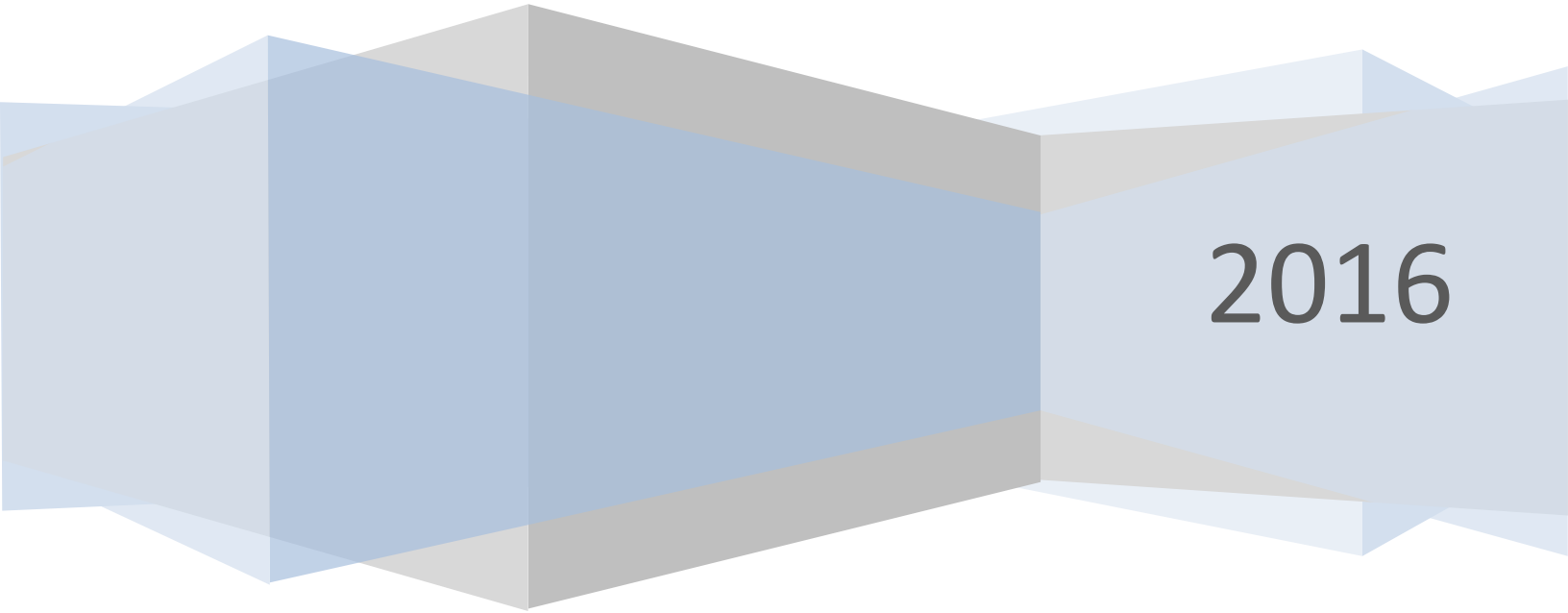
Intervention Logic

Hooking What You Do to the Bottom Line

Fred Nickols



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OVERVIEW

What is *your* intervention logic? How do you hook what you do to the bottom line? How do you know the actions you take will have the results you intend? How do you start with a bottom line result and figure out how to produce it? How do you examine a proposed action to get a fix on its likely outcomes? These and similar questions point to the need for an "intervention logic," for a way of being able to say with a reasonable degree of certainty that a certain action will produce a certain result or that a certain result requires a certain action.

This article describes a method called “Measurement-Based Analysis.” It is used to analyze the measures being used by an organization. The purpose of this analysis is to identify the actions necessary to produce a specified result. In so doing, it provides a logical basis for your interventions and it helps you identify the links between your actions and the bottom line. The method centers on two activities:

1. drawing diagrams of the architecture or structure of the measures used by an organization, and
2. examining the connections and relationships among the elements of that architecture so as to (a) identify points of evaluation, (b) points of intervention, and (c) configure courses of action intended to produce specified, measurable results.

