

# The Fuzzy Logic between Lead and Lag Indicators

By Richard Lynch

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External financial reporting and internal operational control represent two fundamentally different functions. The former is guided by GAAP, tax laws, and the needs of stockholders and are lagging performance indicators. Operational control, on the other hand, is a leading performance indicator, and is guided by business strategy, and how well customer expectations are met. Satisfying these two needs are related but measured differently. Reporting that is focused only on investor results can have a counterproductive impact on the longer-term performance of the company (e.g., a focus solely on short-term financial metrics may force decisions that impede company agility to capture new market share). However, completely severing the tie between external financial numbers and day to day operating metrics is a mistake.

Art Schneiderman, pioneer of the balanced scorecard concepts at Analog Devices, claims that there is not and cannot be a quantitative linkage between non-financial and expected financial results - but there is a soft link. Empirical research supports his claim. Several longitudinal studies verified the lead-lag relationship at a point in time. For example, companies that achieve fast cycle times later reported triple the revenue growth and double the profits over industry average competitors. However, given the many complex interactions between parts of the organization and the external environment, a quantified linkage is a stretch.

## Architecture impacts

Companies need a business reporting architecture that ensures that the right information is provided at the right time. As opposed to quantifying the lead-lag relationship, focus should be on getting the lead information to decision-makers to take appropriate action that will get desired lag results.

The reporting architecture should direct behavior, evaluate performance against preset goals, and provide information for adjusting the goals themselves through a feedback process. In many cost accounting-based performance measurement systems, this loop is not complete. Accounting variances, rather than serving to update non-financial goals (i.e., efficiency standards), are merely used to create adjusting entries for the general ledger. The underlying assumption, of course, is that the standards are right and operating reality is wrong. This assumption is at odds, for example, with the goals of just-in-time manufacturing.

Whether for an individual operation or the whole department, non-financial measures such as on-time delivery, quality, cycle time and waste provide a complete control loop. See the figure below.

**Loop 1:** Focusing in on the workgroup (or department) level, targets are set (e.g., reduction of waste or cycle time, improvement in quality), action takes place, and results are charted. Based on the results, process adjustments are made to keep the system on track. These measures are timely, and close to the point of action. Feedback can be used to accurately adjust current activities. This is the definition of a complete control loop.

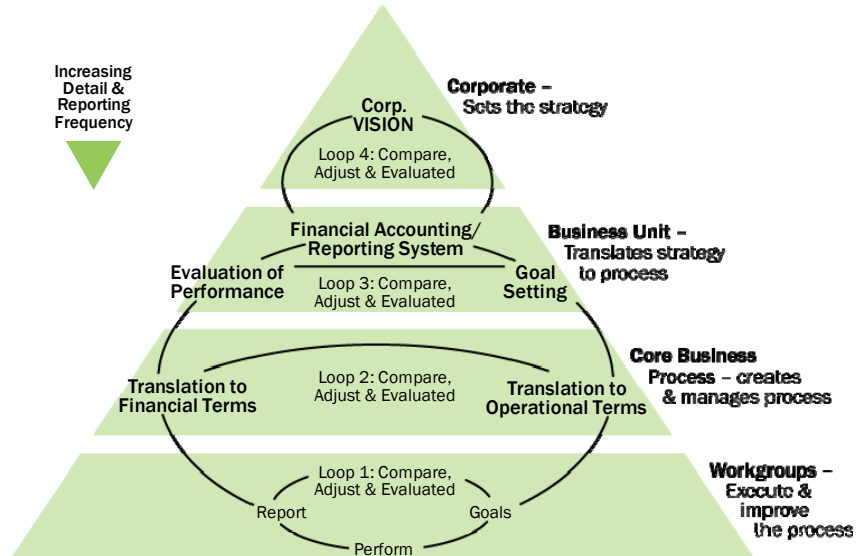
**Loop 2:** The core business process level (e.g. new product introduction, order fulfillment and post sales service) actually consists of a double set of controls: operating and financial. The operating controls are used to evaluate how departments and teams work together in meeting core process objectives.

Financial reporting completes the control loop used at this level, translating the operating data into summary data for top management. For example, as improvements in cycle time are made at the department level, this information is passed up to the

core process in a second performance feedback loop. Adjustments are made to inventory to satisfy external financial reporting needs and the information is fed back into the goal setting process (i.e., the goals are set more aggressively). The "time span" of decision-making at this level is longer and executives should resist micro-managing and leave that to the responsible workgroup.

Managers at the core process level need only enough feedback to know when a problem exists that is going to affect total period performance so that they can put in place appropriate programs to improve performance.

**Figure 1. Feedback Directs Behavior**



**Loop 3:** Moving up the organization, the level of detail decreases markedly, as does the definition, and realities, of the timeliness and frequency of reporting cycles. For example, core process performance (e.g., # of new products, time to market in new product introduction) is passed up to the business unit level to evaluate how well strategies have been executed.

The operating measures (and exceptions) provide a signal that financial and marketing objectives may not be reached. The financial control loop verifies this, after the fact. Here the market share and financial performance of the business unit is reflected in the unit's profit and loss numbers, asset turns, and revenues. Again, the financial results are translated back into operational imperatives in the business system level. For example, if asset return objectives for the business unit were not met, new programs would be developed or emphasis added to the cycle time measures in the business system to help improve financial performance.

**Loop 4:** The final feedback loop provides feedback on the corporate vision itself. Top management receives information over time on how effectively strategies have been executed and resources deployed. Total corporate performance is compared to expectations. Markets and competitive tactics are evaluated and adjusted as necessary.

In summary, the information architecture should support whatever type of reporting upper management wants. The detail is there, ready to be passed up through the reporting hierarchy on demand. Each level has its own tightly defined control loop as well as the means to access information from lower levels through the integrated system. For example, if there is an increase in product defects in loop 1, it will indicate future financial problems and pinpoint whether the problem is related to execution (loop 1), process design fault (loop 2) or strategy issue (loops 3 & 4).

### Business management response

Balanced scorecard projects are predicated on the assumption that employee measures on commitment and capability will lead to desired organizational capabilities such as new product time-to-market, which in turn lead to customer results in terms of quality, delivery, and price. These measures are the independent variables

at the core process level that drive the investor or financial/market results at the business unit or corporate level (i.e., the dependent variables). This assumption needs to be taken on faith or 'fuzzy logic.' In other words, companies need to focus on the non-financial indicators at all levels because they represent, in Schneiderman's words, 'the collective wisdom of the organization that they will improve the odds of success'.

In the case of Analog Devices, the leadership team focused on attracting and retaining great designers, provided high visibility to new product volume and time-to-market indicators, and paid attention to customer metrics as well as the quality system to continuously improve them. Over the years, these efforts have helped Analog improve production throughput rates (which delayed the need for adding capacity) and accelerated new product development - especially in the communications market (wireless applications and high speed internet access).

**About the author:**

Richard Lynch ([Richard.Lynch@Accelare.com](mailto:Richard.Lynch@Accelare.com)) is the Northeast Vice President at Accelare, Inc. He is an acknowledged capability improvement and new growth platform expert and has written three books, including *Measure Up!* and *The Capable Company: Building the capabilities that make strategy work*.