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ANALYZING BENEFITS OF EXTENDING THE PCS TEMPO IN THE MARINE CORPS

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 December 2011**

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**ANALYZING BENEFITS OF EXTENDING THE PCS TEMPO
IN THE MARINE CORPS**

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Submitted in partial fulfillment of the requirements for the degree of

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ANALYZING BENEFITS OF EXTENDING THE PCS TEMPO IN THE MARINE CORPS

ABSTRACT

This MBA professional report examines the impact of extending the PCS tempo for Enlisted Marines and Marine Corps Officers. The primary objective is to analyze how relaxing the Permanent Change of Station (PCS) cycle from 36 months to 48 months influences costs, unit efficiency, individual promotion, and family stress. By lowering personnel fluctuation in any given Marine Corps Organization, the unit may acquire and retain personnel experience that makes it more productive. Finally, this study examines how PCS moves affect Marine dependents. Increasing in the number of household moves through the PCS process possibly causes high levels of stress on the Marine and his or her family, causes changes in children's educational experience, and affects spouse's income, career choice and higher learning. Observations derived from data gathered demonstrate the Marine Corps can possibly save an estimated \$14.6 million annually by keeping Marines on station 36 months or longer, and that an increase in PCS frequency increases a Marine's likelihood of being promoted. However, extended TOS by itself does not necessarily equate to units that are more effective. Lastly, an anonymous survey administered to various Marine units suggests that PCS relocations cause stress at home and affect spouse income and higher education.

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LIST OF ACRONYMS AND ABBREVIATIONS

AFADBD	Armed Forces Active Duty Base Date
ASP	Ammunition Supply Point
CAS	Close Air Support
CONUS	Continental United States
DITY	Do-it Yourself (move)
DOD	Department of Defense
EFV	Expeditionary Fighting Vehicle
FMF	Fleet Marine Force
FCT	Firepower Control Team
FSMAO	Field Supply Maintenance Analysis Office
FY	Fiscal Year
LDO	Limited Duty Officer
LVSr	Logistics Vehicle System Replacement
M&RA	Manpower and Reserve Affairs
MCCDC	Marine Corps Combat Development Command
MedEvac	Medical Evacuation
MM	Manpower Management
MMEA	Manpower Management Enlisted Affairs
MMOA	Manpower Management Officer Affairs
MOS	Military Occupational Specialty
O/H	On-hand
OMB	Office of Management and Budget
PCA	Permanent Change of Assignment
PCS	Permanent Change of Station
PME	Professional Military Education
SecNav	Secretary of the Navy
SecDef	Secretary of Defense
TFSMS	Total Force Structure Management System
TIG	Time in Grade
TIS	Time in Service

TMO	Transportation Management Office
T/O	Table of Organization
TOS	Time on Station
WO	Warrant Officer

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I. INTRODUCTION

A. BACKGROUND

While the federal budget is highly debated and the Secretary of Defense directs his agencies to find ways to lower spending costs while maintaining proficiency, the uniformed services find themselves analyzing multiple alternatives to cut spending. In light of diminishing but ongoing military operations in a combat theater, the Marine Corps finds itself hard pressed to cut spending while still maintaining operational readiness.

The Department of Defense (DoD), along with all departments of the federal government, experienced multiple Continuing Resolutions in Fiscal Year (FY) 2011. The FY2012 President's Budget cut reduces \$78 million in DoD spending over the next five years, which brings zero real growth to defense spending during this period. Overall, the DoD FY2012 proposed budget is approximately 5 percent less than FY2011 spending. With an estimated \$1.6 trillion deficit in FY2011 (OMB, 2011), the third-largest shortfall in the past 65 years according to the Congressional Budget Office, one can expect not only the DoD budget, but federal spending overall, to continue to decline in the long run.

In the Marine Corps, the \$13 billion (Lamothe, 2011) price tag to field the fleet of Expeditionary Fighting Vehicles (EFV) was too big a cost to bear for DoD. During a press conference, former Secretary of Defense (SecDef) Robert Gates announced the Marine Version of the F-35 Joint Strike Fighter would be on hold for approximately two years. Additionally, from Congress and SecDef, also reinforced by Marine Corps Combat Development Command (MCCDC) and the Commandant of the Marine Corps himself, the Marine Corps personnel end-strength will be reduced from 202,000 Marines to 182,000 by FY2014 (Mulloy, 2011). All these changes are due to the current federal economic state and the effort to minimize a growing deficit.

1. The PCS Process

It is important to highlight relative guidance from the Marine Corps Personnel Assignments Policy, Marine Corps Order P1300.8R. After all, this order is the governing guidance in the Marine Corps in regards to the PCS process.

The purpose of this Marine Corps Order is “to implement DoD policy and provide definitive guidance on the assignment and Permanent Change of Station (PCS) of Marines.”

By definition, Time on Station (TOS) is the time an individual Marine spends, counted in months, at a specific duty station. Per the Order, Marines are eligible to execute a PCS relocation after completing 36 months of service at their duty station. Marines can also execute Permanent Change of Assignment (PCA) orders while serving in a major Marine Corps Installation. Such installations include Camp Pendleton and Camp LeJeune, among others. A set of PCA orders transfers a Marine from one unit to another within the same general geographical location. Importantly, PCA orders cost \$0.00 to the Marine Corps.

According to this order, the Marine Corps is to limit the number of PCS moves to achieve combat readiness and to ensure “equitable treatment” and “career development” of individual Marines. Additionally, the order states that compliance with this policy improves combat readiness by “controlling personnel turnover, reducing travel costs, and increasing the stability of Marine families.” From a financial management perspective, the policy also identifies that each PCS transfer should be conducted with the minimum possible use of funds.

In regards to Time on Station (TOS), the order states that requirements “are established to stabilize the movement of Marines and their dependents, and to reduce PCS costs.” Also, TOS should be the primary consideration when a Marine is transferred from one duty station to another. Of the utmost importance to this thesis, “The minimum TOS requirement for all assignments within CONUS shall be 36 months.” However, PCS transfers within CONUS duty stations “shall not be required solely because of the passage of a stipulated period of time.” This means that although the Marine Corps

Order identifies 36 months as the required minimum amount of TOS, there is no set maximum amount of time for a tour on any specific duty station. Amplifying guidance is given on assignments to the Fleet Marine Forces (FMF), but in regards to TOS, FMF assignments also require a 36-month tour.

In regards to Permanent Change of Assignment (PCA), the order recognizes that cost reduction in fully funded PCS moves “requires the judicious use of low-cost PCS and PCA orders.” Both low-cost PCS and PCA orders are issued when Marines are assigned from one command to another, but dependents and household goods are not required to transfer. Specifically, PCA orders can be issued when transfer from one command to another is “within the same city, town, base, air station, or metropolitan area.”

2. Individual Promotion in the Marine Corps

Since this study addresses individual promotions, the following overview provides a broad and basic understanding of the promotion requirements for the non-Marine reader.

The Marine Manpower Management (MM) Division, currently under the guidance of Major General Angela Salinas, is responsible for all aspects regarding career development in the Marine Corps. Of interest to this study, MM oversees active duty and reserve component Marine evaluations, promotions, distribution, and retention. MM functions include PCS entitlements, personnel assignments, performance evaluation, career counseling, and promotions, among others. Under MM are two separate branches that exist for the purpose of managing promotions. Manpower Personnel Management Enlisted Promotions (MMPR-2) is responsible for managing Staff Non-commissioned Officer promotions, pay grades E6 through E9. Manpower Personnel Management Officer Promotions (MMPR-1) provides staff assistance to administer laws and regulations governing officer promotions.

In regards to promotions, the Marine Corps has two sets of guidance. One is the Enlisted Promotions Manual (Marine Corps Order P1400.32D), and the second is the

Officer Promotions Manual (Marine Corps Order P1400.31B). These orders identify policy and eligibility for promotion across the Marine Corps.

In addition to the requirements identified by the above-mentioned Marine Corps orders, the Manpower Support Branch (MMSB-50) identifies Professional Military Education (PME) requirements for enlisted ranks, and the Plans and Program Section (MMOA-3) conducts resident PME boards for officers.

The basis for officer promotion is based on law rather than Marine Corps policy. Regulations governing officer promotion include:

- a. Title 10, U.S. Code Armed Forces.

- Chapter 36 – Promotion, Separation and Involuntary Retirement of Officers on the Active Duty List.

- Chapter 1400 – Promotion and Retention of Officers on the Reserve Active-Status List.

- b. Secretary of the Navy (SECNAV) Instructions.

- 1401.3 – Selection Board Membership.

- 1412.6K – Promotion to the grade of First Lieutenant in the Marine Corps.

- 1412.9A – Promotion and Continuation of Limited Duty Officers (LDO) and Warrant Officers (WO) in the Regular Marine Corps and the promotion and continuation of WO in the Marine Corps Reserve.

According to the Officer Promotions Manual, to be eligible for promotion an officer must:

- a. Be on the Active Duty List.

- b. Have completed Time in Grade (TIG) requirements. TIG is defined as the time an individual Marine Officer has served under his or her current rank.

c. Be identified in the promotion plan for an opportunity for selection based on grade strength limitations.

The Enlisted Promotions Manual policy states, “Promotion of enlisted Marines must positively contribute to the high standards of leadership and proficiency required for continued combat readiness.” As an objective, the Enlisted Promotions Manual aims to set guidance that ensures eligible Marines receive “full and equitable” opportunities when competing for promotion.