THE MYSTERY SURROUNDING ENDS AND MEANS

For many people, the links between the "human side of enterprise" and the organization’s bottom line are shrouded in mystery. Consequently, efforts to improve human or organizational performance through applications of the behavioral or management sciences are often acts of faith. It is hoped or believed that these efforts will yield benefits justifying the resources expended, but no one can say with any degree of certainty that this is in fact the case.

This mystery owes chiefly to a lack of knowledge about the relationships between means and ends. A great deal is known about implementing various methods and techniques, but the ability to specify in advance the bottom-line results of a given course of action is much less developed. Similarly, determining the course of action that will yield a given result is often problematic, especially when the results wanted are on the bottom line. Consider the following questions:

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- What actions are necessary to increase the current ratio to 1:1 from its present level of 1:2?
- What is the impact on profitability of reengineering the order entry process?
- How much and what kind of work process improvement is necessary to yield $10 million in annual cost savings during the next four years?

When faced with questions like these many managers become understandably cautious; they know the limitations of "hard" data and the price tag on impulse.

The bottom line in this case is that a major problem facing those who set out to measurably and systematically improve organizational performance is the difficulty encountered in relating actions taken to effects felt on the organization's bottom line.

FINDING THE LINKS BETWEEN ENDS AND MEANS

There are two ways of making the connections between ends and means; one is evaluation, the other is analysis.

Over time, the evaluation of results can reveal a great deal about the relationships between means and ends. Much can be learned about them. However, evaluation cannot be carried out until resources have been committed to and at least partially consumed in activity. Evaluation is always after-the-fact; it provides hindsight.

The hard reality facing managers and executives is that resources must be allocated before action is taken and before results can be known. This requires foresight not hindsight. Foresight is provided in part by what has been learned from evaluation and experience and in part by what can be gleaned from analysis.

MAPPING THE RELATIONSHIPS: DEVELOPING YOUR INTERVENTION LOGIC

To use analysis as the basis for targeting, selecting, and funding interventions, it helps to construct a map of the relationships between means and ends.

The key to constructing such maps is found in the structure or architecture of the measures used to quantify results. Identifying and breaking

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down the structure of these measures can identify the connections between the results measured and the various activities that produce them. Subsequently, you can target the places where results can be evaluated and the places where interventions can be made. Once these two places have been identified, you have your intervention logic, and various methods and techniques drawn from the behavioral and management sciences can be used to actually intervene in this architecture to achieve the desired results.

TWO KINDS OF MEASURES

Models can be constructed for financial measures such as Return-on-Equity, Profit as a Percentage of Sales, Return-on-Assets-Managed, Current Ratio and so on. Models can also be constructed for operational measures such as Inventory Turnover, Average Collection Period, Mean Time between Failure, and various productivity indices.

THE MODEL-BUILDING PROCESS

Constructing models of measures is a straightforward task. It consists of asking three basic questions:

1. What is the measure?
2. How is it calculated?
3. What are its input variables?

Then, for each of the input variables, the same three questions are asked again. This process continues until a complete model of the measure has been built. The model is complete when the last variables identified are measures of the direct outputs or products of activity. At this point, measurement consists of counting things (e.g., orders, calls, payments, etc.)

The initial stage of this analysis deals with abstract measures, typically calculations of some kind. The input variables are the products of previous calculations (e.g., Return-on-Equity is calculated based on input variables that are themselves the results of calculations). The later stages of the analysis deal with more direct measures of activity (e.g., calls made, sales closed, etc.).

Activity, even cognitive activity, always takes place in the physical world. However, once results are defined and articulated, they also exist in the abstract word of language and measurement. The model-building pro-

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cess enables the identification of the linkages between abstract and concrete measures. In turn, these linkages enable tracing the connections between a given activity and a desired result or, conversely, between a desired result and the activity that will produce it. Thus it is that the links between ends and means are forged.

RETURN ON EQUITY (ROE)

To illustrate the model-building process, consider the fairly common measure of Return on Equity (ROE). It is the ratio of Net Profits to Shareholders' Equity.

