Chapter 6 REPORT DOCUMENTATION PAGE – SF298

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Development of a useful recruiting model requires an in-depth investigation of previous models and the recruiting processes of today. An objective study of the quantitative and qualitative aspects of recruiting is necessary to meet the future needs of the Army, in light of strong possibilities of recruiting resource reduction and increasing mission requirements. Our research will develop a model with an eye towards recruiting process improvement. Our methodology will build on both the new and old schools of recruiting by conducting stakeholder interviews that will lead us to a model that is an efficient starting point for the Recruiter Mission Allocation (RMA) process, ensures user buy-in, and seeks to fill-in process pitfalls along the way.

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U.S. Army Recruiter Allocation Model

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Lead Analyst
Major John R. Brence, Ph.D.
Analyst, Operations Research Center

Senior Investigator
Lieutenant Colonel Michael J. Kwinn, Jr., Ph.D.
Associate Professor, Department of Systems Engineering

Directed by
Lieutenant Colonel Michael J. Kwinn, Jr., Ph.D.
Director, Operations Research Center of Excellence

Approved by
Colonel William K. Klimack, Ph.D.
Associate Professor and Head, Department of Systems Engineering

July / 2004

The Operations Research Center of Excellence is supported by the
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Abstract

Development of a useful recruiting model requires an in-depth investigation of previous models and the recruiting processes of today. An objective study of the quantitative and qualitative aspects of recruiting is necessary to meet the future needs of the Army, in light of strong possibilities of recruiting resource reduction and increasing mission requirements. Our research will develop a model with an eye towards recruiting process improvement. Our methodology will build on both the new and old schools of recruiting by conducting stakeholder interviews that will lead us to a model that is an efficient starting point for the Recruiter Mission Allocation (RMA) process, ensures user buy-in, and seeks to fill-in process pitfalls along the way.

About the Authors

Major John R. Brence is an Assistant Professor and Analyst in the Operations Research Center of Excellence in the Department of Systems Engineering at the United States Military Academy, West Point. He has a B.S. Degree in Engineering Management (Electrical) from USMA, M.S. Degree in Systems Engineering from the University of Virginia and Ph.D. in Systems Engineering from the University of Virginia. His research interests include systems analysis, data mining, math modeling, and applied statistics. Major Brence may be contacted at john.brence@us.army.mil.

Lieutenant Colonel Michael J. Kwinn, Jr. is an Associate Professor in the Department of Systems Engineering and Director of the Operations Research Center of Excellence at the United States Military Academy, West Point. He has a B.S. Degree from USMA, M.S. degree in Systems and Industrial Engineering from the University of Arizona and a Ph.D. in Management Science and Information Systems from the University of Texas, Austin. His research interests include operational assessment methodology, efficiency analysis, recruiting analysis especially marketing effects and capability analysis and modeling. Lieutenant Colonel Kwinn may be contacted at michael.kwinn@usma.edu.

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Chapter 1 Introduction

When the military services meet their recruiting goals (early 1990s and today), the analytical research focus is on how to keep recruiting constant while reducing inputs such as recruiters and advertising. Conversely, when the military services miss their goals (late 1990s), the analytical research focus is on how to increase recruiting while keeping the inputs constant. Today, we may be faced with the challenge of expanding the military, requiring more recruits and possibly less inputs.

The key in any environment is the near-optimal allocation of the tight resources available and the reduction in slack resources. In this study, we work with USAREC and its subordinate Brigades to develop a useful model for allocating these resources either optimally or near-optimally.

Historically, the output of the allocation model was taken as a start point for the final negotiations between commanders within the recruiting community. By the end of the lengthy negotiations, the outcomes can bear very little resemblance to the inputs provided by the analysts. At issue is the credibility of the model itself. A measure of our success will be the inclusion of most opinions into the model development, thereby ensuring consensus with the results.

The remainder of the report is structured into four chapters. Chapter 2 is a brief discussion of the background of Army recruiting and the genesis of our research. Chapter 3 outlines our mathematical formulation of the recruiter allocation model. Chapter 4 is a synopsis of our recommendations for changing policy or adopting new courses of action related to recruiting. Lastly, section 5 concludes the paper and comments on our overall research.

Chapter 2 Recruiter Allocation Concepts

In October 2003, USAAC drafted the Recruiting Market Mission Allocation Mathematical Model Statement of Work. This research was tasked to the Operations Research Center of Excellence at the United States Military Academy, West Point, New York. This research is a year-long study.

USAAC is revisiting USAREC's recruiter allocation model in order to more effectively and efficiently recruit new soldiers. USAAC/USAREC wants to centrally locate their recruiters in order to maintain proper coverage across the nation and improve recruiter management and productivity.

With a real possibility of an increasing mission requirement for more recruits and the looming possibility of decreasing resources, the focus of both the USAAC and USAREC Commanders is to recruit quality soldiers efficiently, while maintaining contact with America and mirroring the United States' diverse demographic. Any model needs to incorporate flexibility in volatile and potential "hotspot" markets in order to focus the efforts of the recruiters and maintain efficiency. Both commanders stated the current state of recruiting is not a constraining factor; they welcome fresh, new ideas that could position the Army for future success.

Recent studies on recruiting focus on all aspects of recruiting from advertising [5,12] to the recruiting process [1,7,14,16,27] to a complete USAREC overhaul [15]. The references listed in this document represent only a small sample of research conducted on military recruiting. These studies focused on either qualitative or quantitative methods to improve recruiting. Qualitative findings on recruiting are quite varied running the gamut from a total restructure of USAREC to mandatory service of all U. S. citizens (much like Israel). Quantitative research uses models to describe efficiency, to predict resources and describe market propensity. Regression analysis, statistics, Data Envelopment Analysis (DEA), and simulation are common methods used for this research. Our research will describe both quantitative and qualitative techniques to prepare for the future of Army recruiting.

2.1 Historical Overview of U.S. Army Recruiting Commands

2.1.1. U.S. Army Recruiting Command

United States Army Recruiting Command finds its origin in the Report of the President's Commission on the All Volunteer Armed Force conducted by Thomas S. Gates, former Secretary of Defense, and his commission, appointed by President Richard Nixon in 1969 [13]. The All Voluntary Army was born, and recruitment of the quality and quantity of soldiers fell directly on USAREC and its predecessors' shoulders. We have not conducted a military draft since the commission reported its findings.

