminated;
- stimulate improvement in the delivery performance of our suppliers;
- ensure that the new product introduction lead time is continually reduced.

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Details

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Title

Purpose

Relates to

Target

Formula

Frequency

Who measures?

Source of data

Who acts on the data?

What do they do?

Notes and comments

Table II.
The performance
measure record sheet

Element 3 – (relates to recommendations 1, 6, 7, 11)

As with purpose, if the measure being considered does not relate to any of the business objectives then one can question whether the measure should be introduced. Hence the business objectives to which the measure relates should be identified.

Element 4 – target (recommendations 4, 6, 7, 8, 11, 14, 20)

The objectives of any business are a function of the requirements of its owners and customers. The levels of performance the business needs to achieve to satisfy these objectives are dependent on how good its competitors are. Without knowledge of how good the competition is, and an explicit target, which specifies the level of performance to be achieved and a time scale for achieving it, it is impossible to assess whether performance is improving rapidly enough and hence whether the business is likely to be able to compete in the medium to long term. An appropriate target for each measure should therefore be recorded. Typical targets include:

- 20 per cent improvement year on year;
- 15 per cent reduction during the next 12 months;
- achieve 98 per cent delivery performance (on time, in full) by the end of next year.

Element 5 – formula (recommendations 2, 4, 5, 9, 15, 16, 19, 21, 22)

This is one of the most challenging elements to specify because the formula – the way performance is measured – affects how people behave. Take, for example, a measure such as value of new products won. This appears to be an appropriate measure for a sales manager. But if the formula is value, in terms of “£”, the measure may encourage sales managers to seek large contracts, rather than profitable ones. Hence, perhaps the measure should be contract contribution, but the problem with this is it might stop sales managers pursuing new business opportunities, even if they are of strategic significance. Take, for example, the automotive components industry. Toyota have recently opened a new plant in England. To become a supplier to Toyota a business may have to bid for a series of small, low value added, orders, before it will even be invited to bid for larger, and potentially more profitable, contracts.

The above example emphasizes the problems that can result if the formula is inappropriately defined, but it should be noted that the converse is also true. That is, it is often possible to define the formula in such a way that it induces good business practice. Take, for example, a measure such as time to quote. In many businesses quote generation is a race against the competition and the formula simply defines when the clock should start ticking, and when it should stop.

When they first arrive, requests for quotations rarely include all the information needed to produce the quote. One of the golden rules of performance measurement is that there is no point measuring someone on something over which they have no control. Hence, it could be argued that the clock should not be started until the customer has provided all the necessary information and the sales engineer can begin the quote generation process.

What behaviour might such a measure induce? In certain situations the sales engineers might end up with two piles of quotes on their desks. They would work on the ones that they were being measured on and leave the remainder. As far as the customer is concerned, however, the clock started ticking as soon as they first made contact. Hence, what the business really wants is for the sales engineer to ensure that the customer provides all the information they need to start the quote generation process immediately.

A similar issue arises when exploring when the clock should be stopped. Here the obvious answer is – when the quote has been posted. But if the clock is not stopped until verbal confirmation of the receipt of the quotation is provided by the customer, the formula actually encourages the sales engineer to phone the customer and ask if they have received the quote. And, while the sales engineer is on the phone, they may as well ask if the quote was acceptable and whether there is anything else they can do to help. Hence, the formula for the performance measure can be defined so that it encourages the sales engineer to provide better customer service.

Element 6 – frequency (recommendations 3, 12, 13, 18, 20)

The frequency with which performance should be recorded and reported is a function of the importance of the measure and the volume of data available.

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Element 7 – who measures (recommendations 4, 17)

The person who is to collect and report the data should be identified.

Element 8 – source of data (recommendations 15, 16, 17, 18, 19, 21)

The source of the raw data should be specified. The importance of this question lies in the fact that a consistent source of data is vital if performance is to be compared over time.

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Element 9 – who acts on the data (recommendations 4, 6, 10, 20)

The person who is to act on the data should be identified.