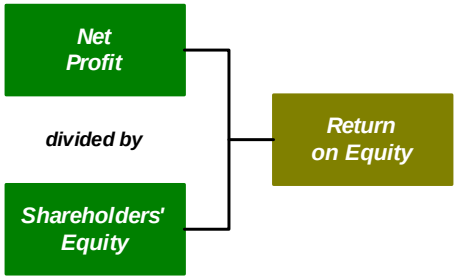

Figure 1 – Return on Equity (ROE)

Asking the three questions presented earlier yields the answers below:

1. What is the measure? *Return on Equity*.
2. How is it calculated? Divide Net Profits by *Shareholders Equity*.
3. What are its input variables? Net Profits, *Shareholders Equity*.

Displaying the answers in a diagram is very simple; merely lay them out in a hierarchical or tree-chart format and indicate the mathematical function as shown in Figure 1.

Next, the same three questions are repeated for each of the two input variables.

For Net Profits:

1. What is the measure? *Net Profits*.
2. How is it calculated? *Subtract Operating Expenses from Gross Profit*.
3. What are its input variables? *Operating Expenses and Gross Profit*.

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For Shareholders Equity:

1. What is the measure? *Shareholders Equity*.
2. How is it calculated? *Subtract Total Liabilities from Total Assets*.
3. What are its input variables? *Total Assets and Total Liabilities*.

Armed with this additional information, the tree-chart can be expanded as shown in Figure 2.

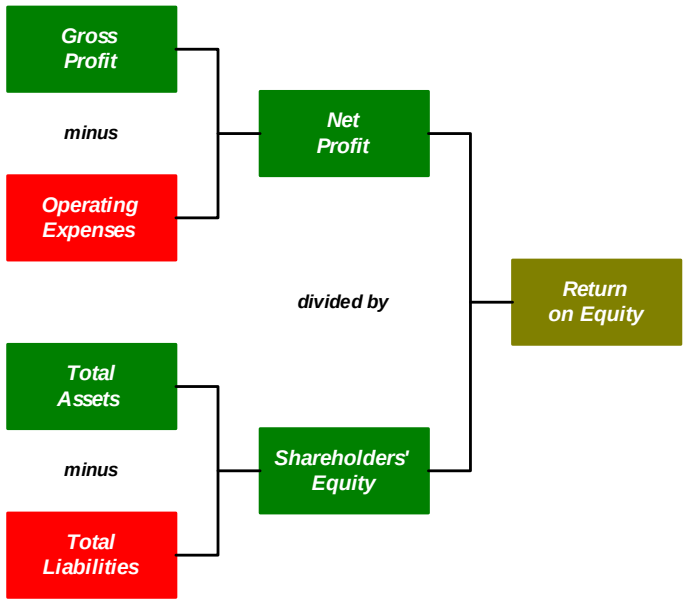

Figure 2 – Return on Equity (Second Level)

Continuing the decomposition of the Return on Equity measure will arrive at something similar to the structure shown in Figure 3.

Eventually, the analysis will lead to variables that are directly tied to activity. Breaking down Gross Sales, for instance, will find the following answers to the three questions:

1. What is the measure? *Gross Sales*.
2. How is it calculated? *Add the dollar amounts of individual customer purchases*.
3. What are its input variables? *Dollar amounts of individual customer purchases*.

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Depending on the particulars of the business in question, breaking down the dollar amount of an individual customer's purchase might reveal that it is equal to the selling price of the item multiplied by the number of items purchased less any discounts or allowances. In this case, the analysis moves out of the organization being studied and into its customer activity; namely, the buying decision. There, it will be found that Gross Sales is a direct measure of customer activity (i.e., buying behavior) but only an indirect measure of selling activity.

