Quantitative Mapping

Deriving value from operating data.

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A quantitative approach to measuring operational risk is the most direct route to extract tangible value out of a rigorous risk management regime. The objective measurement of specific details in an operating process facilitates an understanding of true business risk and can provide a level of transparency throughout a manufacturing or a supply chain process which can work toward establishing the confidence of various stakeholder groups. Conclusions drawn from such an objective approach can contribute to the development of overall business strategies, to formulating business priorities and then ultimately teach organizations how to cope with the uncertainties inherent to their business processes. Perhaps most significantly, objective and transparent operational risk measurement and management can directly improve a manufacturer's working capital positions. Through a process of quantitative mapping, the risk measurement process becomes mathematical and a financial problem solving exercise. Like all measurement challenges, the first two issues to consider, are reliability and validity.

Reliability

A reliable measure is based upon objective criteria. An assessment of potential risk should be based upon directly observable variables, such as specific operational events, increments of time, and units that can be measured, counted or assessed. However, real-life situations frequently give rise to complex interpretations: how should irregularities be handled? Or what excuses exonerate delays? Only if consistency can prevail in the subjective determinations of the input variables could one hope for a reliable risk measurement process. Even objective variables, such as length, if the yardstick is stretched by the observer, may become unreliable. Poor management control of subjective decision-makers (or poor training) can frustrate any scoring system. Short-term fluctuations should be weighted appropriately with longer-term trends in order to obtain a relatively stable assessment. Too heavy a weighting of short-term variables may cause large changes in assessments of operational stability from period to period, when none, in fact, may be justified.

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Reliable measures are based upon objective criteria. If subjectivity is required, reliability requires consistent application of subjective principles, appropriate intermediate calculations, and an appropriate mix of both long- and short-term variables.

Validity

The other fundamental issue of risk measurement is validity: Does the measure really tell us what we think it is telling us? History books (and Monty Python movies) are full of examples of reliable measures that simply are not valid. Intelligence (whatever that is) was once believed to be predictable by measuring the size of the cranium. A witch was thought to be detectable by the presence of warts or

by tests of floating on water (or, in parody, by comparing weight to that of a duck). Regardless of how reliable or repeatable these measurements are, a fundamental question to ask of risk measurement techniques is one of their validity.

In an operational setting data are often collected for a variety of reasons, some transactional, some financial, some operational and some simply for the personal defense of a position or of a specific functionary. The biases of the data collection means and rationale exert the greatest effect on validity. Surely transaction data from the group that unloads widgets from a truck would lead to a different number of widgets on hand than taking the same measure post quality control. Similarly, expecting the inventory reported by accounting at quarter end to tie out to the actual number of items on a shelf without further adjustment is naïve.

Quantitative Mapping

Reliable measurement begins with objective, quantitative mapping of the characteristics of an operational process. Specific rules precisely determine how each instance of a variable is transformed to a number. Age of a sub-assembly, for example, can be mapped as days since origination of a purchase order. Expense, as another example, may be subdivided into the variables of supplies, resources, and transportation expense, each with specific rules determining how various types of effort are to be counted. Certain variables may be qualitative in nature, such as the answers to: Have there been previously reported failures? Such yes/no variables are quantified by substituting a value of 1 for one occurrence, 0 for the other. Other qualitative variables that feature a list of alternatives are best thought of as a sequence of yes/no variables with each yes/no alternative represented by either a 1 or 0 value in the list. Upon completing the quantitative mapping, each Process-Cycle is represented as a series of numbers; as a row of values, with each column representing a different measure of that Process-Cycle. For statistical purposes, it is useful to think of these measurements in terms of rows of Process-Cycles and columns of variables. Once a suitable list of variables is selected (which list may contain, in some cases, as many as 200 or more different measures), the magic of mathematics takes over.

About the Author

Dr. Craig M. Allen has had a long career in investment banking and entrepreneurial start-ups. He is currently President of Delphi Trade and a Director of Viking Asset Securitisation, Ltd., a €2 billion Asset Backed Commercial Paper conduit that he created with Nordea Bank. Dr. Allen founded the Delphi group of companies which have completed $8 billion in transactions globally.

Dr. Allen received his Ph.D. from Arizona State University where he focused on decision making under uncertainty, and holds a Masters Degree in Probability, Statistics and Operations Research and a Masters Degree in Animal Behavior.