There were many pitfalls in the early days of recruiting, and it was not until 1979, when General Maxwell Thurman grabbed the reigns of USAREC as the Commanding General, that significant measures were taken to improve Army recruiting. Thurman provided USAREC with a new focus, direction, and know-how to create a foundation for successful recruiting. He implemented sophisticated managerial techniques, redefined the USAREC mission, and focused his staff efforts on the "All-Recruited Force". A critical accomplishment of Thurman was convincing Congress to allow paid television advertisements for recruiting in addition to the scarce free public service announcements, formerly the norm [24].

Currently USAREC is meeting its recruiting mission in all categories. This has not always been the case. At the end of fiscal year 1998, the Department of Defense missed its military recruitment mission and there was some concern that a return to the draft was possible. The U.S. Army was short about 17,000 recruits that year [8]. The Chairman of the Joint Chiefs of Staff, General Hugh Shelton, testified to the Senate that "he would hate to go back to the draft" [22]. General Shelton's comments to the Senate spawned many studies over the years in order to maintain a professional, effective military while avoiding the draft.

The current USAREC brigade and battalion areas of responsibility are shown in Figure 1.

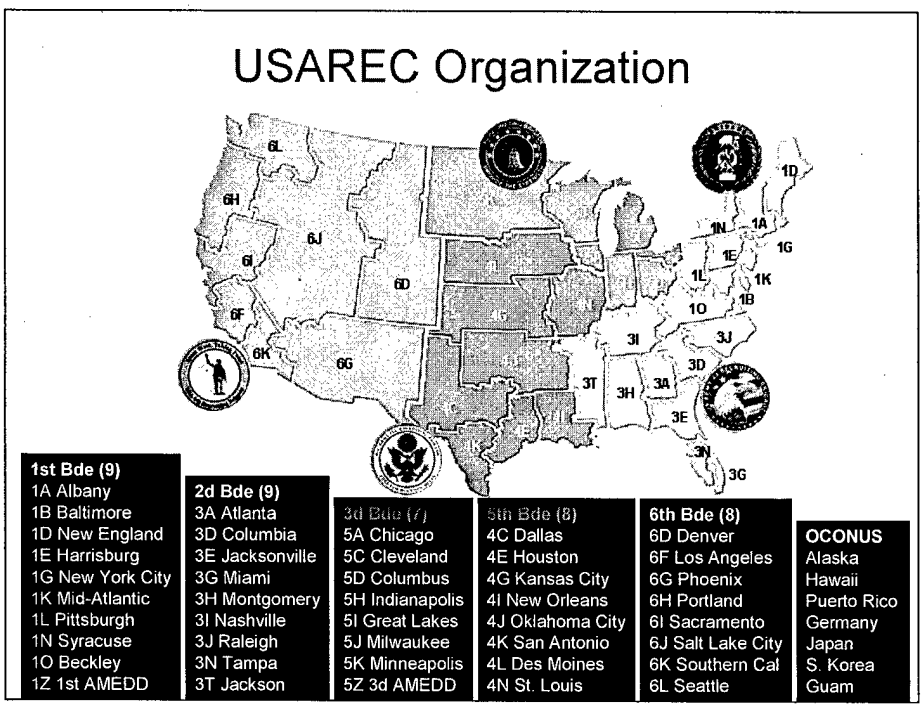

Figure 1: USAREC Brigade Organization

2.1.2. U.S. Army Accessions Command

The U.S. Army Accessions Command is a fairly new command subordinate to Training and Doctrine Command (TRADOC); established by general order on 15 February 2002.

USAAC's mission is to provide integrated command and control of the recruiting and initial military training for the Army's officer, warrant officer, and enlisted forces. The goal of USAAC is to meet the human resource needs of the Army from first handshake to first unit of assignment; this command transforms volunteers into Soldiers and leaders for the Army. USAAC is responsible for the management of recruiting enlisted, warrant officers and commissioned officers in both the active and reserve component. USAAC is the parent organization of USAREC.

Most of the recruiting research is coordinated through the USAAC Studies and Analysis Program under the direction of the Center for Accessions Research (CAR). This center was developed to manage recruiting research and house the research library for recruiting studies. The CAR is stationed at USAREC headquarters at Fort Knox, KY.

2.2 Client's Primitive Need

According to the original state of work entitled, "Recruiting Market Mission Allocation Mathematical Model", the client's primitive need was two-fold:

- Develop a model to optimize the placement of recruiters and mission distribution by category.

- Use optimization techniques to study, and then, develop a mathematical model to optimize territory allocation, placement of recruiter stations, recruiter allocation, and mission distribution with resolution at company level within given agreed upon constraints

These tasks solely focused on a mathematical solution to optimize USAREC's recruiting market and recruiting tasks.

2.3 Research Methodology

Allocating Army recruiters to meet mission requirements is a very sensitive and important issue. Each level of command in USAREC has a key stake in the outcome of this study. This study will determine the amount of recruiters each command will receive. Ideally, each command would like to be heavily resourced with recruiters and lightly burdened with recruitment mission due to the considerable emphasis placed on recruiting mission success. The impact of moving one recruiter or allocating one more recruit to the mission could result in a command failing its mission which requires a detailed explanation of the reasons for failure directly to the higher headquarters.

The literature review reveals that similar studies were conducted in the past in order to meet changing American demographics, Army Vision, and resource constraints. The ever-changing recruiting environment requires USAREC to periodically reevaluate its allocation

model and process to ensure the Army gets the quality and quantity of soldiers needed to defend our nation.

Our approach to this study varies from the previous research. We chose to systematically capture all the factors in this study using an iterative process known as the Systems Engineering and Management Process (SEMP). This process was developed at the Department of Systems Engineering at the United States Military Academy, West Point. The process was created from a collaborative effort of many individuals, but mainly due to the work of MAJ Dan McCarthy [16].

Figure 2 is a diagram depicting the flow and iterative nature of the SEMP. The SEMP consists of four phases, shown as circles, and nine total steps which are named within each phase. The initial and most important phase of our research is Problem Definition.