Element 10 – what do they do (recommendations 4, 6, 10, 20)

This is probably the most important element contained on the performance measure record sheet, not because it contains the most important information, but because it makes explicit the fact that unless the management loop is closed, there is no point in having the measure. It is not always possible to detail the action that will be taken if performance proves to be either acceptable or unacceptable, as this is often context specific. It is, however, always possible to define in general the management process that will be followed should performance appear to be either acceptable or unacceptable. Typical entries for this box include:

- set up a continuous improvement group to identify reasons for poor performance and to make recommendations as to how performance can be improved;
- publish all performance data and an executive summary on the shop-floor as a means of demonstrating commitment to empowerment;
- identify commonly occurring problems. Set up review team, consisting of sales, development and manufacturing personnel, to establish whether alternative materials can be used.

Table II shows how these various elements are incorporated into the performance measure record sheet.

The next question to be addressed is – does the record sheet work? Does it enable performance measures to be designed?

Testing the framework

The design of a performance measure is a process. Inputs, in the form of requirements are captured, and an output, in the form of a performance measure, is produced. The performance measure record sheet simply provides a structure to support this process. The implication of this is that testing the framework involves answering two different questions. The first is concerned with whether the output of the process is appropriate, i.e. are the measures that are produced appropriate measures? The second asks whether the performance measure record sheet actually facilitates the design of these measures, i.e. does

the performance measure record sheet simplify the process of designing measures?

Question 1 – are the measures that are produced good measures?

As discussed earlier in this paper, few authors have explored the issue of what constitutes a “good” performance measure. The criteria listed in Table I provide an indication of the characteristics a well-designed performance measure should exhibit. When the rationale for the record sheet was described the links between it and the information contained in Table I were made explicit. To answer the first research question – are the measures produced good measures? – it is necessary to establish whether measures developed using the record sheet satisfy the criteria listed in Table I. If they do not, then there are two possible explanations :

- (1) the record sheet is incomplete; and
- (2) the criteria listed in Table I are inappropriate.

Question 2 – does the record sheet simplify the process of designing measures?

Businesses choose to measure performance for various reasons – to know where they are, to know how rapidly they are improving, to enable comparison with other business, even to influence individuals’ behaviours. The plethora of poorly designed measures which encourage undesirable behaviours suggests that the process of designing measures is fraught with difficulty. In theory the performance measure record sheet should help businesses design better performance measures by ensuring that they consider all of the subtle implications of the measures being proposed. Answering the second research question – does the record sheet simplify the process of designing measures? – therefore involves establishing whether the record sheet provides insight into the behavioural implications of the performance measures.

Data collection

In order to address these two research questions the performance measure record sheet has to be used by practising managers to design performance measures. To date, the record sheet has been used by over 200 managers from 50 different organizations[29]. Rather than attempt to review all of the measures that have been designed using the record sheet this paper will draw on the experiences gained during five specific applications in the aerospace and automotive sectors. These five applications have been selected as they provide useful insights into the strengths and weaknesses of the performance measure record sheet.

Application 1 – customer service

The performance measure shown in Table III was developed during an action research project with a manufacturer of automotive components. The measure was developed during a meeting between one of the authors of this paper and

Table III.
Performance measure
– customer service

Title	Customer service – adherence to customer schedule
Purpose	To enable us to monitor factory completion performance
Relates to	Business objectives – “meet quality standards”, “delivery on time” and “no customer complaints”
Target	100 per cent schedule completion on time at least by end of 1996
Formula	Percentage of pieces to arrive at the customer’s location when promised
Frequency	Weekly
Who measures?	Despatch manager
Source of data	Delivery receipts
Who acts on the data?	Production manager
What do they do?	Investigate reasons for late delivery, set up problem-solving teams to eliminate root causes
Notes and comments	Early deliveries are not on time

the manufacturing manager. In this case the value of the performance measure record sheet lay in the fact that it forced the manufacturing manager to define what he meant by customer service and adherence to schedule.