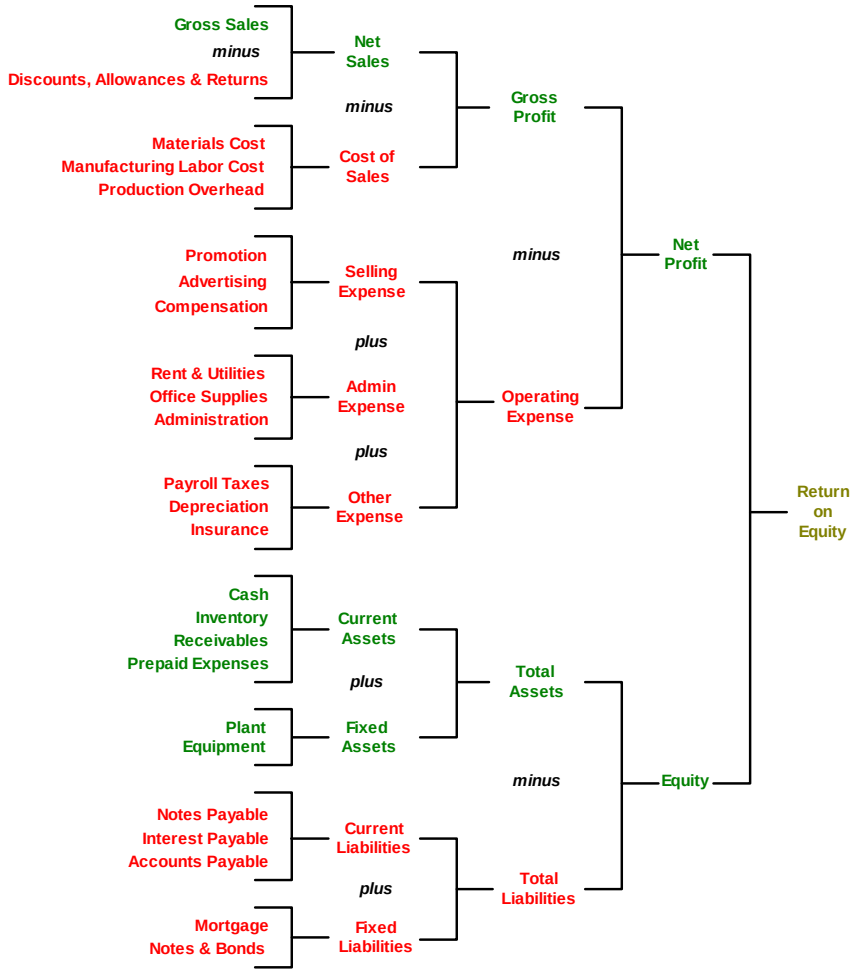

Figure 3 – Return on Equity (Expanded View)

The illustration of the model-building process will continue with a direct measure of selling activity: Closing Rate.

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CLOSING RATE

Closing Rate is a measure commonly found in canvassing sales operations.[1] It compares the number of accounts for which a sales call has been closed to the number of days worked in a given time interval.[2] Going back to the three basic questions yields the following answers:

1. What is the measure? *Closing Rate*.
2. How is it calculated? *Divide the number of accounts closed by the number of days worked*.
3. What are its input variables? *The number of accounts closed and the number of days worked*.

As before, repeat the process for each of the input variables:

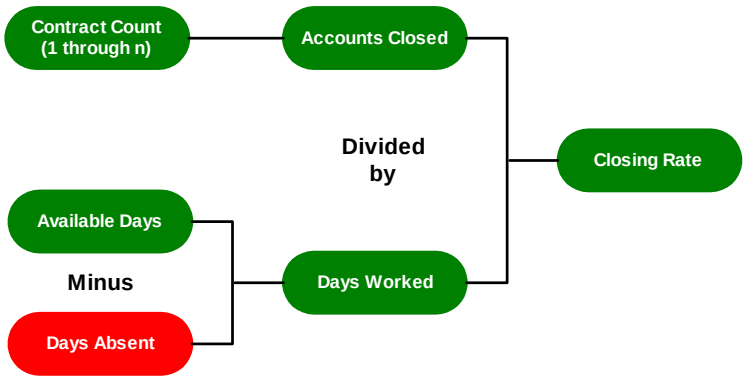

Figure 4 – Closing Rate

1. What is the measure? *Number of accounts closed*.
2. How is it calculated? *Count the number of contract forms submitted (for both sale and no-sale calls).*

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[1] A canvassing sales operation involves a mobile sales force moving into a territory, canvassing it, and then moving on. Advertisements for the Yellow Pages were once sold in this manner and might be still.

[2] "Closed" does not mean a sale. It means merely that the sales call has been concluded and, whether or not a sale has been made, no further contact with the customer will be made during the current sales campaign.

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3. What are its input variables? *The number of contract forms submitted*.

Repeating the process again:

1. What is the measure? *Number of days worked*.
2. How is it calculated? *Subtract the number of days absent from the number of normal working days in the time interval*.
3. What are its input variables? *The number of days absent and the number of normal working days in the time interval*.