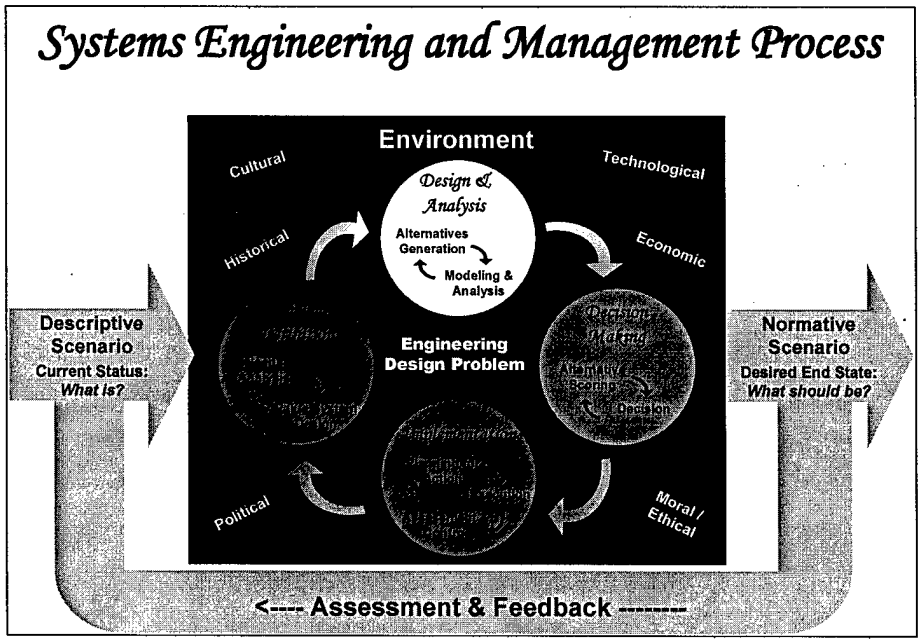

Figure 2: Systems Engineering and Management Process (SEMP)

2.4 Stakeholder Analysis

The Needs Analysis step of the Problem Definition phase is where we conduct Stakeholder Analysis. Stakeholder Analysis is important because it assists the researcher in the exploration of the true underlying problem, it helps either focus or broadens the scope of the study, and of particular importance, it facilitates user buy-in of the research. By interviewing the key players above and below the decision-maker level we determine the relevant needs of the system studied. From the needs, wants, and desires of our stakeholders we can derive the functional requirements and objectives of our study, and in the end, our revised problem statement that focuses on the true crux of the problem.

The use of a systematic approach that includes Stakeholder Analysis is the main differentiation in comparison to much of the previous research. We want to gather information and opinions from the key players in the recruiting process in order to best address the issue of recruiter allocation and missioning. The current problem statement provided by USAREC is simply to build a better mathematical model to address recruiter allocation, mission allocation, and possibly, recruiting station location [25]. As in any solid analysis, we wanted to first confirm that this statement captured the scope and focus of the issues USAREC wanted to resolve in our study.

2.4.1. Stakeholder Interviews

We conducted stakeholder interviews with LTG Cavin (Cdr, USAAC), MG Rochelle (Cdr, USAREC), COL Varljen (USAREC CoS), the Recruiting Brigade Commanders, Brigade Headquarters Staff, Brigade Market Chiefs and Brigade Marketing Analysts. In addition, we visited several joint recruiting stations to gain a perspective of allocation impacts at the lowest level and to speak with some of the other service recruiters.

2.4.1.1 Interview Questions

We conducted the interviews prepared with a general question set that was geared to start a discussion. In many of these interviews, we were able to stray away from these questions and discuss more pertinent issues that the stakeholder wished to address. The general list of questions is shown below.

General Questions:

1. We have been asked to develop a recruiter allocation model for the Command. What are your biggest concerns with the development of such a model?
2. What types of things would you want specifically included (or excluded) in such a model?
3. How do you want to allocate recruiters?
4. What output or information do you expect to get out of a model at your level?
5. How should the model address the Reserve Mission and Recruiter Allocation?
6. Do we maximize recruits given a specific budget or do we minimize costs subject to a specific recruiting target?

Some Questions for Brigades:

1. What is your process once you receive your mission and recruiter allocation from USAREC?
2. What specifically do your analysts do when they get the USAREC requirements?
3. Do you have a specific "Brigade Model" that you run once you get the USAREC requirements?

4. At what level of recruiter allocation does a USAREC model go from helpful to intrusive?

5. Relating to your recruiting region, what specific concerns or issues do you have?

2.4.1.2 Brigade Comments

Most of the Brigade Commanders and their staff, as expected, are concerned with the allocation of recruiters and mission within their command [26]. There is much concern about the current allocation process especially with the mathematical model used to assign recruitment mission and recruiters. The current RMA process takes up to six months to complete, and the final allocation often bears little resemblance to the mathematical model's solution. The current process starts with the result of the allocation model and then requires a "rebuttal process" by the recruiting brigades. The rationale behind the rebuttal process is that the current model does not do a very good job of predicting recruiting resource needs at the lowest level and fails to provide any insight into future needs or where to assume risk. We understand that no model is perfect; however, we believe that more information may be garnered from a model with predictive ability, not a model based on demographics only. Oftentimes, the demographic data used in this model is not current; another reason to review the current model and practices.

2.4.1.3 Commander, USAREC Comments

One of the toughest questions dealing with recruiting is how to maintain an efficient recruiter presence in a location without losing touch with the community. The Commanders are willing to accept the risk of not having recruiting personnel in every market, if that strategy leads to a better recruiting performance in another area within their command. The question to be answered is which markets have the best and worst propensity for recruiting, especially in light of the current state of the military and the public opinion on U. S. wartime operations.

The USAREC Commander's Intent, from MG Rochelle, was to foster a recruiting environment to attain a significantly increased write-rate [20]. In addition, he commented there is need to add flexibility to the allocation process and affirmed his willingness to assume risk in areas of the country with low market value. MG Rochelle broadened the scope of our research to provide USAREC with a means, not necessarily a new allocation model, to meet this guidance.

