Analysis of Military Occupational Skills Requirements for the Army National Guard for Fiscal Years 2009 – 2010

PURPOSE

To explain the methodology used in the identification and selection of military occupational specialties (MOS) recommended for development in a distributed learning format and its possible application to other areas of MOS analysis within the Army National Guard Bureau Training division (NGB-ART).

OVERVIEW

At the beginning of every fiscal year, the Distributed Learning (DL) branch performs an MOS analysis to identify those most needed for transition (reclassification) to meet ARNG readiness and deployment requirements. Before 2004 the methodology for selection had been to request input from the field, compare the Army Training Requirements and Resources System (ATRRS) database with the Standard Installation/Division Personnel System (SIDPERS) database, and survey the G-3 for "future needs." This information would be compared to the results of the Structure Manning Decision Review (SMDR) and then a consensus would be reached during a TRADOC–sponsored conference as to which specialties would receive focused resources allowing development with proponent approval. This selection criteria and the analytical method were without much probative value and primarily relied on two sources of information, ATRRS and SIDPERS.

Issues arising from use of this method began with the acceleration in ARNG unit optempo. While the forces quickly became operationally-based, institutional training did not. The proponent schools and the Army G-1 ultimately negotiated what becomes the SMDR. Issues not considered are the fundamental changes made to the doctrine by the Army staff regarding the make-up and content of the units being deployed.

As gaps in training numbers became apparent, "efficiency friction" began to appear in certain proponent schools. By continuing improvement to these databases as well as the inclusion of information from the ATRRS Funding Allocation Model (AFAM) and the Reserve Component Manpower System (RCMS) databases, the developing selection methodology is more concise and the analysis more robust.

ASSUMPTIONS,

It is important to note that this analysis process makes certain assumptions each time it is performed:

1. We assume the current optempo will remain the same or increase.
2. The model assumes the objective force numbers will be met by recruiting.
3. The Institutional training section (ART-I) makes exceptions when it calculates "operational DMOSQ" which excludes certain populations. In order to conduct a more complete picture of training availability, we include these numbers.
4. Our development philosophy is that the excluded population will have to be trained to a certain level or re-trained, and for our purposes will remain included in the total population.

Note: We find it is worth recognizing that the current disparity between our assumed DMOSQ% and that of ART-I is approximately 14% and that this number is near the calculated attrition rate of 17% and well within the standard error for this size population.

METHODOLOGY

Determining recommendations for Reserve Component (RC) courseware development hinges on three basic elements: the requirement of the Army, the availability of institutional resources to train the requirement and most importantly, the opportunity for the RC soldier to access the resident course. At its most fundamental level the Army National Guard Training division (ART) endeavors to meet each of these criteria.

Beginning with "data pulls" from RCMS we,

1. Collect information by state, by MOS, by grade:
2. Sort this data by DMOSQ % - by Assigned strength and exclude all MOS' above 85%;
3. Segregate results into officer, warrant officer, and enlisted grades. Because current ARNG DL courseware development is presently limited to MOS transition courses (MOS-T) and PME courses we eliminate consideration of grades below E-3 (Private First Class.)
4. Pull the attrition reports from the RCMS
5. Combine the reports into one broad model that encompasses:
    a. Required Strength
    b. Authorized Strength
    c. Assigned Strength
    d. DMOSQ (by quantity)
    e. Assigned-to-Authorized Ratio
    f. DMOSQ – to - Assigned Ratio
    g. Number Over-strength

h. Number of Vacancies

i. Attrition Rate

At this point the basic spreadsheet is ready for the initial analysis.

6. Determine the potential training with a simple formula:

(Assigned – DMOSQ) + (Vacancies – Overstrength) = Potential Training Pool (κPT).

κPT is further stressed by removing the attrition % (κPT – Attrition) = objective training pool. [1]

At this point we insert the ATTRS information into our model. We use the Quarterly Training Utilization Module (QTUM) and the "SUP1" super reports from the previous Training Year for data reference.

7. We create two columns labeled "DL MOS-T" and "DL NCOES" which denote by using "1" = Yes or "0" = No whether DL courseware already exists or not. This simple binary notation will be used as discriminators later in our analysis.
8. We create columns titled "Requirements", "Original Quota", "Current Quota", "Inputs", "Grads", "Waits", "Cancels", "No Show", and "Un-Qualified". Using ATRRS data from the QTUM and SUP1 reports we insert the appropriate data for each MOS under consideration.
9. We create a final column to identify all Soldiers unable to receive training for the next FY. κPT – Requirements – Current Quota + Grads

Concluding the initial spreadsheet construction, we move to the next step in the analysis and rank determination.

Rank Determination is performed in ascending and descending orders to identify how important each MOS is to the overall readiness of the ARNG in four categories: by overall requirement, by state, by potential, and by number remaining untrained. Each of these categories establishes a position within the whole that will provide variances. It is these variances that are the object of our analysis.