Customer service, like quality and flexibility, is a multi-dimensional concept[30-32] and can be affected by both tangible and intangible factors. Customers may, for example, base their assessment of the level of service they receive on factors such as the value of the product or service, their satisfaction with the environment in which they receive the service and the speed with which the service is delivered. Alternatively, their satisfaction may be affected by factors such as whether the service conforms with their expectations, whether they perceive the service to satisfy their needs and the dependability with which the service is delivered. Therefore, although all organizations are likely to seek high levels of customer service, the essence of customer service will vary from organization to organization. Hence, before performance of any organization, in terms of customer service, can be measured it is necessary to specify what is meant by customer service.

Table III demonstrates how the performance measure record sheet forced the manufacturing manager involved to be explicit about what customer service meant for his business. Initially, the manufacturing manager suggested that the measure be called – customer service. When trying to define a target, however, he realized that what he really meant by customer service was adherence to schedule because this was the factor which really affected customer service in his business. Unfortunately, adherence to schedule is also a multi-dimensional concept. If, for example, an order is delivered one day late then should it be classified as late? The answer to this question is – it depends. If the customer schedules an order for delivery in week 42, but the supplier schedules it for delivery on Tuesday in week 42 and actually delivers it on Wednesday in week

42 then the customer's scheduled delivery has still been achieved and hence the order is not late (according to the customer's schedule). Similarly, if an order is delivered earlier than it is called for has the schedule been adhered to or not? What happens if half of the order is delivered when promised, and half is delivered the following day? Should the delivery then be classified as on time or not?

The manufacturing manager found it impossible to complete the performance record sheet without addressing these issues, primarily because the record sheet required him to specify specific targets, explicit formula and precise sources of data. Requesting this information forced the respondent to define his terms precisely.

Application 2 – sales turnover

The performance measure shown in Table IV was completed during a discussion between the sales director of the same company and one of the authors of this paper. The value of the performance measure record sheet in this application was that it resulted in the sales director questioning whether sales turnover was the most appropriate measure.

The first few boxes on the performance measure record sheet were relatively easy to complete as sales turnover is a well established measure and hence the sales director had little difficulty defining his terms. When asked how he used the sales turnover data that were already available to him, however, he started to question the value of the measure. The reason for this was that he realized that the sales turnover data were of limited value because they simply reported what had happened the previous week, i.e. what had already been sold. Although the board reviewed the figures once a month they were frustrated by

Title	Sales turnover
Purpose	To enable us to track cumulative progress versus plan
Relates to	Business objectives – “achieve sales targets”, “increase market share” and “achieve financial returns”
Target	< 5 per cent deviation from annual plan
Formula	Actual sales expressed as a percentage of planned sales (cumulative)
Frequency	Weekly
Who measures?	Sales manager
Source of data	Invoiced sales records
Who acts on the data?	Sales director
What do they do?	???
Notes and comments	This is a historical measure. It does not help the sales director manage the business. A more appropriate measure would be quotes tendered

Table IV.
Performance measure
– sales turnover

the fact that the data provided no indication of future prospects. Following an extensive discussion the sales director decided that a more appropriate measure would be value of quotes tendered. The reason for this was that he was able, on the basis of past performance, to predict what percentage of quotes tendered would be converted into orders and hence able to predict future sales volumes.

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Application 3 – new business won

As a result of the discussion about the relevance of the measure – sales turnover – the sales director decided to encourage his sales teams to introduce a new performance measure, namely new business won. The specification for this measure is shown in Table V. This measure was developed during a discussion between one of the authors of this paper and all the members of one of the business sales teams. In this case the performance measure record sheet provoked an insightful discussion about the appropriate formula for the measure. Initially, the members of the sales team proposed a simple hit rate, i.e. number of orders won versus number of quotes submitted. When discussing the target for this measure, however, one of the members of the team highlighted the fact that having a hit rate of 100 per cent on low value orders was not as desirable as having a hit rate of 50 per cent on high value orders, i.e. winning one contract worth £1 million was better than winning ten contracts worth £10,000. Hence, the team began to debate whether the measure should be defined in terms of value of hits, rather than volume. The value argument appeared to be gaining support until another member of the team pointed out that Toyota had recently opened a new plant in the UK and that the first Toyota contract the business was invited to bid for was unlikely to be high value, but would undoubtedly be very important. Hence, the team decided that volume of hits, rather than value of hits, was the better measure. When considering the behavioural implications of a simple volume measure, however, the team