2.5 Revised Problem Statement

A significant finding from stakeholder analysis is that the revised problem statement encapsulates two distinct areas. The first area of concern is the modeling aspect of the study that was previously tasked by USAREC. We are to create a model that allocates mission and recruiters to best recruit future soldiers. The second area of interest, gleaned from Stakeholder Analysis, was a need to develop courses of action to update processes and practices of Army recruiting in order to synchronize the mathematical model results with stakeholder needs and

desires. This two-pronged approach is essential to provide a holistic solution to the problem and to meet MG Rochelle's intent.

Revised Problem Statement: To develop a flexible and efficient USAREC *strategy* that improves the enlistment missioning and recruiting process in terms of resource allocation, marketing, and market positioning with an objective to foster a recruiting environment to attain a significantly increased write-rate.

The revised problem statement is more holistic in nature. This statement is not focused entirely on a mathematical model; it also encapsulates the potential for policy change within USAREC. The combination of a near-optimal mathematical model and the correct recruiting policy adjustments could better perpetuate the recruiting goals determined by the U.S Army and USAREC.

Chapter 3 Recruiter Allocation Model

3.1 General

The current USAREC missioning model is heavily weighted on past recruiting performance, uses limited market analysis for its inputs, and ignores current economic conditions. The model is not predictive in nature and provides no flexibility to the decision-maker in terms of sensitivity analysis. The basis of the model is demographic in nature and assumes that past demographics will model future demographics. Also, many of the variables are redundant and skew the results to a less than fair share of recruiters to brigades. In addition, we do not feel the model should be a linear function, since recruiting trends and economics seem more non-linear in nature.

Our aspiration is to protect against model misspecification by conducting in-depth research and analysis to find the critical inputs and outputs of such a model. We see the model as a two-step model that first defines the recruiting markets then allocates recruiters effectively. The outputs of model one are inputs into model two (Figure 3).

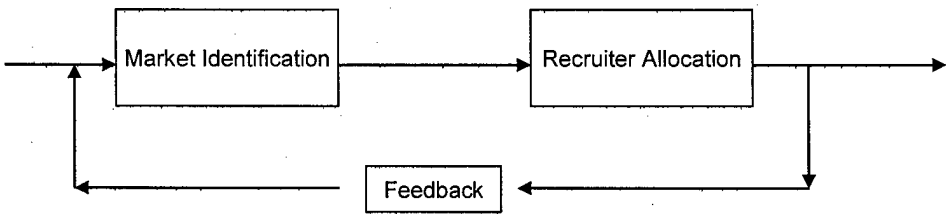

Figure 3: Two-phased Recruiter Allocation Model

From our stakeholder analysis, we have determined that the model needs to include recruiting efficiency and/or propensity to enlist into the Army. We are focusing our attention on those markets that are pro-Army that will set the conditions for Army recruiting success.

3.2 Market Identification Model

A recent paper by Brocket, et al [6] discussed the use of regression coupled with Data Envelopment Analysis (DEA) to determine the best strategy for recruiting advertising mix. This paper's methodology is applicable to this study in that it will enable the user to determine relative recruiting efficiency in the current USAREC markets. By determining recruiting efficiency, we mitigate the effects of managerial inefficiency which allows us to focus our recruiter allocation efforts on the more efficient markets.

Section 3.2.1 will show the formulation of the regression model developed for this methodology. Section 3.2.2 will provide a brief background on DEA. Finally, section 3.2.3 will combine DEA and regression for the market identification model.

3.2.1. Simple Regression Model

From our research, we created the following regression model as the initial, simple basis to predict potential GMA contracts for a specific area i for month t. Equation (3.1) is the foundation of our market identification model

$$\begin{aligned} Con_{i,t} = \beta_0 + \beta_1 Pop_{i,t} + \beta_2 Inc_{i,t} + \beta_3 Ump_{i,t} + \beta_4 R_{i,t} + \beta_5 Ad_{i,t} + \beta_6 Con_{i,t-12} + \\ \beta_7 Con_{i,t-3} + \beta_8 Con_{i,t-2} + \beta_9 Con_{i,t-1} + \beta_{10} t + \varepsilon_{i,t} \end{aligned} \tag{3.1}$$

where the definitions of these variables are shown in Table 1.

$Con_{i,t}$	number of GMA contracts in area $i = 1,\ldots,I$ for month $t = 13,\ldots,60$
$Pop_{i,t}$	17-29 year-old male population in area i for month t
$Inc_{i,t}$	Median income in area i in month t
$Ump_{i,t}$	unemployment rate in area i for month t
$R_{i,t}$	number of recruiters (RA and USAR) *responsible* for recruiting in area i for month t (Note: partially-missioned recruiters may be expressed as a fraction)
$Ad_{i,t}$	amount of advertisement dollars spent in area i for month t
$Con_{i,t-12}$	number of GMA contracts in area i for month $t-12$ (or for the same month of the previous year)
$Con_{i,t-3}$	number of GMA contracts in area i for month $t-3$ (or three months earlier in the same year)
$Con_{i,t-2}$	number of GMA contracts in area i for month $t-2$ (or two months earlier in the same year)
$Con_{i,t-1}$	number of GMA contracts in area i for month $t-1$ (or one month earlier in the same year)
t	observation month (Note: we start with $t = 13$ so it understood that we need data for the year prior when $t = 1,\ldots,12$)
$\varepsilon_{i,t}$	error derived from the regression

Table 1: Variable Definitions

The independent variables $Con_{i,t-12}$, $Con_{i,t-3}$, $Con_{i,t-2}$, $Con_{i,t-1}$, and t are integrated into this equation in order to pick-up any trends, seasonality or the recent recruiting situation in area i. The $Pop_{i,t}$ variable differs from previous research since it captures the 17-29 year old male population. The range of ages is extended to 29 years to take into account college students, especially those on the "greater than four year plan" or working and/or struggling their way

through school, and to account for prior service military population that could be recruited USAR. The other independent variables were chosen based on past recruiting research [5, 7, 12] and the ability of USAREC to obtain this data. Unlike past research, we do not use quotas in this model; instead we integrate DEA.

3.2.2. DEA Overview

DEA is a methodology use to separate efficient and inefficient performers. This section will provide a brief discussion on those points that are relevant to this study. For a more in-depth discussion on this methodology, see [10].