Eligibility for promotion to the Staff Non-commissioned Officer rank includes meeting the minimum TIG requirements and minimum Time in Service (TIS) requirements. TIS is defined as how long an individual has served in the Marine Corps, in years and months, and is determined from the Armed Forces Active Duty Base Date (AFADBD). Paragraph 1202 in the Enlisted Promotions Manual identifies the minimum TIG and TIS requirements, by years and months, for promotion to each specific rank.

No guidance was found within any of the above Marine Corps Orders that identified that a Marine must execute PCS orders to meet eligibility for promotion, nor that the Marine will not be promoted if he or she does not execute PCS orders a certain number of times throughout his or her career.

B. PURPOSE

The purpose of this study is to analyze what the ripple effects may be if the Marine Corps relaxes the Permanent Change of Station (PCS) tempo. Primarily, an estimate on annual savings can be calculated if the Marine Corps increases the PCS cycle from 36 to 48 months. With this in mind, this thesis is designed to analyze more than just the potential financial savings of executing fewer PCS orders annually. Additional analysis includes how Time on Station (TOS) affects unit cohesion and efficiency, whether PCS frequency affects individual promotions, and how PCS affects family issues such as spouse career and income, spouse higher education, and children’s education.

C. SCOPE

The main problem at hand is lowering spending costs while maintaining a mission-capable Corps. This study examines trends from historical data to analyze annual spending, Marine Corps-wide, on PCS orders for the past 10 fiscal years, and the number of PCS orders executed within those fiscal years. This analysis may assist in estimating the possible savings of relaxing the PCS tempo to 48 months. Additionally, by analyzing how much time Marines spend on their duty stations prior to executing PCS orders, one can determine whether the current 36-month TOS requirement is being met.

Through a survey, this study also analyzes how Marines feel about the level of cohesion and efficiency their last three fleet commands possessed in comparison to the amount of months they served under each of these units. These questions may reveal whether Marines think they need to serve long periods of time under a unit before their sections or platoons accomplished cohesion and efficiency. If the consensus is that Marines feel their units were more productive the longer they served under those units, an argument can be made in which extending TOS not only reduces spending, but also increases unit cohesion and efficiency.

Additionally, this study estimates whether a strong or weak correlation exists between the number of PCS moves executed by an individual Marine affects the amount of times he or she has been promoted.

Lastly, this study looks at the effects of the PCS process on the Marine's home front. Although Family Readiness Centers, Military Schools for grades 1 through 12, Transportation/Distribution Management Offices, and various websites exist in the Marine Corps to assist family members through the PCS process, geographical relocation may still create a large amount of stress on the family and the Marine. This stress may potentially create lower performance and productivity at work. Areas that may be affected by constant execution of PCS orders include children's education, spouse career choice and income, and spouse higher education. A survey will be designed to determine how Marines feel about the PCS process and its tempo, and how much it affects them and their families.

D. RESEARCH QUESTIONS

The hypotheses of this research are as follows:

1. If the Marine Corps increases the PCS requirement from 36 months to 48 months, the Corps will save money, and units may find it easier to maintain high proficiency levels due to a less significant amount of turnover in personnel.
2. Marines do not need to PCS in order to get promoted.
3. Spouses can acquire and keep jobs or pursue higher education without the concern of constant, pending, or unexpected PCS moves.
4. Children of school age can undergo a richer learning experience by decreasing the frequency of changes in the number of schools and teachers from grades K through 12.

In order to prove or deny the above hypotheses, the research in this thesis poses the following questions:

1. Will extending TOS lower Marine Corps-wide spending without affecting unit cohesion and efficiency?
2. Do Marines need to PCS in order to get promoted?
3. Do Marines feel that execution of PCS orders cause a high level of stress at home, and if so, how do they feel about the PCS process and its effect on the following aspects of family life?
 - a. Spouse higher education.
 - b. Spouse career and income.
 - c. Children's education from grades K through 12.

In the following chapters, literature and theories that support this study's hypotheses are reviewed, methods for gathering and analyzing data are identified, and observations are derived from the analysis of data that either support the hypotheses or prove the hypotheses wrong.

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II. LITERATURE REVIEW

A. OPTIMAL PRODUCT QUALITY THEORY

The ability to monitor performance in financial as well as nonfinancial areas is crucial for organizations. According to Ronald W. Hilton, successful companies place quality at the forefront of the areas in which nonfinancial performance is critically important (Hilton, 2011). He believes the quality of the product or service an organization provides spells the difference between profitability and disaster. To apply this concept to the Marine Corps, imagine a Maintenance Battalion that averages eight months to repair Major End Items (MEI) or an Infantry Battalion whose annual Physical Fitness Test (PFT) average lies in the second-class bracket. The quality of the service or product from these two units would not meet the Inspector General standard, therefore declaring these units as failures.

1. Relevance

The Marine saying goes, “The more you sweat in peace, the less you bleed in war.” The Optimal Product Quality Theory applies to any type of organization in the Marine Corps that is concerned with unit efficiency. Imagine a Fighter Attack Squadron for example; the effectiveness of a fighter squadron in peacetime can be derived from flight hours conducted or in combat by accomplishing successful missions. These airplanes would not fly if the preventive maintenance program is below standard, or if the pilots themselves did not receive adequate formal training. Thus, the more the Fighter Attack Squadron invests in preventive maintenance, training, and evaluation (the appraisal and prevention costs), the fewer expenses it will incur in terms of safety mishaps, loss of flight hours, accidental deaths, and even failed combat missions (the failure costs).

Table 1 provides a more descriptive example of how Quality Control Costs can be applied to Marine units. In this example, the theory is applied to a Ground Supply Shop.

Table 1. Quality Control Costs in a Ground Supply Shop.

COST AREA	TYPES OF COSTS	DEFINITIONS	EXAMPLES
• Control Costs	• Prevention Costs	• Costs of preventing a defective product or service	• Formal Schools • Internal Training • Certifications • Admin Stand-down
	• Appraisal Costs	• Costs of determining whether defects exists	• IG Inspections • FSMAO Inspections • Fiscal Audits
• Failure Costs	• Internal Failure Costs	• Costs of repairing defects prior to product or service delivery	• Warehouse roof leaks ruin admin supplies • Mice eat through MRE boxes • Corroded batteries found in battery locker
	• External Failure Costs	• Costs incurred after defective products or services have been delivered	• Improper size personal gear issued • Personal Effects delivered to wrong recipient • Negative funds in the unit budget

In direct application to this study, the Quality Control Cost theory emphasizes that the longer an individual Marine serves under a specific command, the higher the investment such command places on this Marine. The Marine can better understand the mission of the unit and his or her individual responsibilities through his or her experience and training while at such command. Per the Quality Control Model, the higher the investment in control costs, the higher the savings in failure costs. In theory, a command should perform more efficiently with lower personnel turnover.

2. Product Quality Costs

Product quality is determined by two concepts. The first concept is product grade: the extent of the product's capability in performing its intended purpose, in relation to other products with the same functional use (Hilton, 2011). An example of product grade would be a computer monitor's capability by number of colors it displays. A high-grade monitor displays approximately 65,000 colors, while a low-grade monitor displays 300 colors. The second concept is product quality design, which refers to how well a product is conceived or designed for its intended use. A Logistics Vehicle System Replacement (LVSR) can carry up to 16.5 tons of supplies on unpaved or unimproved roads. The LVSR would have poor quality design if it could only carry one ton of cargo while driven on unpaved or unimproved roads.

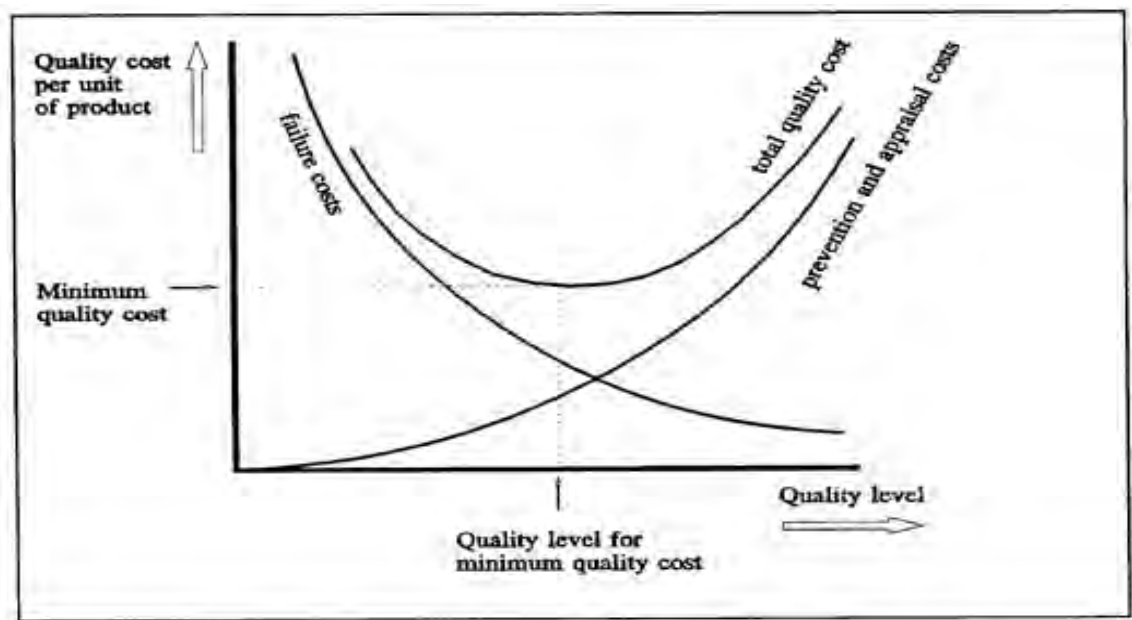
According to Ronald W. Hilton, due to the importance of being able to deliver a good-quality product or service, an organization should routinely measure and evaluate the following four types of costs:

