Waiting list statistics as performance indicators: Observations on their use in hospital management

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Abstract

Improvements in data collection and the types of statistics collected have enhanced the usefulness of waiting list statistics as a measure of hospital performance. But these changes are not sufficient for waiting list statistics to be used effectively for management purposes. The statistics need to be viewed alongside activity data if clinicians and managers are to identify specific areas that need improvement. This means that how the data are analysed and presented is also important.

During a study into the management of waiting lists, we observed that waiting list data were typically presented in a way that made interpretation difficult. A simple but effective solution was found by using available PC-based software, but obstacles remain. These stem from limitations of current information systems and the awareness among staff of the potential of common software packages.

Introduction

Waiting list statistics for elective surgery have long been used as a measure of hospital performance in publicly funded health systems. This is despite various problems that can limit their usefulness. For example, waiting list data are prone

to becoming less accurate as the medical condition and personal circumstances of listed patients change over time (Standards Sub-committee of the Victorian State Commission of Royal Australian College of Surgeons 1991). Interpretation can also be hampered by inconsistencies in the rules governing the inclusion or exclusion of patients from the statistics (Gillett & Mays 1994).

In recent years, various initiatives have made waiting list statistics more appropriate and reliable performance measures. The quality of waiting list data has improved, thanks to the introduction of computer-based administration systems and the implementation of explicit management policies that, among other things, promote regular audits of the information (for example, NSW Health Department 1994). To enable comparison, effort has been made to standardise the rules for the inclusion and exclusion of patients from waiting list statistics. Such rules cover, for example, whether patients who are 'not ready for care', either because of medical or personal reasons, are excluded. In addition, most States and Territories have agreed to use a standard set of urgency categories with which to prioritise patients (National Health Data Committee 1997). A maximum desirable waiting time for patients in each category has also been defined.

Agreement on standard urgency categories has facilitated another important improvement, namely, a change in the waiting list statistics used to judge performance. The focus has shifted to the appropriateness of the time waited, and the Australian Institute of Health and Welfare has begun to publish national figures on the proportion of admitted patients who had waited longer than the maximum desirable waiting time as defined by their urgency category (Mays 1995; Moon 1996). This shift has been reinforced by the recommended inclusion of waiting time statistics, reported by a uniform categorisation of urgency, in the core set of quality and outcome indicators for acute health care services (Boyce et al. 1997).

The focus of these improvements has so far centred on the use of waiting list statistics by an external organisation to evaluate hospital performance. Little attention has been paid to using these statistics for management purposes within a hospital. Although these changes have resulted in better quality data, it has not been widely recognised that the new statistics are not sufficient in themselves to assist internal hospital management. For this purpose, waiting list statistics need to be linked more explicitly to the process of care. This article reviews the extra information that clinicians and managers need to interpret and act upon waiting list statistics. It then highlights some problems hospitals can experience in trying to produce reports that meet these requirements, as observed during a recent study into the management of waiting lists (Cromwell & Mays 1996). The article also describes a simple but effective approach that was found to overcome these problems.

Waiting list statistics in the context of hospital management

For management purposes, the usefulness of a performance indicator depends primarily on whether it identifies specific processes that need modification (Hofer et al. 1997). However, when viewed in isolation, waiting list statistics do not meet this criterion because it is not possible to determine what might have caused excessive waiting times without additional information. To understand changes in waiting list behaviour, it is necessary to examine waiting list figures alongside surgical activity data. Only then is it possible to determine (for example) if an increase in the number waiting for surgery was due to an increase in the number of patients added to the list, or a decrease in the number admitted.

At a basic level, the surgical activity data required to make sense of waiting list figures are the rate at which patients are added to the list and the rate at which patients leave, distinguishing between whether they were admitted for surgery or removed from the list without being admitted. It is important to separate these two streams for several reasons. Firstly, if these data were combined, it would give a false impression of access to surgery. Secondly, the admission rate is positively correlated to resource availability, whereas the removal rate is more likely to be behave in the opposite manner, increasing if resources decrease and vice versa. Finally, the removal rate can be fairly erratic (likely to peak during an audit, but be fairly low otherwise), which, if combined with the admission rate, would make it more difficult to interpret the cause of fluctuations.

