A Visual Explanation of WABA: An Overview

by

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Abstract

Visualization techniques can be helpful for understanding the relationship of variables and entities in any multilevel analysis. This paper reviews and explains one possible way of visually analyzing the four major inferential components of WABA (Within and Between Analysis) (Dansereau, Alutto, & Yammarino, 1984) as operationalized by the DETECT Program (Dansereau et al., 1986).

Introduction

Since the analysis of organizations using multilevel tools can be challenging, visualization techniques can reduce the complexity and increase the understanding of the results. The purpose of this article is to explore the use of visualization as one of many tools for simplifying and interpreting the specific multilevel analytical procedure known as WABA (Within and Between Analysis). Why visualization? Visualization can increase our ability to deal with complex information in a timely manner (Wilkinson, 1999), and its proper application has a number of advantages over more traditional techniques (Wainer, 1997). Why multilevel techniques? In terms of modeling business and organizational processes, multilevel techniques have a record of accomplishment and an increasing degree of applicability across a wide variety of research domains (Klein & Kozlowski, 2000). Why WABA? WABA has a number of advantages with respect to visualization when compared to other multilevel techniques (Markham, 1998).

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This paper reviews and visually explains the four major inferential components of WABA (Within and Between Analysis) (Dansereau et al., 1984) as operationalized by the DETECT Program (Dansereau et al., 1986):

SLA – Single Level Analysis,

MLA – Multiple Level Analysis,

MVA – Multiple Variable Analysis, and

MRA – Multiple Relationship Analysis.

The particular visual perspective presented here (Markham, 1998) is only one possible way of illustrating the multilevel results that are calculated by the DETECT program. While there are a wide number of alternatives for graphing data and illustrating entities, this particular framework accommodates both explicitly.

In examining the four major components, a number of questions will be applied to each. These questions include:

1. What is the research question behind each component?
2. What is the practitioner issue that parallels the research question?
3. What are the more general scientific issues and analogs associated with this component?
4. How can the inferential results of the component be translated into a visual image?

By answering each of the above questions, the reader should come away with a clearer understanding of WABA and the general design of multilevel research. At the same time, these visual symbols may help to simplify and summarize the issues contained within a complete multilevel analysis (i.e., one containing the four inferential components) so as to make this type of research more accessible.

In pursuing the above objectives, a few critical assumptions have been made about the readers. First, they have some knowledge of multilevel issues, specifically as it applies to organizational problems, and they have read a few background articles (Dansereau et al., 1995) using these techniques (Yammarino & Markham, 1992). Second, they have attempted to run either the DETECT program itself or the equivalent analysis in SAS or SPSS. Third, agreement on certain terminology is helpful. When the term "levels of analysis" is used, possible conflicting definitions surface. For our purposes, the

term “levels of analysis” refers to identifiable entities (such as teams, software modules, computer networks, factory machining centers, or even individual managers) that (1) can be objectively identified and enumerated as entities, (2) have the potential to be hierarchically nested within larger entities that meet the conditions in item 1, and (3) have the potential to be decomposed (i.e., analyzed) into smaller piece parts, components, or separate entities in and of themselves. In contrast, the use of the term "hierarchical levels", as in organizational charts, while a valuable construct in its own right, would not lend itself to the specific use referred to here. A hierarchical organizational level may contain some or many entities of research interest, but it is not, in and of itself, what is meant by the term “level” in this context. By using a more technically based definition of level, we retain the ability to equally test the relationship of variables and entities, which is the central insight that is explicated in the classic 1984 text, *Theory Testing in Organizations: The Varient Approach* (Dansereau et al., 1984). (This is also the source of the term “varient”, i.e. variables + entities.) The fusion of these two concepts is not without precedent in other fields, and has been carried forward by the later work of Edward Tufte (Tufte, 1997). In summary, the juxtaposition of the concern with variables and entities allows for testing advanced research questions as explained below.

The First Inferential Component: SLA – Single Level Analysis

Let us now turn our attention to the issue of how to visualize the results of a WABA analysis. Traditionally, the DETECT program starts with what is termed Single Level Analysis, or SLA, before moving to MLA (Multiple Level Analysis), MVA (Multiple Variable Analysis), and MRA (Multiple Relationship Analysis).

In explaining the visuals for the SLA inference, the general scientific issue can be viewed as that of texture identification. In much the same way that deep space astronomers are concerned with detecting the inherent structure and texture of matter, be it visible or invisible and large (such as supernova) or small (such as specific molecular components), so also is the organizational scientist, using the rubric of groups and multilevel studies, concerned with similar issues of texture and structure.