Title	New business won
Purpose	To enable us to track cumulative progress versus plan
Relates to	Business objectives – “achieve sales targets”, “increase market share” and “achieve financial returns”
Target	100 per cent of contracts targeted
Formula	Orders received versus orders targeted (expressed as percentage)
Frequency	Monthly
Who measures?	Sales manager
Source of data	Order book
Who acts on the data?	Sales director
What do they do?	Identify shortfalls in performance and investigate reasons
Notes and comments	This measure will require us to introduce a new management process – namely the screening of contract opportunities

Table V.
Performance measure
– new business won

realized that such a measure would encourage people to tender only for those contracts that they felt they stood a high chance of winning.

This observation led the sales team to conclude that the business should be far more selective when bidding for contracts. Current practice in the organization resulted in all opportunities being pursued. The sales team decided that a new order screening process should be introduced. The aim of the order screening process would be to identify which opportunities should be pursued. Hence, the phrasing of the target – “100 per cent of contracts targeted” and the statement recorded in the notes and comments box (see Table V).

Application 4 – emerging technologies

When designing measures to encourage specific behaviours it is necessary to consider how the message can be re-enforced. The measure shown in Table VI was developed by members of the senior management team of the procurement function of an aerospace business. The management team were conscious that their buyers visited a variety of potential suppliers on a regular basis and wanted to ensure that the maximum business benefit was achieved from each of these visits. Although most of the buyers visited suppliers to establish whether they could supply a particular item the buyers were often shown related products and technologies during their visits.

The senior management team realized that individual buyers were gathering this information but that the business as a whole had no means of capturing and exploiting it. They, therefore, introduced “technology assessment forms”, the aim of which was to capture information on technologies that might be of interest to other buyers. The management team debated whether they should measure number of forms returned or the usefulness of the information. They

Title	Identification of emerging technologies
Purpose	To encourage everyone to become involved with the process of identifying emerging technologies
Relates to	Business objectives – “enhance the quality of service we can provide to our customers”
Target	1,000 technology assessment forms completed by the end of 1994
Formula	Forms completed and returned
Frequency	Monthly
Who measures?	Financial controller
Source of data	Technology assessment forms to accompany expense claims
Who acts on the data?	Procurement director
What do they do?	Procurement director to monitor number of forms returned and publicly acknowledge contributions. Anyone not completing forms to be asked why
Notes and comments	This measure will need to be changed within 12 months

Table VI.
Performance measure
– emerging technologies

decided that until the process was established they would simply measure the number of forms returned because this would encourage people to submit completed technology assessment forms without worrying whether the information they were submitting was of value. To reinforce the importance of this information the management team also decided to copy the technology assessment forms onto the back of the expense claim form and issue a statement declaring that expenses would only be paid if the technology assessment forms were completed. Hence, through careful design of the measure (in this case the method of data collection) the management team conveyed the message that all information on emerging technologies was useful and that they were serious about capturing it.

Application 5 – time to quote

Table VII shows a completed performance measure record sheet for the measurement of time to quote. The rationale underpinning the formula has already been discussed earlier in this paper. However, in this application the performance measure record sheet also had a second, very important, benefit. When discussing how to complete the box entitled “what do they do”, the sales director realized that one of the reasons time to quote was so difficult to control was that three different functions within the business were involved in the process.

Requests for quotations were received by salespeople. The salespeople then asked engineers to design the necessary tooling. Once the tooling had been

Title	Time to quote – days
Purpose	To stimulate improvements in our responsiveness to our customers
Relates to	Business objectives – “improve sales team performance” and “time to quote”
Target	Seven calendar days by the end of 1994
Formula	Date of verbal confirmation of receipt of quote by customer – date of first contact by customer
Frequency	Monthly
Who measures?	Sales manager
Source of data	Customer contact
Who acts on the data?	Should be the sales director, but is the quote generation process under his control?
What do they do?	Monitor time to quote and investigate any unexpected results
Notes and comments	Current system means that the only person who has management authority over everyone involved in the quote generation process is the site general manager. There is a need to examine this business process in more detail (and perhaps redesign it)