- a. Prevention costs: the costs of preventing a defective product or service (Hilton, 2011). The costs of training are an example of prevention costs. The better training a unit experiences, the better it performs during an evaluation or deployment.
- b. Appraisal costs: the costs of determining whether defects exists (Hilton, 2011). The Inspecting General or Field Supply Maintenance Analysis Office (FSMAO) inspections are examples of efforts that fall under this category.
- c. Internal failure costs: costs of repairing defects prior to product or service delivery (Hilton, 2011). An example of internal failure costs would be an ammunitions technician who finds defective ammunition inside a bunker in the Ammunition Supply Point (ASP). The defective ammunition will have to be returned to the manufacturer or destroyed, in either case, the ASP's internal failure costs will derive from the man hours dedicated to disposing and replacing the defective ammunition.

d. External failure costs: costs incurred after defective products or services have been delivered (Hilton, 2011). Using the defective ammunition again, an external failure cost would be the ammunition technician does not realize the ammunition is defective, and he or she issues it to a customer unit. The costs would derive from man hours in completing required administrative paperwork and unscheduled rework while re-issuing usable ammunition to the customer, in addition to still having to replace or destroy the defective ammunition.

3. The Theoretical Model of Optimal Product Quality

Finding the optimal level of product quality is a balancing act between incurring costs of prevention and appraisal on one side, while incurring costs of failure on the other side (Hilton, 2011). As depicted in Figure 1, the more an organization spends on appraisal and prevention costs, the less it will spend on failure costs. Contrastingly, the less an organization spends on appraisal and prevention costs, the more it will spend on failure costs.



Source: <http://softwarequalityonline.blogspot.com/2006/01/key-quality-concepts.html>

Figure 1. Theoretical Model of Optimal Product Quality.

B. TEAMS AND GROUPS THEORY

Applied in the Marine Corps, a team can be analogous with a small unit such as a mortar section, an infantry squad, or a logistics shop. On a bigger scale, squadrons or battalions represent larger, more complex teams.

According to the Merriam-Webster Dictionary, teamwork is defined as “work done by several associates with each doing a part but all subordinating personal prominence to the efficiency of the whole.” For Marines, this translates to placing mission first while individual needs become subordinate to mission accomplishment.

Although behavioral scientists and engineers, amongst others, have conducted over fifty years of research to understand and measure team effectiveness, to date no single or universally accepted model of team effectiveness exists (Henderson, 2002). With this in mind, this segment will describe characteristics typical to an effective team and the stages team members go through prior to accomplishing specific tasks.

1. Relevance

Tuckman’s five-stage model provides a strong foundation for the experience Marine units undergo while trying to accomplish a specific task. A battalion or squadron experiences these five stages when doing a work-up for a deployment or preparing for an Inspector General evaluation.

In preparing for a deployment, for example, the *forming* stage includes receiving new Marines and identifying the leadership philosophy of the command. During *storming*, the unit creates command relationships and establishes clear roles in the chain of command. In the *norming* phase, the unit undergoes training, reviews or sets Standard Operating Procedures, and begins to create and believe in unit cohesion. Finally, in the *performing* stage, the unit experiences the deployment. Identifying lessons learned, presenting awards, and individuals executing PCS orders after redeployment are part of the *adjourning* phase.

In regard to the research questions of this study, Tuckman’s model demonstrates that teams must experience the first three stages before accomplishing a task. These

stages require time to develop. From that premise, the hypothesis identifies that increasing TOS requirement from 36 months to 48 months may allow units to maintain experienced personnel in the command longer, thus achieving the *performing* stage more expediently in comparison to units that have higher personnel turnover ratios. Therefore, in theory, a unit with minor personnel turnover ratios should be more efficient than units with major personnel turnover ratios.

2. Team Effectiveness

In order to perform well, a team requires overcoming three main obstacles (Hackman, 1975). First, a team must “exert sufficient effort to get the tasks accomplished at an acceptable level of performance.” Second, members of the team must possess adequate knowledge or an adequate skill-set to perform expected tasks. Last, the team must “employ task performance strategies that are appropriate to the work and to the setting in which it is being performed” (Hackman, 1975). Although flexibility and adaptation is a cornerstone of Marine Corps ethos, inappropriate levels of experience and unsuitable equipment may prove catastrophic in a hostile environment. Imagine a newly assembled Firepower Control Team (FCT) attempting to call indirect fire support, medical evacuations (MEDEVAC), and Close Air Support (CAS), all under enemy fire and while having to reprogram radio frequencies and encryption into the tactical radios. Granted, these highly stressful situations challenge even the most experienced FCT leaders. However, one cannot forget this is the reason for undergoing training – hard realistic training. Through time and training, an FCT, as with any other team in the Marine Corps, can establish a high level of efficiency and capability to accomplish missions in the most stressful of environments, just as the proud U.S. Marine history attests to.

Essentially, team effectiveness has three components (Shea, 1987). First, effective teams have high performers who accomplish tasks adequately. Second, a relation exists between team effectiveness and the satisfaction level and well-being of team members. Third, a relation also exists between the team survivability and its effectiveness. That is, failing teams can expect difficulty recruiting new talent or keeping

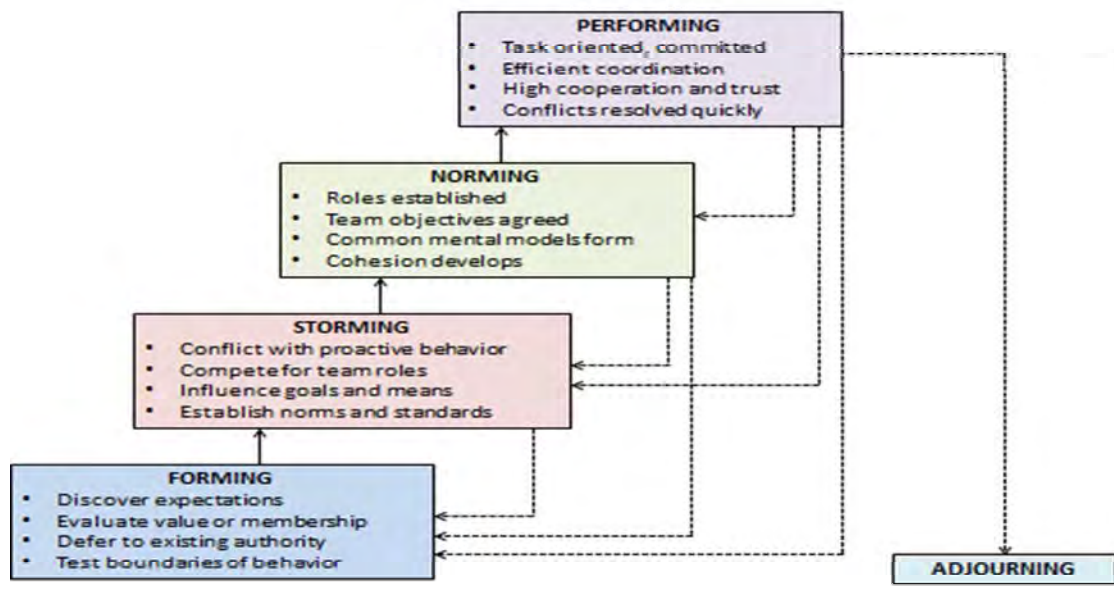
experienced members. Additionally, factors such as team design and team processes affect effectiveness of the team. Team design includes characteristics such as team size, tasks expected to be performed by the team, and composition of the team. Processes include how team members are trained or developed, the level of trust and cohesiveness within the team, and norms, all of which also take time to establish.

Lastly, as identified by Larson and LaFasto in *Teamwork: What Must Go Right, What Can Go Wrong*, at a minimum, the following eight characteristics are necessary if a team is to become effective:

- a. The team must have a clear goal or objective. Once complete, no question should exist as to whether the team has accomplished its goal.
- b. The team must have a result-driven structure.
- c. The team must have competent team members. With time and training, new members can reach a specific level of competency.
- d. The team must have unified commitment. Although team members may not agree on every issue, each individual believes in directing his or her efforts towards accomplishing the team's goal.
- e. The team must have a collaborative climate. A collaborative climate requires trust and consistency, which takes time to build. Without a collaborative climate, the team risks failure.
- f. The team must have high standards understood by all.
- g. The team must receive external support and encouragement. As intangible as this issue may seem to the Marine Corps, a stressful home environment for the married, or a failing relationship for a single Marine, can have negative impact at work, especially in a high-tempo environment.
- h. The team must have principled leadership. Dishonest, unprincipled, incompetent Officers and Staff Non-commissioned Officers can have ruinous influence over hard working goal oriented subordinates.