After determination of ranking is performed the resulting data is exported to the JMP statistical analysis software package. JMP is a SAS[2] derivative that was originally developed to help MAC users visualize SAS data in three dimensions. With its initial success with MAC, JMP's utilization was broadened to include all PC-based formats.

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[1] Potential Training Pool and objective training pool are nominal terms used to identify a possible number of requirements. These formulae are used as reference only and meant to be indicative, NOT predictive.

[2] SAS - (pronounced "sass", originally *Statistical Analysis System*) is an integrated system of software products provided by SAS Institute that enables the programmer to perform data entry, retrieval, management, and mining. Barr, Anthony J., Goodnight, James H. *SAS, Statistical Analysis System,* North Carolina State University, 1971

The JMP software package allows us to perform a discrete analysis using the *Principal Component Analysis* (PCA) method or factorial method[3] described as a mathematical procedure that transforms a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components. PCA lets us take a large number of variables and reduce them to a relative few primary components in our case requirements, shown as *demand, availability,* and *opportunity*. Often similarity is according to a distance measure and that measure is utilized in the PCA.

ANALYSIS

We use the rankings of each category as the basis for our measurements. The measurements result in a set of eigenvalues that determine the direction of the data clusters. When these values are rendered into a visual representation we see the following graph. The abbreviations (i.e. Avail2) indicate this is the second "data run" of information. The points are of various sizes that correspond to their assigned strength. The "red cloud" encloses clusters that fall below the "zero" threshold in any two of the categories. PCA shows all points in relation to a central or zero point. "Less than 0" indicates a weakness, but "greater than" is not necessarily a positive, but serves more as an impetus for direction along the component axis.

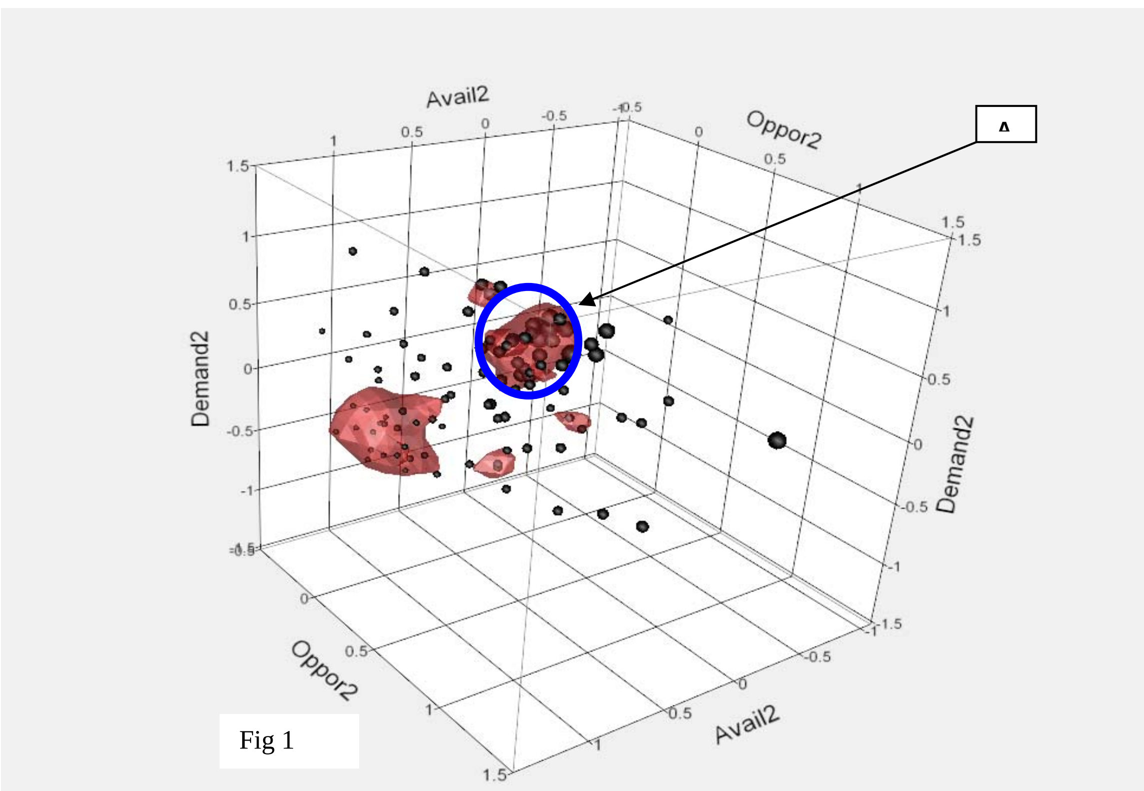
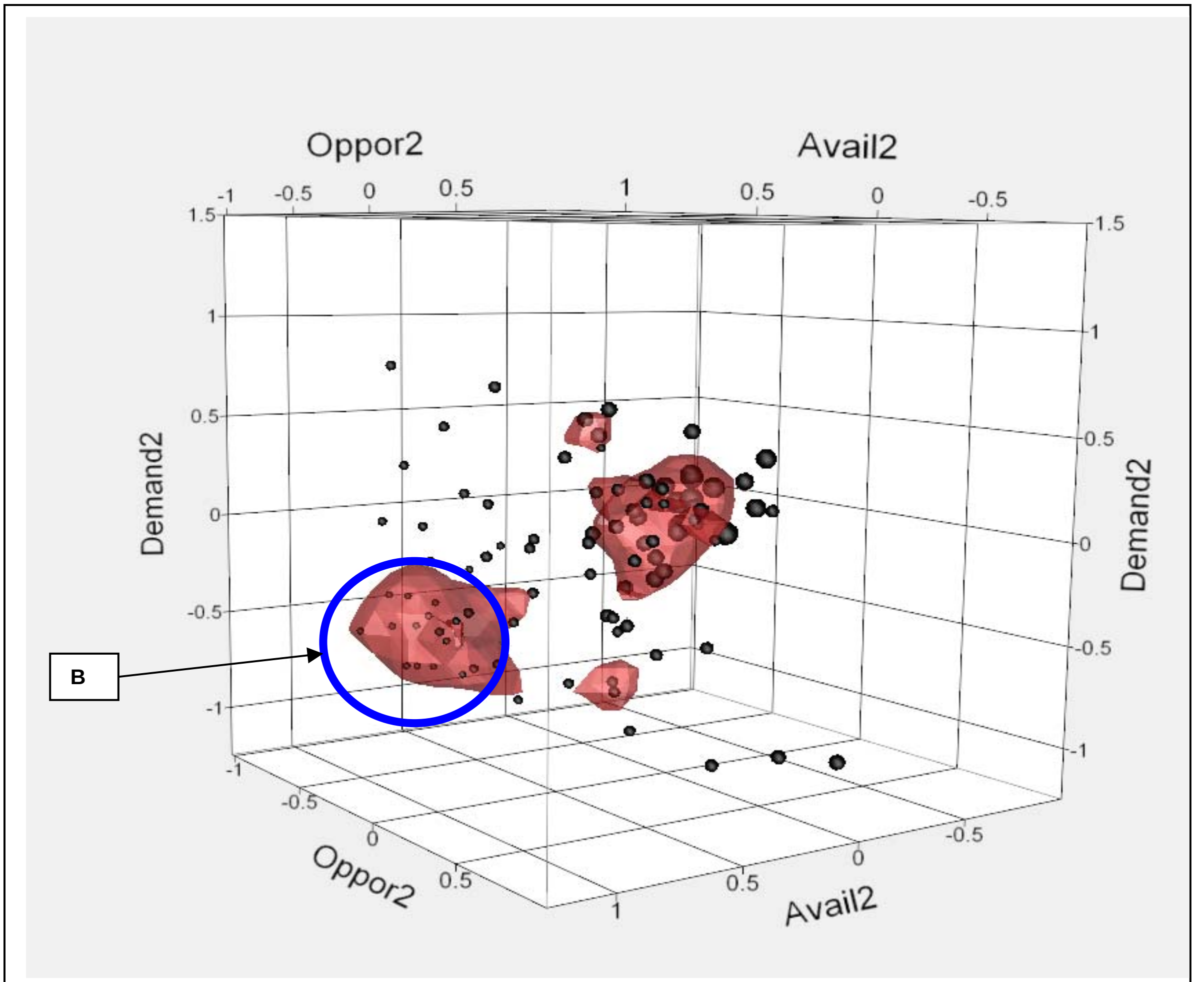