Figure 4 shows the efficiency frontier created by invoking DEA (Envelopment model). The crux of this methodology is to develop a comparative efficiency policy as determined by the inputs and outputs. The points A, B, C, and D are developed from the data input and output coordinates derived from the envelopment model. The points F and G are more theoretical in nature and will not be discussed in detail.

The solid line segments in this figure create the efficiency frontier. Any point along this frontier is given an efficiency value of 1 or $\theta^* = 1$ in which movement along this frontier entails a trade-off between the input and output values. One can see that a movement from point A to B necessitates an increased level of input to achieve an improved output. A likewise situation occurs when moving from B to C.

The extended frontier, shown as the broken line segments terminating with arrows, does not follow the same input-output trade-off as described for the efficiency frontier. In this manner, the movement from G to A results in an output improvement while maintaining the same input level. Likewise, the movement from F to C displays a reduction of the input while marinating the same output level. Together, the extended frontier and the efficiency frontier *envelop* all of the other data observations. Because the entire data (representing the set of production possibilities) lie within the envelope formed from a subset of the data on the efficiency and extended frontiers, we call this method Data Envelopment Analysis.

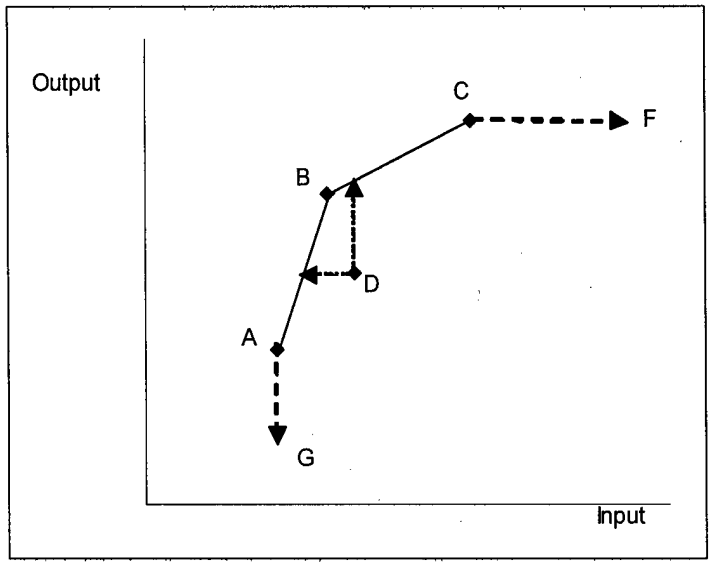

Figure 4: Efficiency Frontier [6]

The point, D, is recognized as an inefficient performer, since its combination of input and output do not place it on the efficiency frontier. In this case we define point D's efficiency rating as $\theta_0^* < 1$ and $(1-\theta_0^*)x_0$ represents the input reduction needed to eliminate the inefficiencies in D's performance, where x_0 is the current input level. Determining this input reduction leads to increased efficiency.

3.2.3. DEA and Regression

We chose to use a more sophisticated model than Equation (3.1) for two reasons. First, this model does not provide any insight into recruiting efficiency. Our solution to this issue is that recruiting efficiency may be attained through DEA as outlined in section 3.2.2. Second, the linear relationship of Equation (3.1) will do a poor job in emulating the true recruiting markets. For example, a linear relationship between GMA contracts and the number of recruiters is sub-optimal since at some point we will saturate the market with recruiters; in which more is oftentimes not better. The same argument may be made for advertising dollars.

To more closely emulate the true recruiting markets, we use a logarithmic transform of a Cobb-Douglas production function which from economic theory is said to be *technically efficient* [9]. Previous research in this area has also utilized this approach [6, 12]. However, a Cobb-Douglas function is technically efficient for private sectors, assuming that inefficiency leads to a disbanded company. Since we are modeling the public sector, where an agency may or may not be successful and still be in business, we need to integrate another means to adjust for efficient performers. We use DEA to make this adjustment.

From this discussion, we can formulate Equation (3.2) to identify the best markets.

$$
\begin{aligned}
Log(Con_{i,t}) = {} & \beta_0 + \beta_1 Log(Pop_{i,t}) + \beta_2 Log(Inc_{i,t}) + \beta_3 Log(Ump_{i,t}) + \\
& \beta_4 Log(R_{i,t}) + \beta_5 Log(Ad_{i,t}) + \beta_6 Log(Con_{i,t-12}) + \\
& \beta_7 Log(Con_{i,t-3}) + \beta_8 Log(Con_{i,t-2}) + \beta_9 Log(Con_{i,t-1}) + \\
& \beta_{10} Log(t) + D_{EFF_{i,t}} [\gamma_0 + \gamma_1 Log(Pop_{i,t}) + \gamma_2 Log(Inc_{i,t}) + \\
& \gamma_3 Log(Ump_{i,t}) + \gamma_4 Log(R_{i,t}) + \gamma_5 Log(Ad_{i,t}) + \\
& \gamma_6 Log(Con_{i,t-12}) + \gamma_7 Log(Con_{i,t-3}) + \gamma_8 Log(Con_{i,t-2}) + \\
& \gamma_9 Log(Con_{i,t-1}) + \gamma_{10} Log(t)] + \varepsilon_{i,t}
\end{aligned}
\tag{3.2}
$$

where dummy variables γ_j are coefficients for each input to account for the efficient and inefficient performers. These dummy variables are "activated" by the variable $D_{EFF_{i,t}}$ which returns a value of 1 for an efficient performer and 0 for inefficient performers [6]. All of the other variables were discussed in detail in section 3.2.1. Past research [5] determined there was no seasonality in contracts, therefore we model efficiency based on monthly area performance.

From the market identification model, the elasticity for an efficient performer for a given input is identified by $\beta_j + \gamma_j$. Similarly, the elasticity for an inefficient performer for a given input is simply β_j. For example, when operating efficiently, the elasticity for the Population variable ($Pop_{i,t}$) will be $\beta_1 + \gamma_1$, whereas when operating inefficiently, the elasticity will be only β_1 [6].

Equation (3.2) was formulated through a two-stage approach as proposed by [6]. The first step was to run a regression with the logistic transform of the independent and dependent variables. Second was to run DEA using the same data and transforms to detect efficiency. The conglomeration of this technique is shown in Equation (3.2) where the equation related to the β_j's is the regression function and the portion starting with $D_{EFF_{i,t}}$ is the DEA portion of the equation.