3. Stages of Team Development

According to the Stages of Team Development, first proposed by Bruce Tuckman in 1965, units go through a four-stage process while working together to accomplish an identified task (Figure 2). The fifth stage relates to the team after it has accomplished its task. Today, Tuckman's stages are not only widely accepted, but they are also the basis for various other models (Abudi, 2010). The first stage is *forming*, when the team first meets. First impressions are set, historical background is typically shared by team members, and it should be in this step when leadership identifies clear goals and expectations. In this step, team members also evaluate each other, set individual expectations, and explore boundaries of acceptable group behavior. The team then moves into *storming*. Here, members compete for roles, status, and acceptance of ideas. Teams will have to endure conflict at this stage, due to varying opinions and levels of experience. Professionally immature teams will have difficulty completing this stage, prolonging the time required to accomplish a task. The third step is *norming*. By now, roles are established, objectives are agreed, and cohesion begins to develop. Individuals focus on developing ways of working together, and begin to establish processes and procedures. The team begins to realize the value of team effort, so working together becomes more natural. Then teams begin *performing*. Effective teams reach this stage quickly. At this level, conflicts are resolved expediently, coordination is efficient, trust and cooperation levels are high, and the team is committed and task oriented. The fifth stage, *adjourning*, applies to the team after the task has been accomplished and includes celebration, preparation for the next task, identifying lessons learned, and possible departure of team members. Per Figure 2, teams will not necessarily always progress through these stages in order. Unforeseen circumstances may set the team back to prior stages, at which point teams will have to resolve the problem prior to continuing their progress towards accomplishing the task.



Source: McShane, Steven and Von Glinow, Mary Ann, *Organizational Behavior*, McGraw Hill, 2007.

Figure 2. Stages of Team Development.

From this model, one can see how teams that have worked together for longer periods of time have established roles, can coordinate efficiently, and members create and hold trust in one another. In a NASA study on fatigued pilots, researchers discovered that crews who had worked together made fewer errors than fresh crews who had never flown together (Hackman, 2002), subsequently demonstrating that newly established teams have to start fresh and experience the first three stages of the model before actually performing.

C. FAMILY STRESS

Previous literature that addresses the effects of PCS on Marines and their dependents in particular was not found during this research. Nevertheless, these effects have been analyzed for the military in general, as described within this section.

Dr. Melissa Conrad Stoppler defines stress as external and internal factors that affect an individual. Depending on the individual's response, however, stress can be a neutral, positive, or negative experience. Some external factors include jobs, personal relationships, challenges, and various others. Internal factors, as Stoppler describes, determine the ability of the body to respond or deal with the external stress-producing factors.

In *Military Family Under Stress: Implications for Family Life Education*, Amy Rinkober Drummet et al. (2003) provides a summary on stressful experiences of military families; one of these stressful experiences is relocation. Military families move more frequently than their civilian counterparts (Pittman & Bowen, 1994), and relocation of military families involve longer distances in comparison to their civilian counterparts. In a study by Dennis K. Orthner (2002), customer satisfaction of the support provided by military agencies has significantly decreased since the mid-1990s. In his own words, "Overall satisfaction rates were modest at best."

1. Relevance

The complex and stressful nature of the PCS process not only affects Marines, but it affects the family as well. It is safe to assume that Marines accept constant PCS moves as a part of "needs of the Marine Corps." However, wives and children may not be as open in their sentiments toward relocating; especially if PCS orders continuously fail to meet the 36-month TOS requirement. Although the Marine Corps is currently right-sizing its total end-strength, as an organization, the proper manner of right-sizing should be decided by qualified decision makers, not by the individually capable and goal-oriented Marine whose family members have grown tired of not being able to hold a job or maintain ties to a specific community or school.

Data collected through this study's survey should help identify how Marines feel about the effects of the PCS process and the impact on spouse's income and education, and the effects on children education.

2. PCS and Spouse Employment

The Military Family Resource Center, according to Drummet, estimates that 55% of officer spouses and 63% of enlisted spouses are either employed or actively seeking employment. However, a major issue military spouses encounter while searching for employment is employers who are reluctant to invest time or funds in training individuals who may soon leave their work force. Moreover, frequent employment disruptions, due to relocation for spouses with career paths, can significantly disrupt career development (Eby, DeMatteo, & Russell, 1997).

An Armed Forces and Society study conducted by J. Brad Schwartz et al. (1991) on military spouse employment, affirms that spouse employment plays an important role on the service member “commitment to military life, job performance, military readiness, and retention.” He also comments on U.S. Army concern in regards to spouse limitation in pursuing satisfactory employment opportunities, and the negative ramifications of such limitations on costs to the U.S. Army, as indicated in *The Army Family Action Plan*. Such costs, according to Schwartz, derive from service member lower productivity and potential retention difficulties. As he declares, “There may be significant savings to the Army from improved spouse employment” (Schwartz, Wood, & Griffith, 1991).

3. PCS and Children

Military children undergo stressful adjustment periods, which start before the move and continue after the move is complete (Cornille, 1993). Issues children are concerned with include the anticipation of their new home, school environment, and fear of the unknown. This emotional turmoil intensifies immediately following the move, because children have not yet had time to replace their previous network of peers with new friends (Drummet, Coleman, & Cable, 2003). Teenagers are especially concerned with social rejection. Girls have more difficulty adjusting than boys, mostly due to the importance they place on social relationships (Brown & Orthner, 1990). Additionally, correlations have been found between five or more lifetime moves and lower adolescent self-esteem (Hendershott, 1989).

Drummet et al. (2003) believe that children and adolescents are troubled the most during relocation due to the lack of control on their environment. Unlike civilian families, the service member cannot refuse a set of PCS orders. Since families have limited decision-making power during this process, the authors are confident that adolescents feel especially powerless in their own lives. As a recommendation, Drummet states, “Programs need to be developed for relocated children to help them adjust to their new educational system” (2003). Since disparities exist in educational standards between different state school systems, any effort that assists in early identification of fluctuating standards between school systems may give families a chance to enrich or remediate children prior to attending new schools. Moreover, services should be provided to help integrate children into their new educational environment. Such services are paramount since schools are where children learn of their new community’s norms and values (Pollari & Bullock, 1988).

The following chapter identifies raw data, how it was collected, and how it will be analyzed to provide observations that may answer this study’s research questions.

III. DATA AND METHODOLOGY

A. ESTIMATING FINANCIAL SAVINGS

1. Data Collection

The Manpower Management Office at Headquarters Marine Corps, Manpower and Reserve Affairs (MR&A) provided data for the cost savings analysis. Data was received on total expenses incurred by the Marine Corps and the total number of Marines that executed PCS orders per Fiscal Year (FY) spanning 10 years. The raw index for Military Personnel, Marine Corps (1105) funds as identified by the Naval Center for Cost Analysis will be used to normalize PCS expenses. FY2010 was chosen as the base year for the analysis.

2. Raw Data

Table 2 provides the expenses incurred by the Marine Corps for the past 10 fiscal years, as well as the number of PCS orders executed for those years.

Table 2. Raw PCS Expenses and Number of PCS Orders Executed per FY.

	ANNUAL COST TO PCS MARINES	NUMBER OF PCS ORDERS EXECUTED
FY2001	\$ 262,182,000.00	97,384
FY2002	\$ 263,764,000.00	97,788
FY2003	\$ 305,836,000.00	102,834
FY2004	\$ 316,936,000.00	96,371
FY2005	\$ 335,318,000.00	100,018
FY2006	\$ 372,556,000.00	119,889
FY2007	\$ 397,076,000.00	133,215
FY2008	\$ 434,964,000.00	108,269
FY2009	\$ 599,612,000.00	105,964
FY2010	\$ 523,956,000.00	105,389

Table 3 identifies the Military Personnel, Marine Corps (1105) raw index.

Table 3. Military Personnel, Marine Corps (1105) Raw Index

FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
0.7128	0.7548	0.7931	0.8263	0.8554	0.8827	0.9042	0.9326	0.9671	1.00

3. Estimating Financial Savings on a 48-Month PCS Cycle

Due to the lack of individual-level data for the cost of each Marine executing PCS orders, this study relies on aggregated measures to conduct the analysis. Proposed savings derive from crude approximations, which the Marine Corps could possibly incur savings on, if the PCS tempo is relaxed by a period of 12 months.

To estimate the possible annual savings of switching from a 36-month PCS cycle to a 48-month PCS cycle, the average cost for an individual set of PCS orders over a 20-year career will first be calculated. This average cost of executing one set of PCS orders, over a 10-year period, is represented by $\bar{x}$. The calculation to estimate $\bar{x}$ is described by the following equation:

$$\bar{x} = \frac{\sum_{i=1}^{10} \text{Annual PCS Costs}_i}{\sum_{i=1}^{10} \text{PCS Orders Executed}_i}, \text{ where } i \text{ is an index for each FY, and } i = 1, \dots, 10.$$

Under the current system, which requires Marines to PCS every 36 months, a Marine will execute 6.7 PCS moves during his or her 20-year career. This assumption does not include execution of PCS orders due to training or formal schools, accession, or separation. By multiplying 6.7 times $\bar{x}$, the average cost to PCS a Marine during a 20-year career can be calculated. Likewise, if the PCS tempo is relaxed to a 48-month cycle, one can presume that Marines will execute 5 PCS moves during a 20-year career. By multiplying 5 times $\bar{x}$, one can estimate the average cost in PCS moves for a Marine during a 20-year career. The difference between these two costs ($\bar{y}$), would identify the savings per Marine in PCS costs during a 20-year career, and is calculated as follows:

$$\bar{y} = (6.7)(\bar{x}) - (5)(\bar{x})$$

Lastly, the estimated average annual savings on PCS moves per Marine ($\bar{z}$) can be calculated by dividing $\bar{y}$ by 20, or:

$$\bar{z} = \bar{y} / 20.$$

B. EFFECTS OF PCS ON UNIT EFFICIENCY

1. Data Collection

The data to analyze whether TOS affects unit efficiency and cohesion derives from the Field Supply Maintenance Analysis Office (FSMAO) and from the Manpower Management Enlisted Affairs (MMEA) and Manpower Management Officer Affairs (MMOA) at Manpower and Reserve Affairs (M&RA), Headquarters Marine Corps. FSMAO provided FY2010 inspection results on the top and bottom five scoring stateside units. M&RA provided the fluctuation in manning quantities for these units during FY2010. Also, the Table of Organization (T/O) personnel allowance was extracted from the Total Force Structure Management System (TFSMS) to identify the number of personnel each unit rates.

