Transform This

If you are in the defense business and not heard of transformation, you are not in the defense business. Transformation is everywhere. The Army is transforming, the Navy is transforming, the Air Force has a flight plan for transformation and not to be outdone, NATO has a transformation command.

Transformation is the new clarion call to change; this year's TQM, MBO, or BPI, times ten. Do you want funding? Start transforming. Do you want to get promoted? Get involved in transformation.

This issue of CROSSTALK, coinciding with the Systems and Software Technology Conference, focuses on transforming business, security, and warfighting. We are transforming business, systems, organizations, and the force. How long will it be until the Jedi slogan transmogrifies to, "May the Force be Transformed."

So, what are we transforming into? Transformation for transformation's sake is not always a good idea. Michael Jackson transformed and look how that turned out. My fear is the siren for transformation is drowning out the end goal of the transformation. A key indicator shows up on a majority of the transformation Web sites and organization road maps, stating, "Transformation is foremost a continuing process that does not have an end point." Modifying an old proverb; with no end point any road will do.

Let us venture back to our early math classes and use transformation matrices to illustrate a few points. For those who have not been transforming matrices lately, below is a refresher on matrix multiplication.

$$\begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix} = \begin{bmatrix} A_{11} & A_{12} & A_{13} \\ A_{21} & A_{22} & A_{23} \\ A_{31} & A_{32} & A_{33} \end{bmatrix} \begin{bmatrix} B_{11} & B_{12} & B_{13} \\ B_{21} & B_{22} & B_{23} \\ B_{31} & B_{32} & B_{33} \end{bmatrix}$$

where,

$C_{11} = A_{11} B_{11} + A_{12} B_{21} + A_{13} B_{31}$ $C_{12} = A_{11} B_{12} + A_{12} B_{22} + A_{13} B_{32}$
$C_{13} = A_{11} B_{13} + A_{12} B_{23} + A_{13} B_{33}$ $C_{21} = A_{21} B_{11} + A_{22} B_{21} + A_{23} B_{31}$
$C_{22} = A_{21} B_{12} + A_{22} B_{22} + A_{23} B_{32}$ $C_{23} = A_{21} B_{13} + A_{22} B_{23} + A_{23} B_{33}$
$C_{31} = A_{31} B_{11} + A_{32} B_{21} + A_{33} B_{31}$ $C_{32} = A_{31} B_{12} + A_{32} B_{22} + A_{33} B_{32}$
$C_{33} = A_{31} B_{13} + A_{32} B_{23} + A_{33} B_{33}$

THE IDENTITY MATRIX: Multiplying a matrix by the identity matrix (below) yields the original matrix or no transformation.

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

You go through the same steps, expend the same amount of energy, and end up where you started. When transforming, do not confuse motion with action.

THE SHEARING MATRIX: Multiplying a matrix by a shearing matrix (below) slants the original matrix parallel to the x or y-axis. A vertical slant (left) is similar to a bob.

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 1 & k \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} \qquad \begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ k & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

A horizontal slant (right) is similar to a weave. Struggling organizations tend to bob and weave around a productive transformation with their own slant on change.

THE ROTATION MATRIX: Multiplying a matrix by the rotation matrix (below) rotates the original matrix by an angle θ counterclockwise about the origin.

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} \cos(\theta) & -\sin(\theta) \\ \sin(\theta) & \cos(\theta) \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

While an essential part of transformation, rotation has one danger. Used too often at the same angle, the rotation matrix spins you in a circle, like a dog chasing its tail. Do you have organizations chasing their transformation tails?

THE REFLECTION MATRIX: Multiplying a matrix by the reflection matrix (below) reflects a vector about a line (u_x, u_y) that goes through the origin.

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 2u_x^2 - 1 & 2u_x u_y \\ 2u_x u_y & 2u_y^2 - 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

Distorted and subdued, reflections are imperfect apes of a known solution. A good transformation should stretch, challenge and revolutionize.

AFFINE MATRICES: Adding rows and columns to a matrix allows one to mix different types of matrices.

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos(\theta) & \sin(\theta) & 0 \\ -\sin(\alpha) & \cos(\alpha) & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Unfortunately, affine matrices can be used to puff up a transformation effort, making it appear more complex and effective than it truly is. Known as the peacock effect, these cosmetic add-ons drain resources with little return.

I agree with the late Vice Admiral Arthur K. Cebrowski, "The overall objective of these [transformation] changes is simply—sustained American competitive advantage in warfare." However, I suggest we tone down the platitudes to transformation itself and turn up the objectives of transformation, be it flexibility, speed, adaptability, etc.

Barney Fife, may he rest in peace, is capable of instigating transformation. People need directions. Leaders need to lead. Warriors and their supply chain need goals. Once achieved, they can set new goals but without them, I'm afraid you will get more bobbing, weaving and tail chasing than improvement.

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