Table VII.
Performance measure
– time to quote

designed the sales people asked the estimators to produce costings for both the product and the tooling. The salespeople reported to the sales director. The engineers reported to an engineering director. The estimators reported to the finance director. The sales director reported to the managing director of one business unit, who in turn reported to the site general manager. The engineering and finance directors also reported to the site general manager. Hence, the only person who had management authority over all of the resources involved in the quote generation process was the site general manager who was so far removed from the business process that he was not aware it was an issue. By completing the record sheet and exploring how the time taken to produce a quote could be reduced, the complexity of this business process became apparent to the sales director for the first time. The result was that the business began to explore how they might re-engineer the process to make it more efficient and hence eliminate the root cause of the problem (and the need for the measure).

Lessons from the applications

Earlier in this paper two research questions were identified. The first was concerned with whether the output of the process was appropriate, i.e. are the measures that are produced using the record sheet good measures? The second asked whether the performance measure record sheet actually facilitated the design of these measures, i.e. does the performance measure record sheet simplify the process of designing measures? Reviewing the applications of the record sheet described above enables these questions to be addressed and also some improvements to the record sheet to be identified.

Question 1 – are the measures that are produced good measures?

The characteristics of a well-designed performance measure are identified in Table I. Table VIII identifies which of these characteristics are exhibited by the five measures described previously. As can be seen from Table VIII, the measures designed using the performance measure record sheet exhibit many, but not all of the characteristics. It appears that the design of the record sheet ensures that recommendations 1, 2, 3, 4, 6, 7, 8, 9, 13, 14, 15, 20 and 21 are satisfied. The question that this raises, however, is why are the other recommendations not satisfied? Is the performance measure record sheet incomplete or are some of the recommendations inappropriate?

On reviewing Table VIII it becomes apparent that the recommendations that are not satisfied fall into two distinct categories, those that relate to process and those that relate to content. Suggestions such as: performance measures should reflect the business process, i.e. both the supplier and customer should be involved in the definition of the measure (5); performance measures should be consistent (12); performance measures should use data which are automatically collected as part of a process whenever possible (17); and performance measures should be reported in a simple consistent format (18), are all logical

Recommendation	Application				
	1	2	3	4	5
1 Performance measures should be derived from strategy	Y	Y	Y	Y	Y
2 Performance measures should be simple to understand	Y	Y	Y	Y	Y
3 Performance measures should provide timely and accurate feedback	Y	Y	Y	Y	Y
4 Performance measures should be based on quantities that can be influenced, or controlled, by the user alone or in co-operation with others	Y	Y	Y	Y	Y
5 Performance measures should reflect the "business process" – i.e. both the supplier and customer should be involved in the definition of the measure					
6 Performance measures should relate to specific goals (targets)	Y	Y	Y	Y	Y
7 Performance measures should be relevant	Y	Y	Y	Y	Y
8 Performance measures should be part of a closed management loop	Y	Y	Y	Y	Y
9 Performance measures should be clearly defined	Y	Y	Y	Y	Y
10 Performance measures should have visual impact					
11 Performance measures should focus on improvement					
12 Performance measures should be consistent (in that they maintain their significance as time goes by)					
13 Performance measures should provide fast feedback	Y	Y	Y	Y	Y
14 Performance measures should have an explicit purpose	Y	Y	Y	Y	Y
15 Performance measures should be based on an explicitly defined formula and source of data	Y	Y	Y	Y	Y
16 Performance measures should employ ratios rather than absolute numbers					
17 Performance measures should use data which are automatically collected as part of a process whenever possible					
18 Performance measures should be reported in a simple, consistent format					
19 Performance measures should be based on trends rather than snapshots					
20 Performance measures should provide information	Y	Y	Y	Y	Y
21 Performance measures should be precise – be exact about what is being measured	Y	Y	Y	Y	Y
22 Performance measures should be objective – not based on opinion					

Table VIII.
Characteristics displayed
by the various
performance measures

suggestions. They are outside the scope of the performance measure record sheet, however, because they focus on:

- the process of designing measures, i.e. prescribing who should be involved;

- the process of reviewing measures, i.e. ensuring that the measures are modified as circumstances change;
- the process of capturing data; and
- the process of reporting performance.