2. Raw Data

Table 4 identifies the top and bottom five FSMAO scores of units 1 through 10 in FY2010. The T/O personnel allowance for each unit is also provided, as well as the quarterly On-hand (O/H) number in personnel for each specific unit as provided by MMEA and MMOA.

Table 4. FY2010 Unit T/O, Quarterly Manning, and FSMAO Results

UNIT	T/O	O/H 10/31/2009	O/H 1/31/2010	O/H 4/30/2010	O/H 7/31/2010	FSMAO SCORE
1	903	831	854	874	866	98.63
2	863	580	610	634	685	96.03
3	781	783	781	806	815	95.90
4	138	133	122	129	110	95.89
5	781	790	778	808	823	95.43
6	203	200	211	212	223	67.49
7	1316	1132	1089	1114	1076	58.79
8	454	256	248	254	274	52.95
9	268	198	224	210	218	51.35
10	66	65	70	69	67	44.91

3. Analyzing Effects of Personnel Fluctuation on Unit Efficiency

The goal of this segment is to compare the percentage of personnel on-hand throughout the fiscal year to the FSMAO score for each unit. If units with a low percentage of personnel on-hand throughout the FY score poorly, the argument can be made, per the Theoretical Model of Optimal Product Quality and the Teams and Groups Theory, that these units did not possess adequate personnel expertise or experience to perform well during the inspection.

The average personnel on-hand, represented by $\bar{x}$, is calculated as follows:

$$\bar{x} = \frac{\sum_{i=1}^4 \text{Quarterly On-hand}_i}{4}, \text{ where } i \text{ is an index for each quarter, and } i = 1, \dots, 4.$$

In order to compare $\bar{x}$ to unit scores, it needs to be transformed into a percentage of each unit's T/O personnel allowance, represented by $\bar{y}$, and calculated as follows:

$$\bar{y} = \left(\frac{\bar{x}}{\text{T/O Allowance}} \right) \times 100$$

C. THE PCS PROCESS SURVEY

1. Sample

The sample for this study consisted of 105 active duty Marines within various types of commands including an infantry battalion, a communications battalion, a recruiting command, and academic detachments. Subjects included Non-commissioned Officers, Staff Non-commissioned Officers, and Commissioned Officers ranging from E-5 through O-5 in pay-grades. On average, respondents were 33.75 years of age with 2.1 dependents at home. Large groups include married Marines (83%) and Caucasians (79%). Of note, 44% of the respondents were prior enlisted officers.

2. Measures

a. *Individual Promotion and PCS*

Data necessary to calculate a regression on the effects of PCS frequency and individual promotion was gathered by asking Marines to provide the date they entered military service to identify Time in Service (TIS), how many times they have executed PCS orders, and what their current rank is. To compensate for the amount of times a prior-enlisted Marine Officer has been promoted, the survey also asks what rank he or she achieved prior to commission.

b. *Team Trust*

Team trust was assessed using Jackson et al. (2006) Psychological Collectivism scale. Subjects indicated their level of agreement on a 5-point Likert-type response scale 1 (strongly agree) to 5 (strongly disagree). A sample item includes, "There is a great deal of trust among the members of my team." The scale showed strong internal consistency reliability ($\alpha = .91$).

c. *Team Effectiveness*

A six-item scale of team effectiveness was developed for this study. Subjects responded to items on a 5-point Likert-type response scale 1 (strongly agree) to 5 (strongly disagree). Sample items include, "The section/platoon I worked with performed well," and "The section/platoon I work with is very efficient." The scale showed strong internal consistency reliability ($\alpha = .89$).

d. *PCS Related Stress*

A five-item scale of PCS related stress was developed for this study. Subjects responded to items on a 5-point Likert-type response scale 1 (strongly agree) to 5 (strongly disagree). Sample items include, "PCS moves cause tension at home," and "PCS moves cause my family a lot of stress." The scale had acceptable internal consistency reliability ($\alpha = .83$).

e. Effects of PCS on Spouse Career, Income, and Education

A six-item scale regarding effects of PCS on spouse education, career, and income was developed for this study. Subjects responded to items on a 5-point Likert-type response scale 1 (strongly agree) to 5 (strongly disagree). Sample items include, “PCS moves have hindered my spouse’s career,” “My spouse makes less money because of PCS moves,” and “PCS moves have hindered my spouse’s opportunities to further his or her education.” The scale showed strong internal consistency reliability ($\alpha = .92$).

f. Effects of PCS on Children’s Education

A five-item scale regarding effects of PCS on children’s education was developed for this study. Subjects responded to items on a 5-point Likert-type response scale 1 (strongly agree) to 5 (strongly disagree). Sample items include, “My children are less motivated about school after PCS moves,” and “Overall, PCS moves tend to hinder my children education.” The scale showed strong internal consistency reliability ($\alpha = .91$).

g. Total Number of PCS Orders Executed

The total number of PCS relocations enacted by a Marine was assessed using a single objective measure that asked, “How many times have you executed PCS orders in your military career?”

h. Total Number of PCS Orders Executed Under 36 Months

The total number of PCS orders executed under 36 months enacted by a Marine was assessed using a single objective measure that asked, “How many times have you executed PCS orders under 36 months of Time on Station?”

i. Time on Station Spent on Your Last Command

The total TOS a subject spent in his or her last command was assessed using a single objective measure that asked, “How many months did you spend on your last command?”

3. Calculating the Correlation between PCS and Promotions

From the data gathered through the survey, a regression can be calculated to estimate the correlation between PCS and promotions, as identified in the following equation:

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Where y represents the number of promotions, and β_0 is the intercept. β_1 represents the coefficient on number of PCS orders executed and X_1 is the number of PCS orders executed. β_2 represents the coefficient of TIS, and X_2 is the TIS served, in months, by each individual Marine. Finally, ε represents the term for random error normally distributed with a mean of 0.

4. Analyzing Survey Responses

Data gathered through the survey will be analyzed by calculating correlations between variables and by graphing aggregate quantities related to specific responses. Correlations identify weak or strong internal consistency reliability between variables while graphs visually depict and help interpret how Marines feel about specific questions in regards to the effects of PCS.

The following chapter demonstrates how raw data and results from the survey are analyzed to derive observations that answer the research questions.

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IV. ANALYSIS

A. ESTIMATING FINANCIAL SAVINGS

1. Average Cost of Executing One Set of PCS Orders

The average cost of executing one set of PCS orders, over a ten-year period, is represented by $\bar{x}$.

The raw expenses identified in Table 2 must be normalized to a base year in order to account for inflation. To normalize these expenses, one simply divides the raw expenses from past fiscal years by the base year raw index. FY2010 was used as the base year to deflate the cost data. Table 4 demonstrates the normalized PCS expenses, including the normalized ten-year total expense.

Table 5. FY2010 Normalized PCS Expenses.

	Annual Cost to PCS Marines	FY2010 Raw Index	Normalized PCS Cost
FY2001	\$ 262,182,000.00	0.7128	\$ 367,819,865.32
FY2002	\$ 263,764,000.00	0.7548	\$ 349,448,860.63
FY2003	\$ 305,836,000.00	0.7931	\$ 385,620,980.96
FY2004	\$ 316,936,000.00	0.8263	\$ 383,560,450.20
FY2005	\$ 335,318,000.00	0.8554	\$ 392,001,402.85
FY2006	\$ 372,556,000.00	0.8827	\$ 422,064,121.45
FY2007	\$ 397,076,000.00	0.9042	\$ 439,146,206.59
FY2008	\$ 434,964,000.00	0.9326	\$ 466,399,313.75
FY2009	\$ 599,612,000.00	0.9671	\$ 620,010,340.19
FY2010	\$ 523,956,000.00	1.00	\$ 523,956,000.00
TEN YEAR TOTAL			\$ 4,350,027,541.93

The second step to calculate $\bar{x}$ is simply adding the ten-year total number of PCS orders executed as identified in Table 2. This total aggregate is 1,067,121 PCS orders executed during fiscal years 2001 through 2010.