It is important to note that any observation for variable input into this model cannot be zero. The log transform is undefined for zero values. Therefore, the size of the recruiting area investigated should not be lower than recruiting station boundaries; assuming that at least one GMA is contracted by each recruiting station each month.

3.3 Recruiter Allocation Model

The second phase of this model is the allocation of recruiters to the best markets. In order to be more precise, we split-up Equation (3.2) into its regression and DEA component parts for the objective function. In addition, we will transform these components back to a Cobb-Douglas production function using the exponential transform. Our model formulation is:

$$Max \text{ GMA Contracts } (\hat{Con}_{i,t}) =$$

$$\sum_{i=1}^{I} e^{\beta_0} Pop_{i,t}^{\beta_1} Inc_{i,t}^{\beta_2} Ump_{i,t}^{\beta_3} R_{i,t}^{\beta_4} Ad_{i,t}^{\beta_5} Con_{i,t-12}^{\beta_6} Con_{i,t-3}^{\beta_7} Con_{i,t-2}^{\beta_8} Con_{i,t-1}^{\beta_9} t^{\beta_{10}} \tag{3.3}$$

$$+\sum_{i=1}^{I} D_{EFF_{i,t}} e^{\gamma_0} Pop_{i,t}^{\gamma_1} Inc_{i,t}^{\gamma_2} Ump_{i,t}^{\gamma_3} R_{i,t}^{\gamma_4} Ad_{i,t}^{\gamma_5} Con_{i,t-12}^{\gamma_6} Con_{i,t-3}^{\gamma_7} Con_{i,t-2}^{\gamma_8} Con_{i,t-1}^{\gamma_9} t^{\gamma_{10}}$$

Subject to:

$$\sum_{i=1}^{I} R_{i,t} \leq C_1 \qquad C_1 = \# \text{ recruiters available} \tag{3.4}$$

$$R_{i,t} \leq C_2 \qquad C_2 = \text{max recruiters per area} \tag{3.5}$$

$$\sum_{i=1}^{I} Ad_{i,t} \leq C_3 \qquad C_3 = \text{ total advertising budget} \tag{3.6}$$

$$Ad_{i,t} \leq C_4 \qquad C_4 = \text{ max advertising monies per area} \tag{3.7}$$

$$\sum_{i=1}^{I} \hat{Con}_{i,t} \geq C_5 \qquad C_5 = \text{ USAREC monthly recruiting mission (GMA)} \tag{3.8}$$

where all variables are non-negative.

Equation (3.4) constrains the number of recruiters assigned at or below the total amount recruiters available for duty for the current month. Equation (3.5) constrains the number of recruiters assigned at or below some maximal value per recruitment area for the current month. Equation (3.6) constrains the amount of advertisement dollars at or below the total advertising budget for the current month. Equation (3.7) constrains the amount of advertisement dollars spent on a particular recruiting area at or below some maximal amount for the current month. Equation (3.8) ensures that based on your policy of recruiter assignment and ad dollars expended that our potential contracts meet or exceed the USAREC recruitment mission (GMA) for the current month. In addition, we adhere to the requirement that all decision variables used in this mathematical program are non-negative.

This formulation will position recruiters (and advertisement dollars) in recruiting areas; it does not delineate between a RA and USAR recruiter. It places a recruiter in a market based on the total number of recruiters available (RA + USAR). If the location of USAR recruiters is a concern, we suggest that USAR recruiters are populated against allocation totals in areas closest to USAR centers. The amount of USAR recruiters could be varied based on the size of the USAR center.

Chapter 4 Recruiting Process Improvements

4.1 Recruiter Management Workshop

Our decision to study the process of recruiting from the bottom-up is heavily based on our Stakeholder Analysis. Initially this phase of our research was not in the scope of the study; however, it is very clear that there are many qualitative issues that plague USAREC and Army recruiting. There was a significant concern about the bureaucracy of choosing recruiting station location and how leases kept recruiters in a potentially stagnant market. Other comments indicated that the leadership was inexperienced with recruiting, since most individuals only spend a three-year tour on task. Lastly, many stakeholders explained that there was a lack of effort or an "overwhelming" effect on newbie recruiters. Many of these comments lead us to believe that a decent mathematical model would only solve a portion of the problem and more analysis into the process was necessary.

The most significant research effort we accomplished was to gather a panel of experts to discuss the future of Army recruiting. Our panel is comprised of many former personnel that served in USAREC and/or were tasked to conduct similar studies. Many of these individuals have gone on to be leaders of industry in related fields such as human resources and marketing. We received expert advice and feedback on what research was done in the past and cutting-edge methods used today by industry to recruit and market. In this analysis we evaluated potential areas for recruiting process improvement and came up with several suggestions for USAREC.

4.1.1. Execution and Purpose

The workshop entitled "Recruiter Management Workshop" was held on 3–4 March 2004, the Operations Research Center of Excellence (ORCEN), Department of Systems Engineering, United States Military Academy at West Point. This workshop brought together a panel of nine recruiting experts that spent much of their careers in recruiting and recruiting management in USAREC during the 1980–2000 timeframe.

The purpose of this workshop was to develop attainable courses of action that focus on the improvement of the USAREC's current recruiting management process. We focused our effort on MG Rochelle's intent; to develop courses of action to update processes and practices of Army recruiting in order to achieve a 2.0 write-rate by FY06, provide recruiting flexibility and management of recruiting risk in weak markets.

4.1.2. Participants

The participants were chosen through coordination with Dr. Dave Thomas, Executive Vice President, Strategic Services, Loyaltyworks, Inc. Dr. Thomas served as an Operations Research Analyst, Advertising Research and Analysis Division, USAREC 1984–1987, Personnel Policy

Analyst, Pentagon 1990–1992, Academy Professor and Research Analyst, Department of Systems Engineering from 1992–1997. Dr. Thomas was critical in the search for the panel of experts for this workshop.