At this point, the analysis of the Closing Rate measure would halt. Two input variables that are direct products of the salesperson's activity have been identified: number of contracts submitted, and number of days absent.

A WORD OF CAUTION

It is commonplace to hear someone say, "You get what you measure." It is equally true to say that "What you measure is what you get." In other words, people who are subject to measurement systems learn how they work and, in some cases, learn how to play them like a finely tuned fiddle. A quick example based on the closing rate measurement above will illustrate.

If a given salesperson wishes to drive up his or her closing rate, it is possible to do so by calling in sick. That reduces the number of days worked and, for a given number of closes, drives up the closing rate. In situations where sales contests and promotions tie sizable rewards to the closing rate, calling in sick is a means of enhancing one's odds of obtaining the reward in question.

So, to the conventional wisdom that "You get what you measure," must be added this caution: "Be careful what you measure."

ANALYZING MEASUREMENT MODELS

The analytical process involves identifying targets or standards for the variables at each level of the model and then comparing them with actual values. In the absence of organizationally imposed targets or standards, industry norms, trends or projections, relative rates of change between the variables, or benchmarks drawn from best-of-class companies can be used. If a discrepancy exists at one level, move to the next,

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and identify any discrepancies at that level. This process repeats itself until the analysis has worked its way down through the abstract measures to the concrete ones.

When the level of concrete measures has been reached, the analysis is in a position to identify the organizational activities that might be changed to achieve the desired results. It will have identified possible points of intervention. Moreover, how these activities must be changed to produce the desired effects at the targeted points in the measurement system can be specified. The effects of these changes can be traced through the architecture of the measurement system to define the impact on the original discrepancy.

The ability to move from one or more points of evaluation to one or more possible points of intervention and then back again makes it possible to (1) target specific organizational units for improvement efforts, and (2) select appropriate methods and techniques for intervening in the targeted units.

A COLLECTIONS PROBLEM

To illustrate how the analysis of measurement models works, consider an organization that has a "collections" problem. The average collections period is running 72 days versus an organizational goal and industry norm of 45 days.

Knowledgeable managers know that the collections period is affected by variables such as credit authorization, the terms granted at time of sale, and the intensity of the collections effort. But these are broad areas. More precision is required. The first step is to construct a model of the way in which the average collections period is measured.

The organization in question uses the fairly common practice of computing the average collection period based on Receivables expressed as a percentage of Net Sales multiplied by 360 (see Figure 5).

The actual value of the collection period is 72 days; the standard is 45 days. There is a discrepancy of 27 days. A problem or gap statement is easily formulated: The collection period is averaging 72 days; it should not exceed 45 days.

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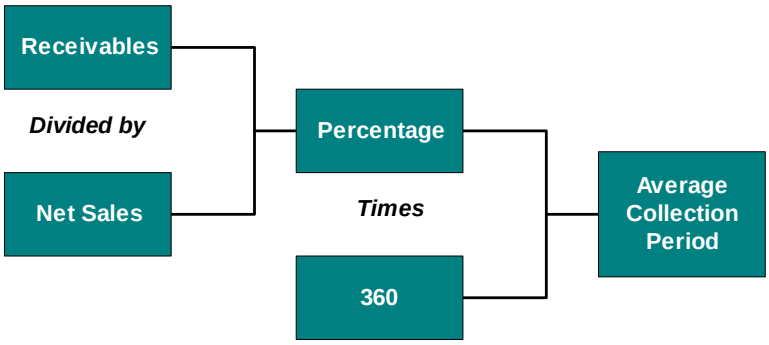

Figure 5 – Average Collections Period

The component variables are Receivables, Net Sales, Receivables as a percentage of Net Sales, and 360 days. The relationships are such that if Receivables as a percentage of Net Sales decreases, so does the average collection period. Because the 360 days component variable is a constant, the balance of the analysis must be confined to the Receivables and the Net Sales variables.

Given the actual values, it is easily determined that Receivables as a percentage of Net Sales is currently 19.9 per cent. But what should it be?