The last step to calculate $\bar{x}$ is to divide the ten-year total normalized expense by the aggregate number of PCS orders executed, as indicated by the following calculation:

$$\bar{x} = \frac{\$4,350,027,541.93}{1,067,121} = \$4,076.41$$

Now that the average cost to PCS one Marine has been identified as \$4,076.41, the average cost to relocate one Marine 6.7 times through the 36-month cycle on a 20-year career, and the average cost to relocate one Marine 5 times through the 48-month cycle on a 20-year career, can also be calculated. The difference of these two figures ($\bar{y}$) is the total savings per Marine on a 20-year career track. The following calculation demonstrates this figure:

$$\bar{y} = (6.7)(\$4,076.41) - (5)(\$4,076.41)$$

$$\bar{y} = \$27,311.98 - \$20,382.07$$

$$\bar{y} = \$6,929.90$$

In essence, this study's estimated total savings per Marine on PCS costs during a period of 20 years is \$6,929.90—if the Marine Corps relaxed the PCS tempo from 36 to 48 months. This figure divided by 20 gives us the estimated annual savings ($\bar{z}$) per Marine, demonstrated as follows:

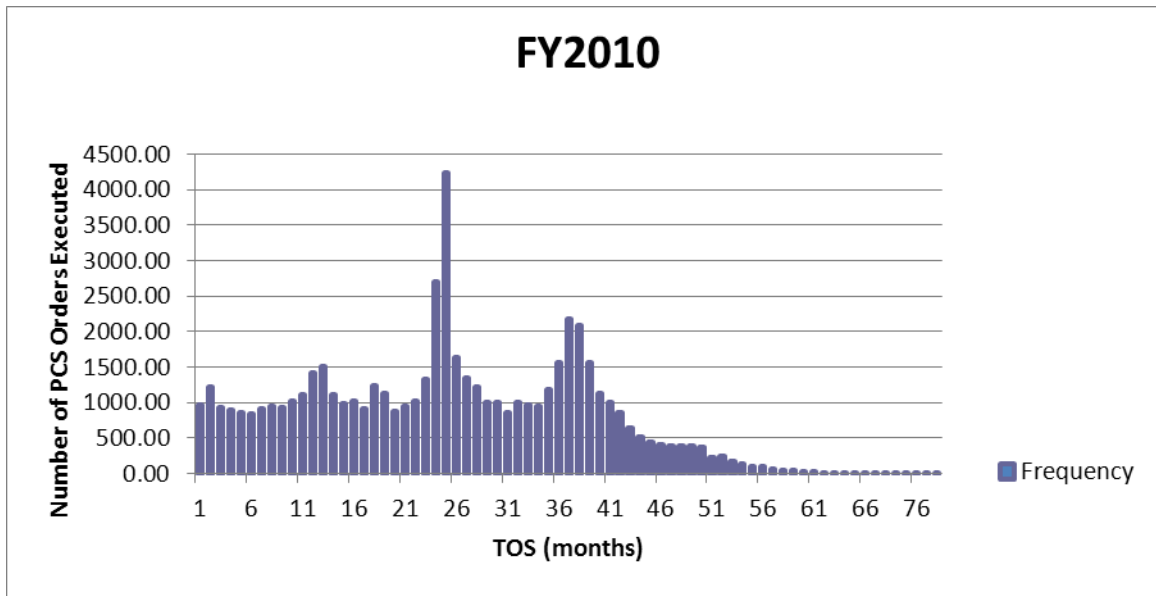
$$\bar{z} = \frac{\$6,929.90}{20 \text{ years}} = \$346.50 \text{ per year.}$$

2. Further Analysis

Since \$346.50 on annual savings may appear as a grossly insignificant quantity, the following analysis may prove more attractive.

Figure 3 identifies the number of PCS orders executed in FY2010 by TOS. Unarguably, the histogram is heavily skewed to the left, especially to the left of 36 months of TOS. The large column over by the 25-mark indicates that most PCS orders in FY2010 were executed by Marines who had approximately 25 months of TOS. According to this data set, 42,304 PCS orders were executed with 35 months of TOS or less. This number multiplied by the estimated \$346.50 equals \$14,658,336 in annual

savings if no Marines were to execute orders under 36 months of TOS. Granted, certain relocations such as formal schools, accessions, and separations do not apply to the 36-month model.



Source: Manpower Management Office at Headquarters Marine Corps, Manpower and Reserve Affairs.

Figure 3. Number of PCS Orders Executed by TOS.

Lastly, under the current 36-month PCS cycle, the number of PCS orders executed per FY range from 96,371 to 133,215 and average 106,712 orders executed per FY. For the past 10 fiscal years, that averages to more than half of the Marine Corps end strength executing PCS orders on a yearly basis. The average of 106,712 PCS orders executed annually multiplied by the estimated \$346.50 equals \$36,975,708 in annual savings—allowing this \$36.9 million in savings being skewed in favor of the hypothesis since it is calculated through the possible annual savings of a 48-month PCS cycle. The average number of annually executed PCS orders in a 48-month cycle cannot be calculated because a 48-month PCS cycle does not currently exist in the Marine Corps.

B. EFFECTS OF PCS ON UNIT EFFICIENCY

1. Manning Average and Unit Efficiency

To calculate $\bar{x}$, the average number of personnel on-hand per unit throughout FY2010, we simply add each unit's on-hand for all four quarters, then divide that number by four. Table 6 identifies these averages in the last column.

Table 6. T/O Personnel Allowance and Average On-hand Quantity

UNIT	T/O	O/H 10/31/2009	O/H 1/31/2010	O/H 4/30/2010	O/H 7/31/2010	AVG O/H
1	903	831	854	874	866	856
2	863	580	610	634	685	627
3	781	783	781	806	815	796
4	138	133	122	129	110	124
5	781	790	778	808	823	800
6	203	200	211	212	223	212
7	1316	1132	1089	1114	1076	1103
8	454	256	248	254	274	258
9	268	198	224	210	218	213
10	66	65	70	69	67	68

In order to compare $\bar{x}$ to the FSMAO unit scores identified in Table 4, the average number of personnel per unit is transformed into a percentage of each unit's T/O personnel allowance. Table 7 identifies the percentage of personnel on-hand possessed by each unit in the bottom row.

Table 7. Percentage of Personnel On-Hand.

UNIT	1	2	3	4	5	6	7	8	9	10
T/O	903	863	781	138	781	203	1316	454	268	66
O/H 10/31/2009	831	580	783	133	790	200	1132	256	198	65
O/H 1/31/2010	854	610	781	122	778	211	1089	248	224	70
O/H 4/30/2010	874	634	806	129	808	212	1114	254	210	69
O/H 7/31/2010	866	685	815	110	823	223	1076	274	218	67
AVG O/H	856	627	796	124	800	212	1103	258	213	68
AVG O/H (%)	94.82	72.68	101.95	89.49	102.40	104.19	83.80	56.83	79.29	102.65

An assumption on this analysis is that all personnel fluctuations derive from PCS orders. This study understands that personnel fluctuation may result from other causes such as deaths, separations, detachments, etc. Arguably, regardless what the cause of the fluctuation, the manning percentage on any command may impact, favorably or adversely, the performance of such unit during an evaluation.

Figure 4 visually compares FSMAO scores to the manning averages calculated in Table 7. Per the Theoretical Model of Optimal Product Quality and the Teams and Groups Theory, units that maintained a higher percentage of personnel on-hand throughout the fiscal year should have a better score. On average, these theories hold true according to the data analyzed. Individually, units 9 and 10 contradict these theories by having 80% and 103% manning throughout the fiscal year, yet scoring as the two lowest units during the FSMAO inspection. Conversely, unit 2 maintained 73% manning throughout the fiscal year, yet scored as second highest during its inspection.

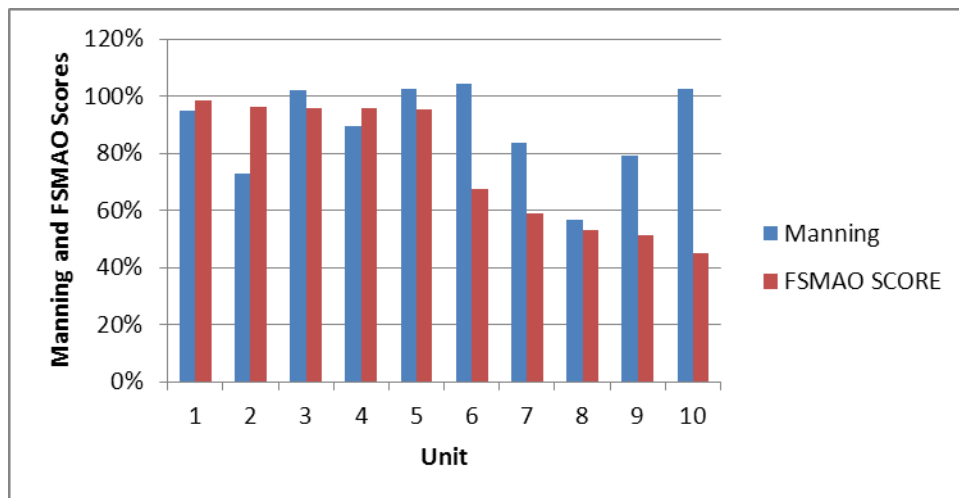


Figure 4. Manning Percentage per Unit vs. FSMAO Scores

C. THE PCS PROCESS SURVEY

1. Results

Table 8 presents the descriptive statistics and correlations among the study variables. All results are based on correlation analysis.

Table 8. Means, Standard Deviations, and Correlations.