The workshop participants worked in various divisions within USAREC during the 1980–2000 timeframe. Many of these individuals worked as division heads as well as in the recruiting trenches from Brigade and below. Included were two individuals that provided insight specifically on USAR recruiting. Many of these people have moved on to marketing and human resource companies that conduct similar analysis. The workshop was planned and facilitated by MAJ John Brence. The following is a list of participants:

NAME	*USAREC-related Service*	*Positions Held*
Dave Thomas	1984-1992	Analyst, Advertising Research & Analysis, Policy Analyst and Recruiting Research Lead (HQDA DCSPER DMPM)
Byron Brown	1983-1988	USAR Market Analyst & Branch Chief
Jack Donahue	1982-1985	Program Analysis Branch Chief
Mike Gintz	1985-1995	Field Recruiter, NCOIC Reserve Marketing Branch, BN USAR OPNS NCO, USAR OPNS SGM
John Hershberger	1983-1994	CO CDR, BN S3 & XO, Advertising Research & Analysis Analyst & Branch Chief, Mission Branch Chief
Jeff Laack	1983-1992	Mission Branch Chief, Chief Operations Branch of Recruiting Operations, Director Recruiting Operations
Billy Nix	1984-1988	Recruiter Zone Analysis Branch Chief
Dan Ryan	1983-1988	Marketing an Mission Branch Chief, Deputy Director PAE
Tom Snyder	1992-1997	BN CDR, Mission Branch Chief

Table 2: Recruiting Management Workshop Participants

4.1.3. Workshop Conduct

The workshop covered two days and six phases:

Day One

Problem Background: This phase of the workshop included a brief description of the workshop, its purpose and focus as well as discussion of our research effort in the problem definition phase.

Brainstorming: Brainstorming utilized the GroupSystems® computer program. There were three questions posed to the participants:

- If you knew THEN what you know NOW you would recommend USAREC….

- MG Rochelle, CDR USAREC, has been charged to get to a write-rate of 2.0 by FY06. What management (USAREC) or recruiting (recruiter-related) processes do we need to alter to get to this goal?

- What are the important inputs into a Recruiter Allocation Model?

Affinity Diagramming I: After the data were collected from the brainstorming session, we took the each participant's comments and categorized them into electronic "buckets" via the GroupSystems® computer program. This process is called affinity diagramming (http://www.hq.navy.mil/RBA/affinity.pdf).

Day Two

Affinity Diagramming II: Based on previous experience, it often necessary to revisit the affinity diagram after a session break. During this phase, we re-looked the "buckets" and validated the data contents in each. Typically this leads to the deletion, creation and altering of the several buckets; however, this serves as participant buy-in, creates a better product and reviews the previous day's work.

Group Analysis and Feedback: This process analyzed the input from the brainstorming session. The nine participants were broken-up into groups of three and asked to analyze the contents of their select buckets. Each group reviewed 3 – 4 buckets, provided comments and briefed the rest of the workshop.

AAR: The AAR provided feedback to the host and chair on the execution, results and administrative events that supported the workshop.

4.2 Recruiting Process Recommendations

From the initial stakeholder analysis and analysis of the data from the 'Greybeard' Recruiter Management Workshop, we uncovered several promising alternatives. Of note, were significant modifications to recruiting management and policy that pertain to the Army's accessions strategy.

4.2.1. Growing and Finding Recruits

The primary comment from the group was to"fish where the fish are," a drastic change to Army recruiting which assumes risk in weak recruiting markets. Those failing markets could easily be covered by part-time recruiters, kiosks or by advertising (primarily through the internet). We can keep in touch with America through the internet and part-time help. Through our discussion, we continually expressed that "All markets are not the same. Some regions just won't make it." The idea is to locate recruiters in strong recruiting markets and maintain coverage in the weak markets by other means; an example of economy of force.

4.2.2. Recruiter Management

We determined to be successful in recruiting; the Army needs to be more active in making a positive presence in a community. Using community influencers i.e. teachers, coaches, police officers as part time recruiting liaisons will allow the Army to push its message to a much younger population. These people would not have a recruiting mission but are compensated based on accessions that were referred by that specific liaison. These part-timers are our early contact force (that does not require the brick-and-mortar station to operate). This alternative does not shrug off recruiting college students, which presumably will always provide quality recruits; it just assists the Army in developing a positive foothold in a growing community.

Some of pearls of wisdom gained from the Greybeards focused more on management of recruiting personnel at all levels. Most of the focus was on the recruiter in the trenches and how we select, train, motivate, manage, and reward them. In our interviews with many detailed recruiters, we found that they were very adamant about "getting out of recruiting ASAP!" A course of action that may increase sales and provide a quicker way out of recruiting for detailed recruiters is to provide an overall goal for the three-year recruiting tour (tour mission), where once that recruiter meets that cumulative goal, they return to TOE Army. Backfilling this soldier is the only tricky part of this suggestion; however, it may also provide flexibility and timeliness to position the replacement recruiter in a station that is in more dire need. This assumes a Brigade is constrained by the current number of recruiters.

Another incentive related course of action is to treat recruiting Special Duty Assignment Pay (SDAP) similarly to flight pay. Everyone gets SDAP when entering recruiting, but continuation depends upon meeting accession gates at periodic reviews. The accession gates could be calculated based on monthly write-rate or quarterly accessions etc... These reviews could be done yearly.

Recruiter selection and skills management is vital to maintaining an effective selling force. We need to identify recruiters with the mentality and ability to sell ~ and keep them selling. A good salesman could be a recruiting specialist; maybe not a "hard-stripe" soldier. Because many of these recruiters are not management material, we should not consider the station manager position as a step toward promotion. The recruiting business is the closest the Army gets to a profit-focused organization; it should be structured a bit different. Likewise, we should consider using a permanent professional manager as station commander. This manager may be a civilian or a permanent 79R. Structuring management in this fashion would maintain local area knowledge and continuity.

As a form of career progression for 79Rs, we would use warrant officers as company commanders. This would keep experienced and effective station managers in recruiting trenches, but at a higher level of responsibility (and pay). Training to prepare the soldier for the new duties should be minimal based on their previous experience. In addition, many of the problems in recruiting are tied to the detailed recruiting company commander because they lack motivation to work in recruiting, are in a "last-chance to fix their Army career" status or are not capable of handling the complex nature of the job.