Although the monitoring of hospital performance now correctly concentrates on waiting times, the waiting list census (which gives how many people are currently waiting) can be useful to clinicians and managers. Changes in census figures are directly linked to fluctuations in activity, as can be illustrated using the simple formula:

$$\text{census}[t] = \text{census}[t-1] + \text{additions}[t] - \text{admissions}[t] - \text{removals}[t]$$

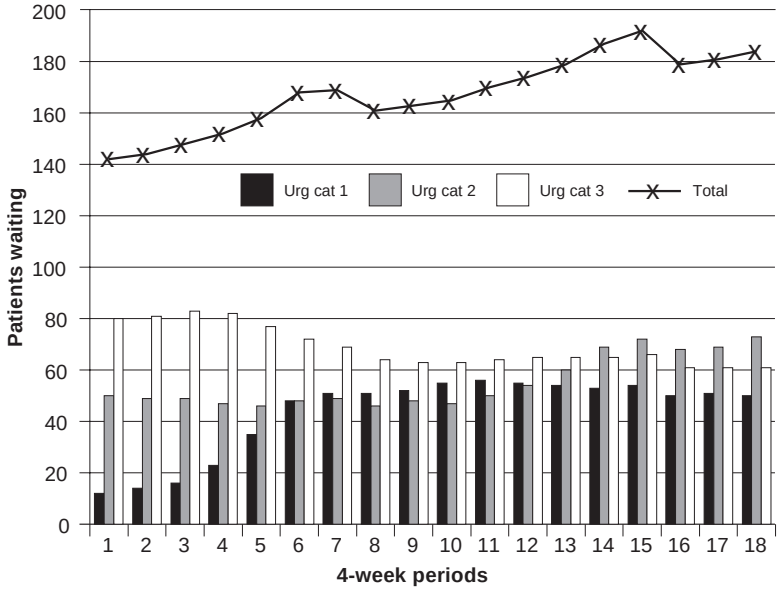
where *t* represents a particular period of time. The relationship between the waiting times of admitted patients and activity is more complex and this can hamper their interpretation. But census figures can give an indication of waiting times when they are divided by the average rate at which patients leave the list. This measure, called the clearance time, is regarded as the theoretical length of time that it would take to clear the waiting list if the rate at which patients leave remains the same. However, care is needed when interpreting this statistic as it can be unstable, and therefore misleading, if the average rate at which patients leave is small.

The fact that information in addition to waiting time figures is required for management purposes means that it is necessary to consider the consequences of how these statistics should be presented. Clinicians and managers are no longer interpreting only a single set of figures. Instead, they are required to make sense of three or more statistics whose behaviour is interlinked (as indicated by the formula above). Also, activity and waiting list data fluctuate from month to month due to the influence of a range of factors, which makes it difficult to interpret figures collected over a single period (for example, a month) or be confident that changes from one month to the next will continue. Consequently, it is preferable to examine data over a series of consecutive periods. The easiest way of meeting both requirements is to plot the data as a time series graph. Figure 1 gives one possible format of such a graph, although there are other reasonable combinations. For example, the plotted data could focus on one waiting list urgency category.

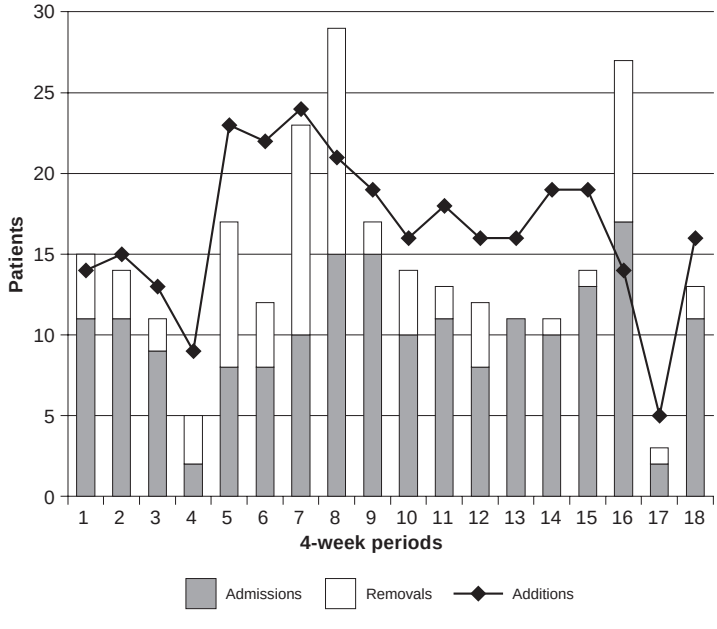
There is one final issue that differentiates the information needed for management purposes from that required to simply monitor performance. This concerns the level at which the data are aggregated. For monitoring purposes, the main objective relates to comparing the figures against a benchmark. As long as the indicator is expressed as an appropriate rate, the choice of how the data are aggregated depends largely on who is held accountable. There is also little need to look at any different level of aggregation. This is not the case when the data are used for management purposes. Excessive aggregation can prevent identified problems being linked to specific processes. It can also be misleading in the context of waiting list management because aggregation is equivalent to assuming that a patient can be admitted by any surgeon, which is not the case in reality. Consequently, managers and clinicians need data that relate to the level at which a waiting list is administered (usually the level of a surgeon) as well as aggregated data that give an overview of the situation.