Variable	M	SD	1	2	3	4	5	6	7
1. Number of PCS Orders Executed	5.78	2.78							
2. PCS under 36 months	2.85	2.12	.75**						
3. Time Spent at Last Unit	23.19	12.28	0.09	-0.01					
4. Team Effectiveness	3.81	0.83	0	-0.09	.23*				
5. Team Trust	4.02	0.76	0.02	-0.02	.25*	.84**			
6. PCS-related Stress	4.05	0.8	0.17	.24*	0.19	-0.1	0.06		
7. Spousal Career Impact	4.12	0.98	-0.07	-0.04	0.06	-0.05	0	.32*	
8. Children's Education Impact	3.44	0.98	0.15	0.25	0.15	0.02	0.21	.60**	.30*

As identified in Table 8, PCS under 36 months is positively related to PCS-related Stress ($r = .24$). This can be interpreted as Marines who execute PCS orders under 36 months find relocation more stressful than those who execute PCS orders after 36 months of TOS. Also, Team Effectiveness ($r = .23$) and Team Trust ($r = .25$) are positively related to Time Spent at Last Unit. Likewise, Team Trust is strongly related to Team Effectiveness ($r = .84$). These relations can be interpreted in favor of this study's hypothesis, which identifies that the longer a Marine spends at a specific unit, the stronger he or she feels about his or her unit's efficiency and cohesion. Additionally, Spousal Career Impact is positively related to PCS-related Stress ($r = .32$), and Children's Educational Impact is strongly related to Spousal Career Impact ($r = .60$). This can be interpreted as Marines who believe their spouse's career is adversely affected by PCS moves, experience an increased amount of stress at home if they also have children of school age whose education is believed to be negatively affected by PCS moves.

2. Individual Promotion and PCS

This study calculated the correlation between promotions and PCS frequency, using the data gathered through the survey, per the following equation:

$$\hat{y} = \beta_0 + \beta_1 PCS \text{ Frequency} + \beta_2 TIS + \varepsilon, \text{ where } \hat{y} \text{ represents promotions}$$

where $\hat{y}$ represents promotions β_0 , or the intercept of this regression, is 0.3567. Additionally, R-squared equals 0.474. This means 47% of the variation in promotions can be explained by the number of PCS orders executed. Lastly, the standard error of the intercept is 0.51, which identifies the coefficient as statistically significant. Figure 5 graphically depicts the positive correlation between promotions and PCS orders executed. In short, the greater the number of PCS orders executed, the more likely a Marine may be promoted.

It is important to mention that 80% of the Marines who took the survey *strongly agree* or *agree* they need to PCS in order to enhance their careers. Likewise, 70% of the Marines who responded to the survey *strongly agree* or *agree* their promotion opportunities would be jeopardized if they did not PCS often.

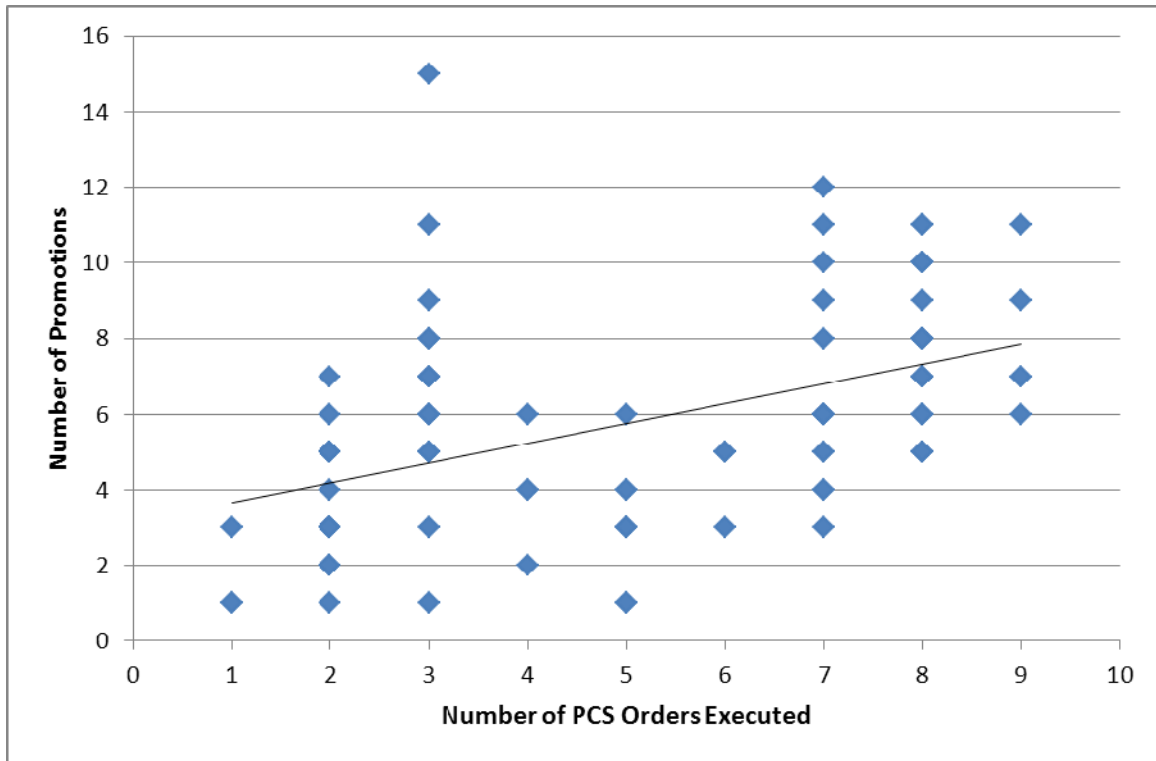


Figure 5. Promotion and PCS Trendline.

3. Further Analysis

Results from the survey in regards to responses towards family stress may be better described visually than mathematically.

Figure 6 identifies responses in regards to stress created at home from PCS moves. In large majority, Marines *strongly agree* or *agree* that PCS moves cause tension to the family at home, create spouse stress, and can be a strain on marriage. A reversal of the question identifies that Marines *strongly disagree* or *disagree* to PCS being stress free.

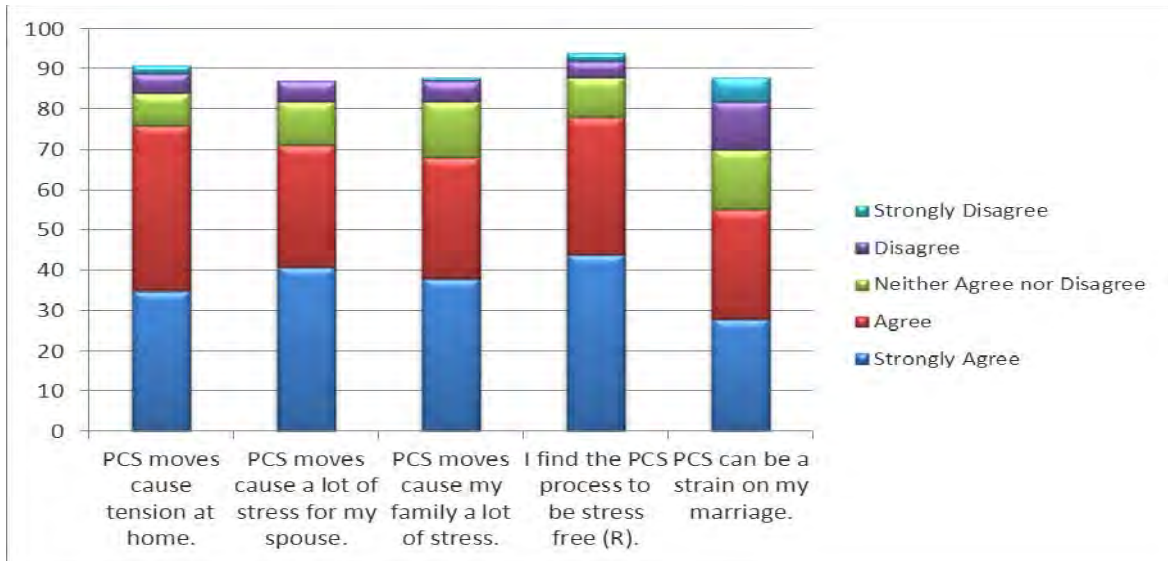


Figure 6. Effects of PCS on Family Stress.

Lastly, Figure 7 demonstrates how Marines feel about the effects of PCS on their spouse's higher education, career, and income. By a large majority, Marines *strongly agree* and *agree* that PCS moves have hindered their spouse's opportunities to seek higher education, their spouse's career choice, and their spouse's income.