Despite the contrary assertions made in the literature, these recommendations are not characteristics of well-designed performance measures. They are, however, important process guidelines and hence supplement the framework provided by the performance measure record sheet.

The remaining recommendations – 10, 11, 16, 19 and 22 – require further research. Only anecdotal evidence exists to support the assertions that performance measures should have visual impact (recommendation 10), performance measures should focus on improvement not variance (recommendation 11), performance measures should employ ratios rather than absolute numbers (recommendation 16), performance measures should be based on trends rather than snapshots (recommendation 19) and performance measures should be objective not based on opinion (recommendation 22).

In answer to the first research question, it appears that the performance measure record sheet does lead to the design of “good” performance measures, but that explicit guidelines on the process of using the record sheet and implementing the measures designed would be valuable.

Question 2 – does the record sheet simplify the process of designing measures?

To answer the second research question it is necessary to ask whether the performance measure record sheet provided insights during the applications described above that would not have been gained had a less structured approach been adopted. Reviewing each of the applications described previously enables us to answer this question with a tentative yes. Tentative, because given the applied nature of this research it was not possible (or ethical) to have a control group, i.e. provide one group of managers with a structured framework for the design of performance measures and expect another group to design the same measures without any such guidance. Yes, because in each of the applications the performance measure record sheet caused the individuals to modify their original proposals. In the first application the manufacturing director realized that if he wanted to measure customer service he would have to define what customer service meant and that simply saying “on-time delivery” was insufficient. In the second application the record sheet caused the sales director to question the value of sales turnover as a performance measure. In the third it resulted in the sales team identifying the need for a new management process, i.e. strategic selection of which potential orders the business should pursue. In the fourth the performance measure record sheet prompted the debate about how the importance of the technology assessment forms could be reinforced, while in the fifth it helped the

management team understand why the quote generation process was unmanageable.

One question that remains is whether these insights were a result of the performance measure record sheet or whether they were stimulated by the fact that an experienced facilitator was involved in the discussion. Undoubtedly, the experienced facilitator influences the process. However, experience with the record sheet in other settings suggests that the questions it forces managers to ask stimulate thought which leads to insight whether or not a facilitator is present.

Improvements to the performance measure record sheet

The performance measure record sheet, then, appears to facilitate the design of performance measures. However, repeated applications of it have highlighted two ways in which it might be improved. Both of these stem from confusion over specific questions in the record sheet – namely frequency and who acts.

There are two ways in which individuals can respond to the frequency question:

- (1) To define how frequently performance should be measured.
- (2) To define how frequently performance should be reviewed.

In many cases these two frequencies are identical, but in some they are not. Hence, it has proved worthwhile to separate the frequency of measurement question from the frequency of review question. Similar confusion emerges when considering who acts on the measure. In many organizations it is necessary to separate who owns the measure, i.e. who is accountable for ensuring that performance improves – from who acts on the measure, i.e. who actually takes action to ensure that performance improves. Table IX shows the modified performance measurement record sheet which makes these two distinctions explicit.

Conclusion

This paper has presented a framework – the performance measure record sheet – which can be used to design and audit performance measures. The framework was based on recommendations made in the literature and then tested through a series of action research studies. These studies demonstrated the practical validity and utility of the framework, although they also highlighted some ways in which it could be improved. To date the performance measure record sheet has been used by over 200 managers from 50 different companies. Experience suggests that the record sheet is valuable because it facilitates the design of performance measures and encourages the designers of such measures to consider the behavioural implications of the measures in particular settings. The record sheet has also proved valuable in the education process as it provides a framework which can be used to explore what constitutes a well-designed performance measure.

Details	Designing performance measures
Title	
Purpose	
Relates to	1151
Target	
Formula	
Frequency of measurement	
Frequency of review	
Who measures?	
Source of data	
Who owns the measure?	
What do they do?	
Who acts on the data?	
What do they do?	
Notes and comments	

Table IX.
Modified performance
measure record sheet

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