Observed practice in the reporting of waiting list statistics

A study into the management of elective surgery waiting lists was undertaken in collaboration with The Canberra Hospital, Canberra, the St George Hospital, Sydney, and the Illawarra Area Health Service in New South Wales (Cromwell & Mays 1996). During the study, it was observed that clinicians and managers responsible for managing elective surgery in each organisation were routinely provided with waiting list information. The data were extracted from the organisation's information system using pre-defined reports that could summarise elective surgery activity and waiting list information for a specified period (for example, a month) in various ways. Some gave an overview and included both



Census figures



Surgery activity figures

Note: The top graph gives census figures as a total and broken down by three urgency categories. The lower graph shows total surgical activity for the same period, thereby indicating why the total census behaves as it does.

Figure 1: An example of the type of presentation that is required if waiting list data are to assist internal management

types of data, while others provided more detail on one particular aspect. For example, one report gave a breakdown of waiting times using categories based on the maximum desirable waiting times for each urgency category. Data were generally categorised by urgency category, and the user could often choose different levels of aggregation to complement this: by hospital, specialty, surgeon or indicator procedure. Table 1 gives an overview of some of the different type of statistics reported and variables used to aggregate the data.

Table 1: Overview of waiting list statistics used in reporting and variables used to aggregate data into different levels

Types of statistic
Waiting list census figures
Average waiting times (of admitted patients or of patients on the waiting list)
Clearance times
Waiting time distribution (of admitted patients or of patients on the waiting list)
Activity data: number of additions, admissions and removals
Factors that could be used to vary the level of aggregation
Period of time: for example, a month.
Organisational level: surgeon, specialty, hospital.
Type of surgery: in total, indicator procedure.
Clinical urgency: admit with 30 days, admit within 90 days, admit when possible.
Patient listing status: ready for care, not ready for care.
Type of stay: same day, overnight stay.
Type of accommodation: public, private patient.

The information presented to clinicians and managers was typically arranged in a tabular format and generally summarised the state of the waiting list and activity over the last month. Information to show how these figures had changed from the previous month could also be included. The layout of the tables was often equivalent to that produced by the organisation's information system.

Many clinicians and managers had reservations about the usefulness of the waiting list data as they were presented to them. The tabular format meant that it was difficult to examine how activity and waiting list behaviour changed over time. However, most seemed to accept that it was not easy for the staff who produced the reports to present the information in another way because the principal means of extracting data from the information systems was as a paper

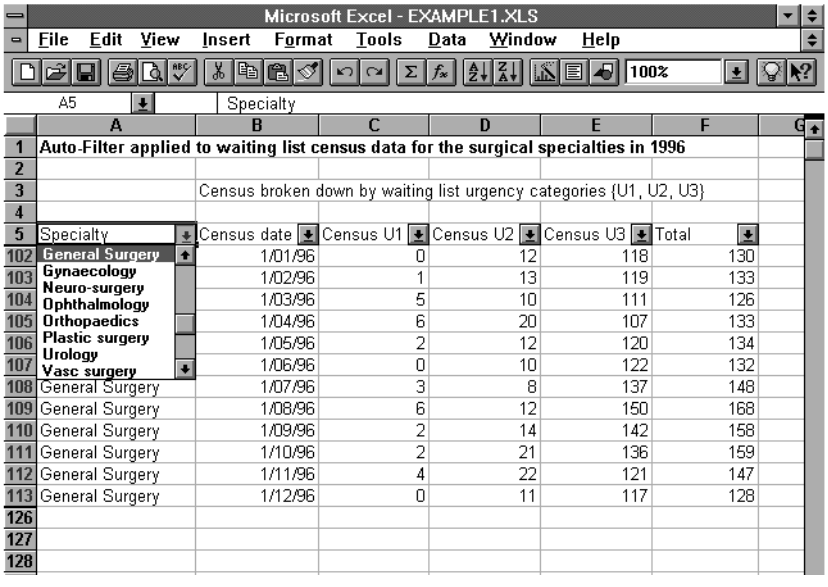
report. Moreover, it seemed to be generally accepted that routinely extracting data in an electronic format was too difficult.

