

Does Computer Based Training Impact
Maintenance Costs and Actions?
An Empirical Analysis of the US Navy's
AN/SQQ-89(v) Sonar System

Robert M. McNab

Diana Angelis

Naval Postgraduate School

Navy Training

- The majority of specialized skills training in the United States Navy has traditionally been provided in a classroom setting by instructors in Navy schoolhouses.
- Executive Review of Navy Training (ERNT) in 2000 recommended using new training technologies to meet future demands while reducing training costs and time.
- The US Navy implemented Computer Based Training (CBT) in 2003, expecting that CBT would increase training capacity and reduce the time and cost of training, while maintaining training quality.

Problems with CBT?

- In 2009, the Naval Inspector General found that although CBT did reduce training time relative to the A and C schools, it may not have adequately prepared sailors for their initial duty assignments.
- Anecdotal evidence suggested that sailors trained with CBT did not possess the required Knowledge, Skills, Abilities, and Tools (KSATs) to perform their duties effectively.
- In 2010 GAO noted that the fleet had concerns over the level of knowledge that sailors and officers have received through CBT.

AN/SQQ-89(v) sonar system

- The AN/SQQ-89(v) surface ship Anti-Submarine (ASW) Warfare combat system is an integrated network of sonar systems designed to search, detect, classify, and engage ASW threats
- Fielded throughout the operational fleet before and after the implementation of CBT with relatively consistent manning.
- The system is currently installed on CG-47 class cruisers, DDG-51 class destroyers, and FFG-7 class frigates.

Hypothesis

Did the introduction of CBT significantly influence maintenance and operation of the AN/SQQ-89(v) sonar system?

Dependent Variables

- Organization Parts Costs (*OrgParts*)
- Corrective Organizational and Intermediate Maintenance Actions (*OrgActions*)
- Organization Labor Man-Hours (*Orghours*)

CBT and Control Variables

- Computer Based Training (CBT) is a dummy variable that is 0 before 2004 and 1 afterwards
- Control variables:
 - Billets authorized for enlisted grades E-1 to E-6 (*BAE*)
 - Navy Manning Plan for enlisted personnel in grades E-1 to E-6 (*NMPE*)
 - Number of enlisted in grades E-1 to E-6 currently on board (*COBE*)
 - Number of days underway in a given fiscal year (*UW*).

Estimation Model

A matrix \mathbf{Z} includes the radar variant, radar's installation year, type of ship, and homeport location. We employ panel data and specify the general estimation form as:

$$y_{it} = \alpha + \beta_1 CBT_{it} + \beta_2 BAE_{it} + \beta_3 NMPE_{it} + \beta_4 COBE_{it} + \beta_5 UW_{it} \\ + \varphi Z_{it} + \mu_i + \lambda_t + \mu_{it}$$

where μ_i and λ_t denote the unobservable individual ship and time effects, respectively. The term u_{it} is a random walk. The subscripts i and t denote ship and time period, respectively.

Data

- Selected the five variants that were on board both prior to and following CBT's introduction into Navy schools.
- Final data set contains 526 observations on 68 ships from FY 1999 to FY 2010.

Findings

- Using CBT increases Organizational Parts Costs by approximately \$4,971 per year at the 1% level of significance. For a given system on a ship, this suggests a 20 to 50% increase in maintenance costs over time.
- CBT increases Corrective Maintenance Actions by approximately 32 per year at the 1% level of significance. For a given system on a ship, this suggests a significant percentage increase in maintenance actions.
- Introducing CBT inflates the number of Organization Labor Hours by 730 hours at the 1% level of significance.

Conclusions

- CBT's use has adversely influenced the parts costs, actions, and labor hours associated with operating and maintaining the AN/SQQ-89(v).
- Supports the anecdotal arguments that CBT negatively impacts sailor performance on ships.
- Suggest that the navy has traded an explicit training cost for an obscured cost in terms of parts, maintenance actions, labor hours, and readiness.

Future Research

- Explore whether CBT has a similar impact on other systems.
- Examine the effect of CBT based on system complexity.