Agent Based Approach to Modeling Technical Skill Acquisition

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Abstract: US Army Training and Doctrine Command (TRADOC) typically lags behind industry and the Army in their pace of providing relevant training to warfighters. This can lead to technologies becoming outdated before the Army implements a standard for training. The issues compound when dealing with the complex software packages prevalent in most Army acquisition programs. This leads to underutilization of technology based tools that are potentially of great benefit to warfighters and resistance to further investment in software based solutions to complex problems. Using the SAGE toolset as a case study, this work developed an Agent-based model to determine how rapidly technical skills diffuse through a user base. Ultimately, this model shows that with a dedicated budget for training, software based tools such as SAGE can be fully taught to a user base to an acceptable level of competency before a standardized training package is approved through the TRADOC pipeline.

Keywords: Agent-Based Modeling, Technical Skill Acquisition, Situational Awareness Geospatially Enabled, Distance-Based Networks

1. Introduction

The military’s ability to take advantage of geographical terrain analysis technology has stalled. Findings, show that most problems with the development and adoption of geographic information systems are embedded in organizational rather than technological issues. These organizational issues result from factors such as complex networking issues, time required for dissemination and training, and the amount of time and resources needed for technological transitions. (Peuquet and Bacastow, 2007).

This is the same problem the Army currently has with the Defense Common Ground System-Army (DCGS-A) program, in particular the Situational Awareness Geospatially Enabled (SAGE) toolset. There is a dramatic underutilization of these tools largely due to the lack of personnel possessing the requisite skills to implement them in mission planning. Likewise, outside of the development team, there are very few personnel in the Army with the ability to facilitate the widespread diffusion of SAGE throughout its intended user base. Using the SAGE tools as a case study, this work will attempt to model the diffusion of the software specific technical skills to the point where there is an educated and capable user base. This model includes relevant factors such as levels of expertise, changes and transfer of unit population, the number of trainers available, and their impacts on promoting and impeding technical skill diffusion throughout an organization. Ultimately, this model provides key decision makers with a timeline from which we can determine when an intended user base will be able to fully implement a new software based technology into their operations. Additionally, the model can provide system acquisition professionals with improved fielding strategies to better synchronize a phased implementation of software tools to better align with the skill development of its users.

2. Background

The U.S. Army Training and Doctrine Command (TRADOC), utilizes an Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model to create training for the Army. The ADDIE Model for course design is useful for training such as Basic Combat Training, Air Assault School, Airborne School or courses that validate a particular skill in a soldier that does not quickly change. For example, the fundamentals of shooting a weapon have not changed since the inception of firearms. The issue with applying the ADDIE model with software and technology skill acquisition is how quickly they change and evolve. Implementation of the ADDIE model is too slow to keep pace with the increasingly dynamic technological advances, particularly with software based tools. Currently, TRADOC estimates that the total time it takes after the development of a program of instruction until the first class of new Soldiers report to their organizations is just under 2 years. (Department of the Army, 2014) This gap in capability provides the reasoning to develop a model to illustrate how to