The extraction of data as paper reports restricted the analysis and presentation of the data in two ways. First, it prevented time series from being produced and examined. Second, it resulted in data being examined at only one level of aggregation, which, at whatever level had been chosen, seemed to cause problems. For example, at one hospital, data were presented for each specialty by urgency category, by type of admission (same day or overnight stay), and by whether a person would be treated as a public or private patient. This made it very difficult to get an overview of the situation. The Area Health Service preferred to examine data at a hospital level, but this also created problems. At the time, the Area wanted to reduce the proportion of admitted 'urgent' patients who waited longer than their target waiting time of 30 days. However, for this group of patients, hospital-level data showed that the average monthly admission rate greatly exceeded the waiting list census. This suggested that all patients on the list should easily be admitted within the target 30 days, a meaningless result given the known level of performance, and clearly demonstrated that the hospital-level data were not useful. However, it was recognised that aggregating data at a lower level (for example, a specialty) would also create problems for the Area. The lower level of aggregation would greatly increase the amount of information, which, if data continued to be presented in a tabular format, would not be easy to digest.

A simple but effective solution

Improving the presentation and analysis of the data was found to be possible by making use of software that was already installed on many personal computers in the organisations, namely, a spreadsheet. With its in-built charting facilities and mathematical functions, a spreadsheet has always been a reasonable tool with which to process small amounts of data and it would clearly have been possible to produce the desired time series graphs of waiting list and activity data. However, manually creating graphs for each urgency category for every specialty (or surgeon) was not a realistic option, and the approach was only feasible because of recent refinements to the data handling capabilities of spreadsheets.

At the time, each organisation was using Microsoft Excel (version 5) (Microsoft 1993). This contains a number of data analysis functions, but there were two in particular that enabled graphs of activity and waiting list data to be produced. The first function, called a filter, provides a way to focus on particular segments of a data set. It can be applied to data organised into a table, where individual records are arranged in rows and their data are arranged in adjacent columns. Figure 2 gives an example table (ignoring for the moment the menu and arrows).



Note: The menu created by the function that allows the user to select the type of data to display is shown on the left of the screen.

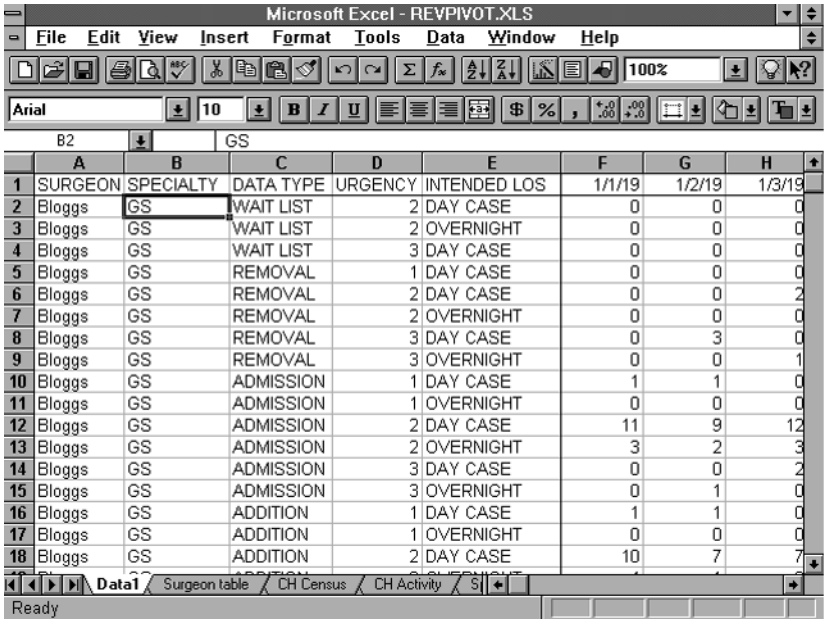
Figure 2: Example of the 'filter' function in Microsoft Excel, including the data structure

The filter command was used on data from one hospital and the Area Health Service. Data were extracted using a table that summarised surgical activity and the waiting list census by urgency category at the level of a specialty. Tables were produced for 24 consecutive months, and the data were arranged in rows so that consecutive tables followed one another.