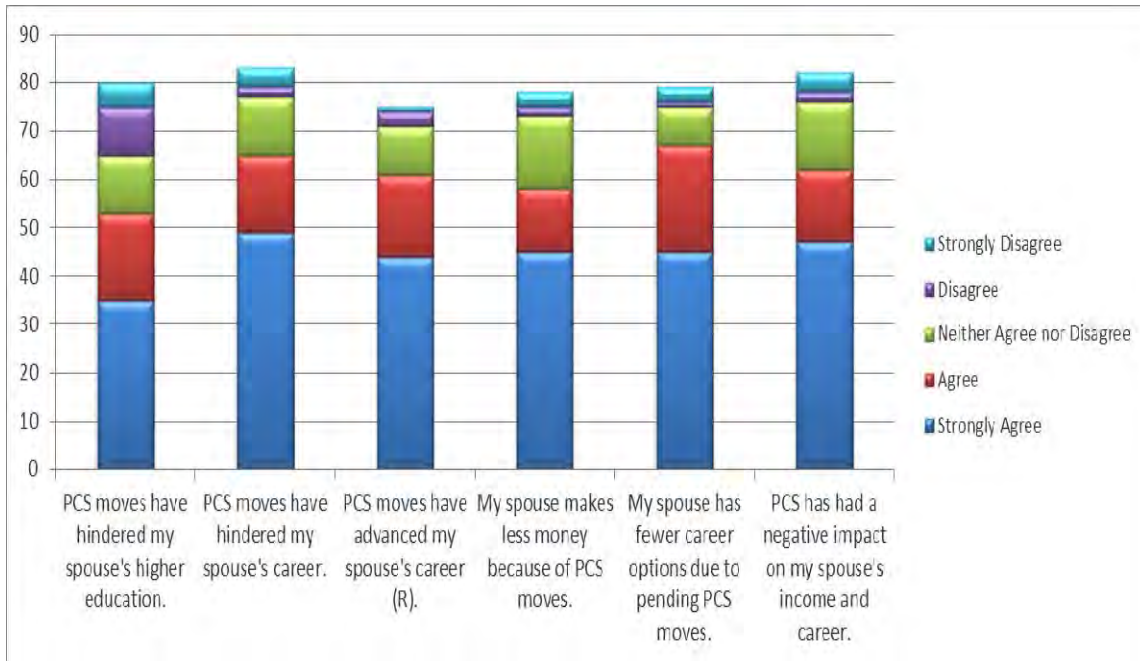


Figure 7. Effects of PCS on Spouse Education, Career, and Income.

V. CONCLUSION

A. OBSERVATIONS

1. Estimated Financial Savings

For the past 10 fiscal years, on average 106,712 PCS orders are executed on a yearly basis – that is more than half of the Marine Corps end strength.

At a minimum, the Marine Corps can save an estimated \$14.6 million annually by keeping Marines on station for 36 months or longer.

2. Unit Efficiency and Cohesion

TOS as a variable by itself does not necessarily affect unit efficiency and cohesion.

3. Effects of PCS on Individual Promotions

An increase in the quantity of PCS orders executed increases a Marine's likelihood of being promoted.

4. Effects of PCS on Stress Levels at Home

a. A large majority of Marines surveyed feel that PCS moves cause stress at home, especially those who execute PCS orders under 36 months of TOS.

b. A large majority of Marines surveyed agree that PCS moves affect spouse higher education, income and career.

c. Marines who believe their spouse's career is adversely affected by PCS moves experience an increased amount of stress at home if they also have children of school age whose education is believed to be negatively affected by PCS moves.

B. RECOMMENDED FURTHER STUDIES

1. Does Deployment Tempo Affect Unit Efficiency?

The PCS process explains individual relocation. A follow up study may analyze how a whole unit's level of efficiency improves or decreases through a work-up, deployment, redeployment, and refit.

2. How Does the PCS Process Affect Retention?

Although Marines understand and agree that PCS is part of being a Marine, spouse and teen-age dependents may not readily agree to geographically relocate every 36 months. A follow up study may analyze how such disparity may cause pressure on the Marine to reconsider continuing a military career, become a geo-bachelor, or retire as soon as eligible.

3. Effects of PCS on Specific Military Occupational Specialties (MOS).

Certain specialties such as Logistics or Supply enjoy the privilege of assignments flexibility. By flexibility, a Supply Officer for example, may serve in the wing, logistics, and ground portion of one specific Marine Expeditionary Force, without having to execute PCS orders. Other specialties, such as an Armor Officer or an F/A-18 Hornet Pilot, are very limited to what geographical locations they may do their primary MOS. A further study may analyze whether regionalization of MOS exists in the Marine Corps and how the PCS process affects different military specialties.

C. CLOSING COMMENTS

The intent of this thesis is not to point fingers or disgrace the tireless efforts of Marines and civilians around the globe that uphold our deeply rooted pride across the Corps. With that said, the first step to fixing a problem is to identify it, and this study would do no service if it simply points out the positives of the PCS process.

The overall consensus of the survey indicates that Marines accept PCS moves as part of the job. However, the large majority would prefer to PCS less, especially those with a working spouse and children of school age. Some Marines have become

geographical-bachelors, other spouses home-school children, all to avoid moving dependents from one state educational system to another. Although no Marine Corps literature specifies that Marines must PCS as a requirement for promotion eligibility, Marines know that rejecting PCS orders is detrimental to their career.

Gathering data for analysis proved difficult. Individual-level data on PCS expenses often proved incorrect, incomplete, or not available. Ideally, individual-level data should be collected to make better policy recommendations. Granted, what this study considers important data may be observed as unnecessary data by the Marine Corps. However, it may prove useful to know not only how much money the Marine Corps spends per FY on PCS orders, but also how much money the Marine Corps has spent relocating a specific Marine and his or her family throughout his or her career.

Transportation and Management Offices (TMO) or Travel Offices could make use of a forecasting or estimating tool to calculate PCS expenses for Marines pending PCS orders, especially if such tool is disseminated for public use. With an estimator, Marines could calculate the difference between a TMO or DITY move, and decide which one is preferable. Currently, it appears that expenses cannot be calculated until after PCS orders have been coordinated between the traveler, administrative authorities, and TMO.

Lastly, I would be immensely unappreciative without personally closing this thesis by expressing my gratitude to all who made this research possible. I simply would have not been able to complete this yearlong research without the time and guidance of many great individuals inside and outside of the Marine Corps. I am in your debt.

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LIST OF REFERENCES

- Abudi, G. (2010, May). *The five stages of project team development*. Retrieved October 23, 2011, from Project Management Articles: www.pmhut.com/the-five-stages-of-project-team-development.
- Brown, A. C., & Othner, D. K. (1990). Relocation and personal well-being among early adolescents. *Journal of Early Adolescence* 10, 366–381.
- Congressional Budget Office (2011, August). *Budget and economic outlook: An update*. Retrieved October 18, 2011, from Congressional Budget Office: www.cbo.gov/doc.cfm.
- Cornille, T.A. (1993). Support systems and the relocation process for children and families. *Marriage and Family Review* 19, 281–298.
- Drummet, A. R., Coleman, M., & Cable, S. (2003). *Military families under stress: Implications for family life education*. Missouri: University of Missouri.
- Eby, L. T., DeMatteo, J.S., Russell, J. E. A. (1997). Employment assistance needs of accompanying spouses following relocation. *Journal of Vocational Behavior* 50, 291–307.
- Hackman, J.R., Morris, C.G. (1975). *Group tasks, group interaction process, and group performance effectiveness: A review and proposed integration*. New York: Academic Press.
- Hackman, J. R., Wageman, R., Ruddy, T. M., & Ray, C. L. (2000). *Team effectiveness in theory and in practice*. Oxford, UK: Blackwell.
- Hendershott, A.B. (1989). Residential mobility, social support, and adolescent self-concept. *Adolescence* 24, 217–232.
- Henderson, S., & Walkinshaw, O. (2002). *Command team assessment: Principles, guidance, and observation*. Fort Halstead, UK: QinetiQ.
- Hilton, R. W. (2011). *Managerial accounting. Creating value in a dynamic business environment* (9th ed). New York: McGraw-Hill Irwin.
- Jackson, C. L., Colquitt, J. A., Weson, M. J., Zapata-Phelan, C. P. (2006). Psychological collectivism: A measurement validation on linkage to group member performance. *Journal of Applied Psychology* 91, 884–899.

- Keller, G. (2009). *Statistics for management and economics* (8th ed.). Ohio: South-Western Cengage Learning.
- Lamothe, D. (2011, January). *Reports say Pentagon will ax EFV program*. Retrieved October 19, 2011 from Marine Corps Times:
<http://marinecorpstimes.com/news/2011/01>.
- Larson, C.E., & LaFasto, F.M.J., (1989). *Teamwork: What must go right, what can go wrong*. Sage Publications, Inc.
- Manpower & Reserve Affairs (2011, July). *Manpower management division*. Retrieved October 25, 2011 from usmc.mil:
https://www.manpower.usmc.mil/portal/page/portal/M_RA_HOME/MM
- Mulloy, J. P (RADM) (2011, February). *FY2012 President's Budget*. Retrieved October 18, 2011, from Department of the Navy:
http://www.defense.gov/pdf/Navy_PB12_Brief
- Munoz, C. (2011, September). *Chairman of Joint Chiefs says doomsday cut would 'break' military*. Retrieved October 19, 2011, from AoL Defense:
www.defense.aol.com/2011/09/22.
- Office of Management and Budget (2011, October). *The President's Budget FY2012*. Retrieved October 17, 2011, from whitehouse.gov:
www.whitehouse.gov/omb/budget.
- Orthner, D. K. (2002). *Deployment and separation adjustment among Army civilian spouses*. Retrieved October 19, 2011, from ArmyMWR.com:
<http://armymwr.com/corporate/operations/planningsurveys.asp>.
- Pittman, J. F., & Bowen, G. L. (1994). *Adolescents on the move: Adjustment to family relocation*. Youth and Society, 26, 69–91.
- Pollari, J., & Bullock, J. R. (1988). When children move: Some stresses and coping strategies. *Early Child Development and Care* 41, 113–121.
- Schwartz, J. B., Wood, L. L., & Griffith, J. D. (1991). *The impact of military life on spouse labor force outcomes*. Research Triangle Park: Sage.
- Stoppler, M.C. (2011, July). *Stress symptoms, causes, signs, types, management and treatment*. Retrieved October 25, 2011, from medicinenet.com:
<http://www.medicinenet.com/stress/article.htm>.

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