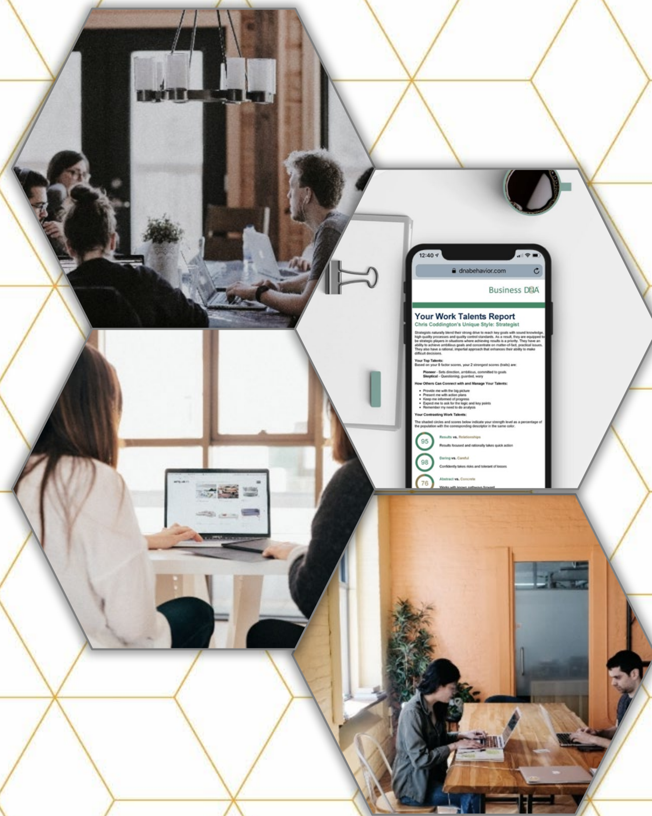

Behavioral Variability Measurement

DNA Behavior®

Appendix C – Behavioral Variability Measurement

Here are some ground rules for measuring Behavioral Variability:

1. To measure Behavioral Variability, there needs to be multiple judgments of the same problem with the different errors of each judgment identified.
2. The different errors add up and do not cancel out; an error is an error. Each error whether it is under or over the actual amount has a cost.
3. The overall error is made up of both Bias (systemic error) and Noise (random error). In some cases, the Bias is the larger contributor to error and in others Noise is the larger contributor.
4. Nevertheless, based on using accepted mathematical principles a reduction of Noise has the same impact on the overall error as does a reduction of Bias by the same amount. Therefore, the reduction of Bias and Noise should have the same organizational priority.
5. The overall individual error is computed as the deviation from the mean (average).
6. Bias and Noise are both contributors to the overall error which is the total Behavioral Variability.
7. The Gauss "method of least squares" provides a tool to weight and combine individual errors into a single measure of overall error. The measure of overall error is called the "mean squared of errors" (MSE) which is the average of the squares of the individual errors of measurement. The formula treats Bias and Noise independently.

The preferred formula to be used for calculating Behavioral Variability is the Gauss “Method of Least Squares” which calculates the “Mean Squared Error” (MSE). The MSE is based on squaring all errors from the mean score.

Step 1: Determining the Total Error in a Single Measurement (Error =Bias + Noise error)

8. The first error equation is calculated as follows:
    a) Firstly, calculate the average of all the errors in the forecasts to determine the mean.
    b) Then, the scores are placed on a bell curve using standard deviations from the mean (one standard deviation is 10%). This means two-thirds of the scores are within one standard deviation of the mean. The result will provide an estimate of the Noise but not the Bias (without knowing the actual number).
    c) Then once the actual score is known the total of each individual error is the difference between the forecast and the outcome.
    d) The Bias will reflect the difference between the actual number and the mean forecast.
    e) The Noise is the residual error being the difference between the forecast and the mean.
    f) The Noise error will be positive when the overall error is larger than the Bias, and negative when the overall error is smaller than the Bias.

g) The average of the Noise errors is zero.

Step 2: Mean Squares Error Calculation (MSE = Bias² +Noise²)

9. The MSE formula works as follows:
   a) Calculate the squares of the Bias calculated in 8(d) above, and the squares of the Noise calculated in 8(e) above.
   b) The total MSE will be the Bias² and the Noise² calculated in 9(a) above.
   c) The MSE calculation will reflect some measurements are far from the true value. The closer the scores (forecasts) are to the mean, the smaller the MSE and vice versa.

10. The MSE formula has the following features:
    a) The MSE is appropriate for studying predictive judgments as against those that are evaluative.
    b) It yields the sample mean on an unbiased estimate of the population mean.
    c) Treats positive and negative errors equally (that is, they are both errors and do not cancel each other out).
    d) Disproportionately penalizes large errors (they are weighted more heavily).
    e) MSE does not predict the real costs of judgment errors, which are often asymmetric. The cost of over and underestimating an event is not the same and does not have the same probabilities.
11. Bias and Noise make equal contributions to the overall error (MSE) when the mean of errors (Bias) is equal to the standard deviations of errors (Noise). When 84% of judgments are above or below the true value and the distribution of judgments is based on a standard bell curve, the effects of Bias and Noise are equal. When the Bias is smaller than one standard deviation, Noise is the bigger source of overall error.
12. To minimize MSE requires concentrating on reducing the large errors (because they increase the overall error and reflect Noise). It is always best to reduce Bias and Noise. If only Noise is reduced, then the Bias becomes more visible and from that perspective can be reduced by a compensating adjustment or other systematic process techniques.

Applying the DNA Behavior Lens to Causes of Behavioral Variability

13. Once the MSE calculations are completed, then a study can be made of identifying patterns of behavior and causes:

    a) The individual errors can be compared against the DNA Natural Behavior Style of the forecasters (judges). This will help to determine if there is a pattern of over or underestimation connected to the behavioral style, and by how much. For instance, do the Initiator's with a high pioneering trait consistently exhibit the natural Bias of overconfidence, thereby overestimating forecasts by x%? Is the converse true for a Relationship Builder who naturally exhibits the status quo bias and is risk-averse, thereby underestimating forecasts by y%?

b) Or are there individual forecasters who are making different errors and to what varying degrees? Is there a forecaster with a DNA Natural Behavior Style who is exhibiting more random behavior because they are more naturally spontaneous? Or, are there other specific circumstances causing individuals to make different forecasts?
c) Once this information is known, specific strategies can be deployed to reduce the Bias and Noise contributing to the overall Behavioral Variability.

To learn more about DNA Behavior International and the solutions we offer, please visit: www.dnabehavior.com

If you have any questions or would like to discuss with an executive on our team, please email us at: inquiries@dnabehavior.com