The variables in Figure 5 can be viewed as an equation having the following form: (R/NS) x 360 = ACP

Dividing both sides by 360 produces this equation: (R/NS) = ACP/360. Substituting the target or goal value of 45 days for ACP and then dividing by 360 establishes that the standard for Receivables as a percentage of Sales is 12.5 per cent. To have a collection period of 45 days, Receivables should not exceed 12.5 per cent of Net Sales. Thus, there is another discrepancy, one which could be stated as follows: Receivables as a percentage of Net Sales is 19.9 per cent; it should be no higher than 12.5 per cent.

Continuing the analysis in accordance with the guidelines provided by the schematic in Figure 4, it is determined that the component variables of Receivables as a percentage of Net Sales are the dollar amounts of Receivables and Net Sales. The relationships between them are such that if Receivables decrease relative to Net Sales, then so does Receivables as a percentage of Net Sales, and so does the average collection period. The average collection period will also decrease if Net Sales in-

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creases in proportion to Receivables. (As a comment in passing, it is helpful to look at the relative rates of change. If Receivables are increasing at a rate faster than that of Net Sales, there might not be a collections problem currently, but there could soon be one. By the same token, if it is decreasing, any existing problem might be in the process of disappearing.)

Now the solution requirements can be specified. If the standard for Receivables as a percentage of Net Sales is 12.5 per cent, then the dollar amount of Receivables should be no higher than that percentage. The dollar amount of Net Sales is $224,787,000. Multiplying that figure by 12.5 per cent indicates that Receivables (at this point in time) should be no higher than $28,098,375. The actual value of Receivables is $44,957,102. The difference between the two figures is $16,858,727. Any solution must reduce Receivables by approximately $17,000,000 to reduce the collection period to 45 days. More precisely, it must reduce Receivables as a percentage of Net Sales to no more than 12.5 per cent and hold it there.

The analysis has uncovered an interesting point: the size of the collections problem is about $17 million. If the organization didn't have the collections problem, there would be $17 million less in receivables than is currently the case (and $17 million more in the bank, so to speak). It also could be the case that the organization is engaging in short-term borrowing to meet its own cash flow needs and it would not have to engage in such borrowing if that $17 million were not tied up in receivables. The cost of that borrowing is an additional, hidden cost of the collections problem. The value of reducing the collection period from 72 to 45 days is considerable. However, no specific solutions have yet been identified so the analysis must continue.

The leftmost variables in Figure 5 reveal that the two input variables are Net Sales and Receivables. If, over time, Net Sales can be made to increase at a faster rate than Receivables as a percentage of Net Sales, the problem will be solved at some point. However, it is probably more practical — and more immediate — to reduce Receivables. Consequently, the model must be extended. Receivables, in dollars, is at any point in time the difference between the dollar amounts that have been invoiced and the dollar amounts that have been received in the form of payments from customers.

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A LINK TO CUSTOMER ACTIVITY

As was the case with the earlier analysis of Gross Sales, the current analysis of Receivables leads out of the organization under study and into its customer organizations. Specifically, it leads to the accounts payable function in the customer organizations.

It is important to recognize that someone else's accounts payable activity lies between the issuance of an invoice and the receipt of payment. Receivables are not the automatic product of a mechanical cause-and-effect process triggered by an invoice. The decision to pay is of as much interest to a selling organization as the decision to buy. This time customer activity will be examined (see Figure 6).

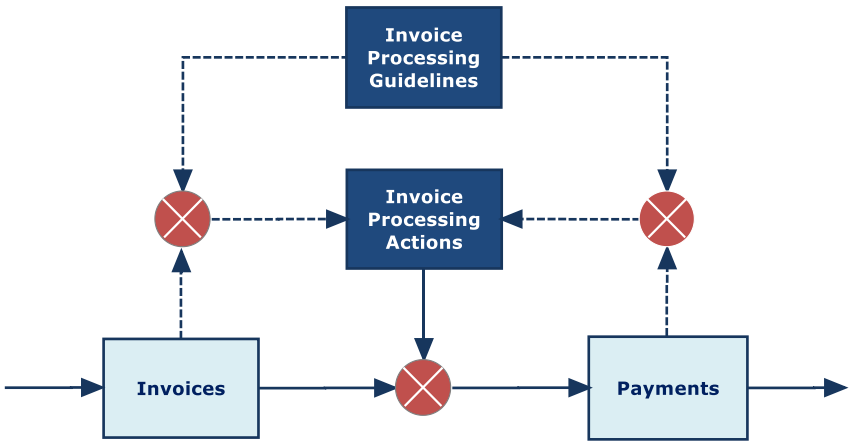

Figure 6 – Invoice Processing System

Assuming that the total dollars invoiced takes the form of invoices sent to the customer, and that the dollars received take the form of payments received from the customer, the two variables can be connected through a simple systems model. The input to this model is the invoice, the process consists of actions and decisions related to paying invoices (governed by invoice payment guidelines), and the output is the payment or lack of it.