In addition, a strategic reserve recruiting force, coined as the Elite Recruiting Force (ERF) was discussed to provide flexibility to the commander either at the USAREC or Brigade level. The ERF would consist of your most experienced salesmen and a few managers. The ERF would be established at either the USAREC or Brigade level. This elite force would not have a recruiting mission; they would be used to provide flexibility to the commander. If the ERF was managed properly, they could be used to 1) re-train stations (on-site) that are under-performing, 2) conduct spot-checks on the recruiting practices of stations, 3) provide flexibility to assist a station with an extremely "hot market", 4) plan and conduct special events to promote the Army and 5) we could deploy this team to meet a re-emerging market, then work to maintain a more permanent presence. This idea is like letting a farming plot rest for a period of time before seeding it again.

Lastly, we discussed outsourcing cold-calling lead generation to telemarketing firm. Let the recruiters recruit and manage the Delayed Entry Program (DEP). To get a soldier to assess, there are many tasks a recruiter needs to accomplish; one of the most time consuming and important tasks is to become a physical trainer for the new recruit. Cold-calling keeps the recruiter tied to his desk in which he loses visibility with the market outside of the recruiting station.

4.2.3. USAREC Staff Tasks and Policies

Probably the most resounding commentary from our research was for USAREC to do a better job of knowledge management. Many of these studies and/or programs discussed in our workshop have been previously implemented or researched. There were two courses of action that may assist USAREC in knowledge management: 1) Establish professional operations research cell at USAREC so that the past lessons are retained and 2) maintain a professional staff in USAREC set-up like a regular profit business with traditional departments such as marketing, sales etc... Both the operations research cell and the professional staff should be permanent party thereby maintaining domain knowledge. If necessary, these positions may be civilianized.

Another key idea is to set-up a recruiting career field early in an officer or warrant officers career. By creating an institutional support career field in recruiting, this could improve the promotion chances for soldiers in the recruiting field and hopefully dismiss the perception that serving in USAREC is bad for an Army career. For officers, this should work the same way as other career fields work in the Army. The officer will start out as a functional area designated recruiting officer, then at the MAJs board will select their top choices. The intention is to get officers and warrant officers in this field that actually enjoy recruiting and/or the ability to live almost anywhere in/out of the U.S.

To maintain currency with a changing market, USAREC needs to buy all of the data needed for market segmentation and RMA processes. Make it a long-term contract with a first tier data provider. This comment is critical to maintaining a grasp on the ever-changing recruiting environment. By gathering the most up-to-date data USAREC can maintain flexibility to shift recruiters to emerging or re-emerging markets; utilizing the ERF if necessary. Money saved from assuming risk around the country should be spent on better market and data analysis.

4.2.4. Professional Research Support Group

One of the most important results of this research was gaining nine more subject matter experts as research sources. These gentlemen are very experienced in the field of recruiting and recruiting planning and were able to give excellent insight on the improvement of the Army's recruiting system. In addition, they have provided us with a network of individuals that could answer any further question related to recruiting.

In 2004, The SAS Group announced a "commitment to sponsor a program designed to bring together retired senior military personnel with leaders in the private sector and academia to study and facilitate the adoption of best business practices by the military." [21] We suggest creating a more permanent Greybeard Panel of Recruiting Experts to assist in the future directions of Army recruiting. These gentlemen have expressed an interest in continuing service to USAREC even though retired. They have provided an extensive amount of information that has application in recruiting today. From the discussions in our workshop, they expressed that they were forced to tackle the same problems in recruiting during their tenure and could provide insights on their successes and failures. This would be an excellent technique to help improve knowledge management at USAREC.

Chapter 5 Conclusions and Future Work

Our focus in developing a recruiter allocation model was to keenly study the required inputs to develop an efficient, feasible model that closely describes what is required for USAREC to meet or surpass their recruiting mission. We are very sensitive to the needs of the people involved in this process and feel that the model needs "user buy-in" to be effective. The current and previous models were never validated with any confidence, even though USAREC still made mission. Most of the success of USAREC lies in its leadership and hard work from all individuals involved and not necessarily the current model. We would like to lessen the burden of the RMA process and set-up each command level for success by creating an effective model and recommending several process improvements.

The difficulty in the derivation of this model is deciding how to succinctly build it so all parties understand how and why it works, while taking into account the accuracy of the model. The model should be useful enough that only slight modifications are made to the recommended recruiter resourcing. The benefits of such a model are that it would lessen the duration of the RMA process and decrease the workload of the leadership. Ideally, as the model continues to evolve and the leadership becomes more confident in the recruiter allocation model, the RMA process will focus only the model result with insignificant feedback from the recruiting brigades.

Future directions for this research would require an extensive data analysis of the model that would lead to a test application of results. This analysis is important to ensure the statistical significance of the variables, even though past research has shown these variables to be important. This analysis would lead to a working model. By creation this model coupled with the aforementioned process improvements we believe that Army recruiting will continue to be successful, especially now, when our country needs a strong and responsive military.

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Appendix A: List of Abbreviations

#	
79R	Military Operations Specialty Code for a Professional Recruiter
A	
AAR	After Action Review
ASAP	As soon as possible
B	
BN	Battalion
C	
CAR	Center for Accessions Research
Cdr or CDR	Commander
CoS	Chief of Staff
CO	Company
COL	Colonel
D	
DCSPER	Deputy Chief of Staff Personnel
DEA	Data Envelopment Analysis
DEP	Delayed Entry Program
DMPM	Director, Military Personnel Management
DTIC	Defense Technical Information Center
E	
ERF	Elite Recruiting Force
G	
GMA	Graduate Male Category Alpha
H	
HQDA	Headquarters Department of the Army
LTG	Lieutenant General
M	
MAJ	Major
MG	Major General
N	
NCO	Non-commissioned Officer
NCOIC	Non-commissioned Officer In Charge
O	
OCONUS	Outside of Continental United States
OPNS	Operations
ORCEN	Operations Research Center
P	
PAE	Program, Analysis, and Evaluation
R	
RA	Regular Army
RMA	Recruiter Mission Allocation

S	
S3	Operations Officer
SDAP	Special Duty Assignment Pay
SEMP	Systems Engineering and Management Process
SGM	Sergeant Major
T	
TRADOC	Training and Doctrine Command
TOE	Table of Organization and Equipment
U	
USAAC	US Army Accessions Command
USAR	US Army Reserve
USAREC	US Army Recruiting Command
X	
XO	Executive Officer

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