Applying the filter command to data results in Excel creating a menu from the items in each column. This is activated by selecting the arrow that is added to each column heading. Choosing an item from a particular menu results in the filter hiding all rows of data except for those that relate to that chosen item. Figure 2 shows the menu of specialties within the example database. Currently, the specialty General Surgery has been selected and the filter has compressed the table to show only those data that relate to that specialty.

The filter command made using a spreadsheet a viable option because its effects extend to any chart that displays the data being filtered. A chart created to show the census data in Figure 2 would automatically update to show only the data for the selected specialty whenever a different one was chosen. For the project, this meant it was only necessary to define 4 or 5 charts, rather than 40 to 50, thus saving a lot of time and effort.

A disadvantage of the filter command is that it does not allow data from various records to be combined, and so it does not solve the problem of aggregation. The user has to select either the most appropriate level possible or apply a filter to databases of data already aggregated at different levels. This problem can be overcome, however, by using the second function – a pivot table. It has the capacity to group data and report a variety of statistics, including the number of records, their sum, or their average. However, the pivot table command requires the data to be arranged so that the various categories by which the data are to be grouped are listed in fields rather than as the headings of a table. Figure 3 gives an example of data arranged in the necessary format.

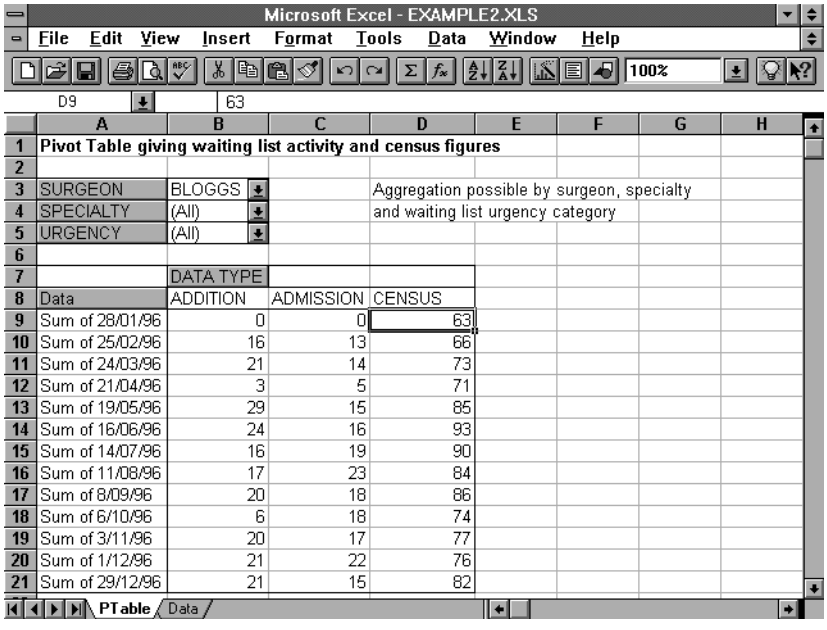


	A	B	C	D	E	F	G	H
1	SURGEON	SPECIALTY	DATA TYPE	URGENCY	INTENDED LOS	1/1/19	1/2/19	1/3/19
2	Bloggs	GS	WAIT LIST	2	DAY CASE	0	0	0
3	Bloggs	GS	WAIT LIST	2	OVERNIGHT	0	0	0
4	Bloggs	GS	WAIT LIST	3	DAY CASE	0	0	0
5	Bloggs	GS	REMOVAL	1	DAY CASE	0	0	0
6	Bloggs	GS	REMOVAL	2	DAY CASE	0	0	2
7	Bloggs	GS	REMOVAL	2	OVERNIGHT	0	0	0
8	Bloggs	GS	REMOVAL	3	DAY CASE	0	3	0
9	Bloggs	GS	REMOVAL	3	OVERNIGHT	0	0	1
10	Bloggs	GS	ADMISSION	1	DAY CASE	1	1	0
11	Bloggs	GS	ADMISSION	1	OVERNIGHT	0	0	0
12	Bloggs	GS	ADMISSION	2	DAY CASE	11	9	12
13	Bloggs	GS	ADMISSION	2	OVERNIGHT	3	2	3
14	Bloggs	GS	ADMISSION	3	DAY CASE	0	0	2
15	Bloggs	GS	ADMISSION	3	OVERNIGHT	0	1	0
16	Bloggs	GS	ADDITION	1	DAY CASE	1	1	0
17	Bloggs	GS	ADDITION	1	OVERNIGHT	0	0	0
18	Bloggs	GS	ADDITION	2	DAY CASE	10	7	7