Fig 1

[3] Shaw PJA, Multivariate statistics for the Environmental Sciences, (2003) Hodder-Arnold.



Notice the large cluster denoted "A"[4] (see figure 1.) Their position within the graph shows them at or below zero for "Opportunity" as well as at or below zero for "Availability". This would be a strong indicator that these MOS' while being well-manned ("Demand" > 0), could benefit from a DL alternative.

ALTERNATIVE USES

[5]Using the same illustration in a different angle of view, the position of the data points denoted in "B" in relation to "Demand" show many data points at the zero threshold or less, this indicates that the MOS has sufficient assigned strength and sufficient school availability but due to the length, complexity, or limited location of the course the "Opportunity" to attend is below the zero threshold. This type of information can also serve as an indicator of courses that should be added in other locations or offered in a distributed learning format.

CONCLUSION

The use of the higher level statistical analysis – the PCA method or Factor Analysis, in the selection of recommended courses for TRADOC - offers the flexibility, rigor, and accountability required in decision-making. It also provides the branch chiefs with one more tool to gain a better view of the institutional training base and its capability. The

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[4] Cluster "A" contains 25U, 11B, 63B, 88M, 42A, 92A, 68W, 92Y, 21B, 31B

[5] Cluster "B" contains 15B, 15D, 15F, 15H, 15Y, 15V, 15W, 15J, 31D, 46Q, 68G, 68X, 68J, 89D

continuing complexity of making the Army National Guard a sustainable and operational force demands deeper and more rigorous analysis of the training than has been performed in the past, particularly as resources become scarce.