There are three decisions of interest lurking in the processing model shown in Figure 6. One is a simple binary decision: To pay or not to pay. A second decision modifies the first. If the decision to pay is made, then: Is all or part of the invoice to be paid? The third decision is a matter of

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timing: When is it to be paid? Identifying these decisions makes the identification of relevant variables easier.

Customers might decide not to pay because of errors in the invoices, non-receipt of goods purchased, the receipt of damaged goods, or because they simply don't have the money. These considerations can be traced to related functions in the selling organization (e.g., billing, shipping, claims, and credit authorization). A customer might elect to make a partial payment for some of the same reasons: invoice errors, incomplete shipments, or inadequate funds. The customer's decision as to when to pay can be influenced by several factors (e.g., financial conditions, the terms granted as a condition of the sale, the customer's sense of urgency about paying, or competing priorities for available funds). Again, there are corresponding functions in the selling organization (e.g., credit terms authorization and credit approval, and the collections effort).

The general form of several possible solutions can now be seen: tighter quality controls in billing (speed and accuracy), more emphasis on shipping (speed and safety), tighter credit controls (authorization and terms), and an intensified collections effort. An experienced manager would recognize these possibilities right away, but would be as hampered as we are by the fact that, although these are appropriate possibilities, they are not sure-fire solutions. More analysis is required.

Analysis of Average Collection Period

The analysis just completed is one of a model of the calculation of the average collection period based on financial variables. It is a very abstract measurement, one that does not apply to seasonal kinds of businesses because it relies on income statement figures that are subject to drastic changes. More important, it is a calculated measurement of the average collection period, not a direct measurement. So, the average collection period must be examined in a more direct manner.

An alternative way of determining the average collection period is to identify the time between issuance and payment for each invoice, add these times, and divide by the number of invoices involved. The use of Julian dates can facilitate this determination. Like the other measures that have been examined, this one, too, can be displayed in model form (see Figure 7).

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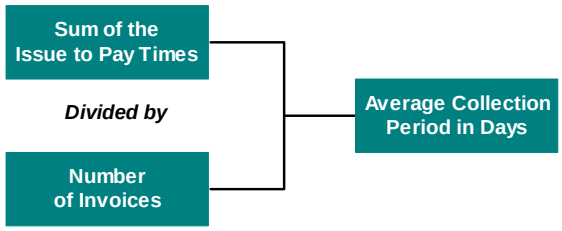

Figure 7 – Average Collection Period

The model in Figure 7 provides a much more accurate measure of the average collection period. Unfortunately, it does not indicate what is important about a reasonably short collection period: the cost of money and the impact on cash flow. But the analysis is getting closer to a solution.

It has been determined that the calculation of the collection period based on financial figures isn't detailed enough for diagnosis. It also has been determined that the more accurate calculation based on elapsed time from invoice issuance to receipt of payment doesn't establish why receivables are so high. Are receivables high because of a few large amounts of money being owed for a long period of time or are the excessive receivables due to a general pattern of delayed payments on invoices?

It is clear, then, that attention centers on the relationships between two key variables: the amount of money owed on an invoice, and the length of time it is owed. A scatter gram is a convenient way to look at these relationships. Let the vertical axis represent the amount of money owed, and let the horizontal axis represent the length of time it is owed. Each invoice can be plotted on this axis (by a computer, if one wishes). Clusters or concentrations of dots represent significant effects on the collection period (Figure 8).

An analysis of the clusters shown in Figure 8 uncovers several informative facts:

- Twenty per cent of the total amount in receivables at any given point is owed by six major customers.
- Thirty-five per cent of the amount past due at any given point is owed by 12 customers, including the six largest.