Figure 3: Example of the data structure required by the 'pivot table' function in Microsoft Excel

Programmers at one hospital were able to create a report that could provide activity and waiting list census figures in this way. Figure 4 shows the structure of a pivot table similar to one used on those data. The table enables different levels of activity and waiting list census figures to be examined over time, and was used to produce the figures that were then graphed. The level of aggregation shown in the table is changed using 'page fields' located above the column headings. The table in Figure 4 currently shows data for a fictional Dr Bloggs, but the data could be aggregated in a number of different ways: by specialty, or surgeon, or waiting list urgency category, or a combination of the

above. And, as before, the chart defined to graph these data is automatically updated to show whatever aggregation of data is selected.



Note: The page fields that enable the user to select different levels of data aggregation are above the pivot table output.

Figure 4: Example of 'pivot table' output

Discussion

The principal reason for collecting and reporting any information in the context of management is to use it to summarise the current state of a particular process and indicate whether it requires attention. And yet, although waiting list statistics have been a feature of hospital information for a long time, our study found that organisations can still have difficulty translating waiting list figures into useful information upon which they could act. The difficulty did not relate to the use of inappropriate statistics, nor to inaccurate or incomplete data. Instead, the problems stemmed from the organisations' inability to manipulate the data they required into an appropriate, summarised form.

It would appear that these problems can be largely overcome with the use of a common software package. With a minimum of effort, the filter and chart commands in Excel revealed trends and changes in behaviour that had not been visible in the reports produced by the hospital information system. The pivot

table command enhanced the monitoring process further by enabling data to be aggregated quickly and simply, thereby allowing the user to get an immediate feel for the overall situation and to zoom in on areas of concern. And while Excel was used in this study, other spreadsheet or database software would probably be able to achieve the same results with equal ease.

However, the project encountered a couple of barriers that prevented people from making the most of the software. First, importing data into the spreadsheet was not easy. Data were either available on printed reports and had to be entered manually, or special effort was required on the part of hospital staff to provide the data in a computerised format. In addition, the reporting facilities are generally rigid and only allowed data to be retrieved in a pre-defined manner, which was not always ideal. As hospital information systems are generally standard across States and Territories, it is likely that other hospitals would have experienced similar problems. Consequently, for software like spreadsheets to be used regularly, the interface between hospital information systems and personal computers will need to be improved.

Second, although staff had Excel on their machines, few were aware of the data analysis features described here and it appeared that few had received formal instruction on how to use the software. Hence, it would seem that there is some benefit to be gained from ensuring that staff are trained in features of common software. This should perhaps be extended to include training on data management and analysis skills as it is important that staff are comfortable with the techniques being applied. And given the general increase in the use of quantitative information throughout the hospital system, it is important that an investment is made in people with good analytical skills (McKee 1997).

The study also highlights some important issues about the use of indicators to compare performance and to support management. Solberg, Mosser and McDonald (1997) make various distinctions in the characteristics that indicators require when used in these two roles and they suggest that different measures should be used in each case. However, the example of waiting list statistics shows that clinicians and managers do not necessarily require different measures for managerial purposes. Instead, they are more likely to require additional measures that are related to, and that are to be viewed in conjunction with, those indicators used to compare performance. This is because effective management is generally more about the control of interacting (and possibly conflicting) processes than about managing the behaviour of independent processes whose performance can be neatly summarised by a single indicator. This is not to say that simply more indicators are needed. The link between decision-making and information is complex (Lewis 1991) and,

to be useful, indicators need to be defined within a coherent framework of ideas that corresponds to the effective execution of the activity in question (Checkland & Scholes 1990).

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