Appendix A

Attributes of Measures

In any situation, it is necessary to select the appropriate measures from the many measures that have been proposed and discussed, to evaluate IT and to interpret actual measurement results in the context of the specific situation and the company’s ultimate business objectives and goals. In other words: the dashboard of IT value gauges has to be custom designed to reflect the specific internal and external issues at hand.

Measures are not all of the same kind. Different types of measures exist to support different purposes and sorts of measurements. Measures can be distinguished by their:

• applicability to support a type of measurement,
• type of scale,
• relationship to other measures,
• comparability.

Applicability of measures

Measurement in general serves different purposes, having consequences for the actual measures to be used. Three different purposes of measurement are:

• Measuring process and activity levels: The focus of this type of measurement is on periodic scores of the effectiveness and efficiency of processes, and deals with cost, timeliness, and quality of processes and activities. Associated measures track the process and the size of activities rather than the quality of the outcome of activities. An example is the development process of IT applications, for which the measure Function Points Per Staff Month indicates the level of activity, and Function Points Per Calendar Month indicates speed of the process.

• Measuring results: The focus here is on the measurement of cost and effectiveness of delivered products or services, or the post-mortem evaluation of just completed projects. In the example of application development, the level of user satisfaction and the number of defects during the first three months of operation would be appropriate result-oriented measures to evaluate some of the aspects of an IT application (the result of the development process).
Measuring performance to budget: Associated indicators gauge either ad-hoc or in a more continuous way management’s ability to match requirements to daily constraints, rather than the ability to perform activities at a certain efficiency level, or the effective results of efforts. For an application development project, the percentage of budget overrun (in money) and project plan slippage (in time) are good examples of associated measures.

Type of scale

Measures are either quantitative or qualitative. Four distinct sorts of measures can be distinguished: nominal (or categorical), ordinal, interval, and ratio measurement types, each with their own scales:

- **Nominal scales** are used to classify. An example would be either “yes” or “no,” to questions like “Do you have experience with system ABC?” or “Are you generally happy with the services of the IT supplier?” etc. The nominal scale is qualitative.

- **Ordinal scales** are used to rank and compare, for example, Company A spends a little or a lot more on IT than Company B. The often-used rankings of ‘better’ versus ‘worse,’ or ‘high’ - ‘medium’ - ‘low’ fall into this category. The ordinal scale is qualitative.

- **Interval scales** are quantitative scales on which the difference between the numbers on the scale can be interpreted meaningfully. An example is the overall customer satisfaction rating of 6 on a scale from 1 to 9. Such a rating is in fact a quantititative representation of a rather subjective, qualitative assessment. However, when asking large, representative sample sizes for a subjective opinion, the average of these subjective opinions will probably be close to objectivity, in context. If, for example, the majority of IT users are unhappy about the service level of IT supplier ABC, an average customer satisfaction rate of 3.2 on a scale from 1 to 9 should be regarded as an objective score of the customer satisfaction measure of the client base of supplier ABC.

- **Ratio scales** are quantitative scales such that the numbers on this scale have meaning. An example of this scale would be the number of dollars a company spends on IT. The scale possesses the property that intervals between points on the scale are comparable. For example, the difference between 100 million dollars a year and 120 million dollars per year is the same as the difference between 150 million a year and 170 million per year. In addition, it might be meaningful to compare an IT cost of 150 million per year with an IT cost of 100 million dollars a year, by stating that the former IT cost is 1.5 times that of the latter.

Ideally, measurement implies quantified, objective measures on ratio scales. However, quantified measures of a qualitative and more subjective nature (measures on the interval scale) can also be useful and may, in fact, be the only practical measures available in many instances.
Relationship with other measures

Most measures do not stand alone but rather are linked to each other, one way or another. Within groups (e.g., the category of IT effectiveness measures, or the category of IT supply effectiveness measures), measures relate together to form a pyramid of rising (vertical) levels of abstraction under a single performance criterion, and have relationships horizontally, as illustrated in Figure A.1. These relationships might be either strong or weak, and either statistically proven or logically derived.

The idea of building pyramids has been developed by Minto for a different purpose (to write clear business documents), but the concept can be equally useful for structuring and ordering performance measures. According to Minto, “at higher levels, aggregate performance measures summarize the performance measures grouped below them (vertical linkage). Performance measures in each grouping must be part of the same logical set of measures, and they must be in strict logical order (horizontal linkage). The logical order can be formed either deductively or inductively. If the order is deductive, the second performance measure is a result of the first one, and the third measure follows from the first two measures. If the order is inductive, the measures are of the same kind and independent of each other.”

Figure A.1 illustrates both the deductive and inductive relationships between measures. The measure “costs of IT” is broken down into three measures. “Costs of

Figure A.1: Pyramid of a Group of IT Performance Indicators
maintenance” is a consequence of the development of IT applications in the past, while the costs of IT operations are implied by both the costs of development and later adaptations and changes to the application. The three cost measures demonstrate a clear deductive relationship.

At the lower levels, the cost of development can be divided into new development and re-development of IT applications. The re-development of (parts of) IT applications cannot happen without the existence of previously developed IT applications. Re-development is thus an implication of (and thus deductively related to) the existing development of new IT applications.

The costs of maintenance, however, do not show a deductive relationship but, rather, an inductive one. Adaptive maintenance of IT applications is not implied by corrective maintenance; both types of maintenance exist side by side in their own right. Both are, however, maintenance activities, and therefore they are considered to have an inductive relationship. The same reasoning applies to different types of operations, in which the examples of centralized and decentralized operations are included.

Although the objectives, frequency, etc., of measurement at different levels might be different, the measures themselves do not need to be mutually exclusive. Some of the same measures at different organizational levels might complement each other. For example, for each completed application development project, it is possible to afterwards measure the efficiency of development in terms of delivered Function Points Per Staff Month. At the higher level, it is possible to measure the efficiency of the application development process by summing up the efficiency levels of the several projects that have been executed over a period of time, say a year, and compare the overall efficiency level with the performance of past years.

Comparability of measures

The final attribute of measures is associated with possible objectives of measurement. Choosing the appropriate, comparable measures is vital in reaching measurement objectives, both from an internal historical perspective (internal trends) or external comparative perspective (benchmarking). Both perspectives require consistency in terms of definitions of measures, and in terms of comparability of measurement results.

Measures can be tracked over time to build an aggregated picture of the subject of measurement, and to smooth out fluctuations of individual measures in a particular period. A few years is probably the minimum length of time needed to get a reliable picture of the main trends for many measures; the actual period is, of course, contingent on the measures used.
REFERENCES