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- Eighty-five per cent of the smaller customers pay their bills within 45 days.
- Roughly 50 per cent of the medium-sized customers pay within 60 days and there is a significant cluster around that point.
- No-pays or bad debts are confined to the smaller customers, with less than a one per cent bad debt rate among medium-sized customers, no bad debts with larger customers.
- The precise collection period figures are: Mean or Average = 64 days and Median = 52 days.

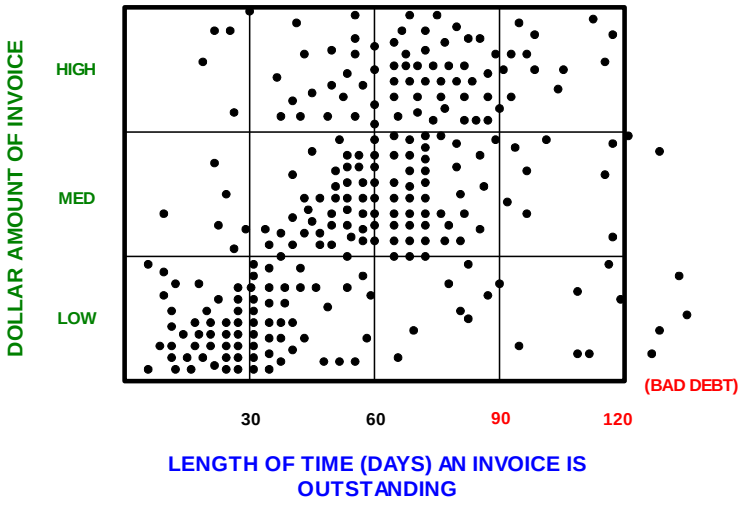

Figure 8 – Scatter Gram of Invoice Payments

At this point, a few questions seem fairly obvious. Why are larger customers taking so much longer to pay? Why do the medium-sized customers cluster around the 60-day mark? Why are the smaller customers paying so promptly? Why is there such a deviation between the actual collections period figures and our earlier calculated ones? It is now time to venture into the world of physical activity to find some answers and the findings prove very interesting.

An invoice does not receive collections treatment until it is 30 days past due. So, when a customer pays an invoice in response to a collections call, it already past due.

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Smaller customers are being given terms that range from Net 10 to Net 30 days; medium customers get terms ranging from Net 20 to Net 45 days; and larger customers are being given terms that average 60 days. The preferential treatment of the larger customers is in keeping with their status, but is wholly inconsistent with a goal of 45 days for the average collection period.

The sales force regularly assures its medium and larger customers that "there's no hurry, invoices really aren't due for 60 days."

Perhaps most interesting, the credit manager, the person who authorizes credit and approves terms, reports to the general sales manager. The credit manager is under considerable pressure to "approve" credit, not do a good job of checking it, and disapproving credit jeopardizes sales targets.

Explaining the solutions to the collections problem at this point would be anti-climactic.

SUMMARY OF BENEFITS

The primary benefit of Measurement-Based Analysis is that it systematically connects organizational means (actions) to organizational ends (results), it provides the logic for your interventions. Other benefits include the following:

- The Measurement-Based Analysis process can be applied to any quantitative measurement system; it is not limited to financial measurements.
- Measurement-Based Analysis can begin at any point in the organization; it does not have to start with any particular measurement or level of measurement.
- Measurement-Based Analysis quantifies both the cost of the problem and the value of the solution, thereby enabling truly valid cost-benefit comparisons among competing alternatives.
- Measurement-Based Analysis forces a focus on that which is relevant, thus avoiding information overload. More important, it prevents screening out of relevant information.
- Measurement-Based Analysis very quickly points out flaws in the measurement systems themselves; for example, measure-

ments that are invalid, not connected to anything and that yield little or no useful information.

- Measurement-Based Analysis facilitates the ready identification of numerous alternatives for organizational improvement instead of persisting in what is frequently a futile search for the cause of a problem.
- Finally, Measurement-Based Analysis provides the conceptual framework and the analytical tools necessary to connect an organization's results measurement systems to its activities. Once these links between ends and means have been forged, it is possible to connect the "human side of enterprise" to the bottom-line.

CONTACT THE AUTHOR

Fred Nickols can be reached by e-mail at this link. Other articles related to Solution Engineering can be found in that section of his web site.

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