Using Social Media with GIFT to Crowd-source and Enhance Learning Content

Irene T. Boland, PhD[1], Rodney A. Long[2], Ben Farmer, PhD[3], Doug Raum[1], Dan Silverglate[1], Ed Sims, PhD[1]

[1]Vcom3D, Inc., 12124 High Tech Ave., Suite 150, Orlando, FL, USA 32817
[2]Army Research Laboratory (ARL), Human Research and Engineering Directorate (HRED), Simulation and Training Technology Center (STTC), 12423 Research Parkway, Orlando, FL 32826
[3]Defense Equal Opportunity Management Institute (DEOMI). Patrick AFB, Florida
{ireneb, dougr, dans, eds}@vcom3d.com
rodney.a.long3.civ@mail.mil
benjamin.farmer.ctr@us.af.mil

Abstract. The US Army recognizes that enterprises that excel at incorporating their latest learning into the mainstream processes of their operations are able to capture and maintain a competitive edge. Among the goals of the Army Learning Concept 2015 is enabling all soldiers to participate in the creation and updating of training without increasing the workload of instructors. In addition to the Generalized Intelligent Framework for Tutoring (GIFT), the Army Research Laboratory (ARL) has funded a Social Media Framework (SMF) that enables an organization to crowd-source and crowd-vet new content and improvements to existing courses. The research questions we seek to answer in our current research include the extent to which the SMF and GIFT can: (a) promote critical thinking, collaboration, adaptability, effective communication, and problem solving; (b) help close the gap between formal training and operational application of the training to missions in the field; (c) reduce the time required to locate and use learning resources; (d) reduce the time required to incorporate feedback from the field into formal instruction; and (e) reduce instructor workload, while maximizing the efficacy of the instructor's time.

Keywords: Social media, GIFT, crowd-sourcing, usability, instructional systems design

1 Introduction

The US Army trains and educates over a half million individuals per year in a course-based, throughput-oriented system. Much of the Army's web-based instruction is in

the form of static PowerPoint presentations, with little tailoring to individual soldier needs. With the ever-changing landscape of full spectrum operations, today's soldiers are facing ill-structured problems and have little time for the ideal levels of reflection and repetition needed to promote critical thinking, adaptability, and mastery of complex skills. Additionally, the current time frame for updating courses (3 to 5 years) is not supporting the modern Army's fast-paced learning needs.

During the Vcom3D demonstration of GIFT at the 17th International Conference on Artificial Intelligence in Education (AIED), attendees will experience how the breadth and depth of knowledge spread throughout an organization can be harnessed and rapidly incorporated into training for the benefit of those who need to know promptly. In the role of a learner, participants will experience and provide granular feedback on an adaptive course in our web-based GIFT environment. Then participants will discuss and vote on the relevance or accuracy of the content to enable refinement before an instructor reviews it for inclusion in training.

2 Background: Social Media Framework

Previously, we investigated a research-based suite of affordances that support the sharing and vetting of information amongst peers. The objectives of the project were to identify lessons learned from: commercial, academic, and US Government applications of social media to knowledge management and learning; and to consider the unique requirements and constraints of the military learning environment and how successful commercial and academic models for learning can be adapted to military applications.

3 Current Research

3.1 Research Objectives

At a high level, our research aims to investigate the extent to which the integrated SMF and GIFT system can:

- Promote critical thinking, collaboration, adaptability, effective communication, and problem solving,
- Help close the gap between formal training and operational application of the training to missions in the field,
- Reduce the time required to locate and use learning resources,
- Reduce the time required to incorporate feedback from the field into formal instruction,
- Reduce instructor workload, while maximizing the efficacy of the instructor's time.

3.2 Experimental Methodology

This research project follows a sequence of overlapping/spiral events, including: Literature Review (ensuring that our proposed research furthers the body of knowledge), Experiential Review (hands-on examination of existing, to ensure that the affordances we test are extending the state of the art), Test Bed Development (creating the suite of affordances to enable testing of our research hypotheses), and Quantitative and Qualitative Research (testing our hypotheses and soliciting feedback from participants).

3.3 Test Bed Architecture

Expanding on the existing SMF, a cloud-based 'headless' instance of the GIFT platform has been created, allowing multiple users to connect to GIFT across the internet.

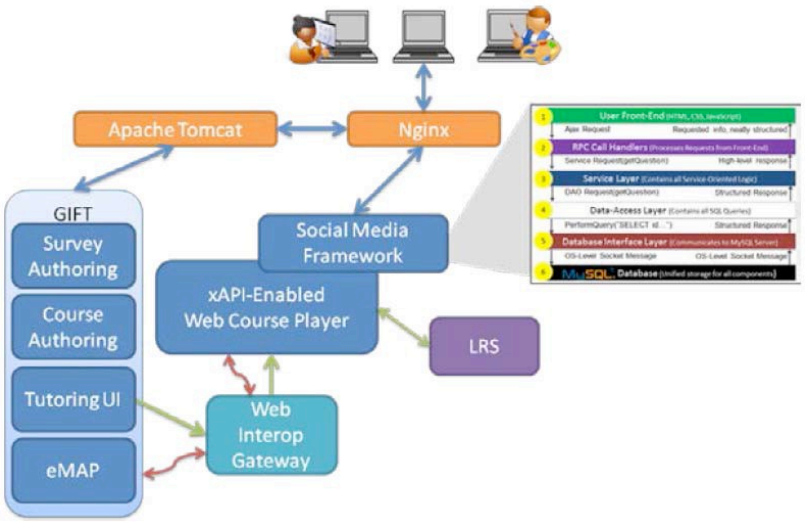

Fig. 1. SMF/GIFT Integrated Architecture

The GIFT platform has been extended to include a gateway interoperability module allowing for connection to a web-based course player. The course player, built on a PHP/MySQL platform and using a responsive front-end (suitable for expansion to mobile devices), will play (experience API) xAPI-wrapped course content. Through the gateway interoperability module, the course player will also communicate to the GIFT engine for Management of Adaptive Pedagogy (eMAP), allowing adaptivity within the course driven by GIFT's advanced adaptive capabilities. The course player also generates xAPI statements which are stored in a Learning Record Store (LRS) and usable for learning analytics.

The web-based course player includes the ability for courses to collect social media feedback on granular aspects of the course: paragraphs of text, images, videos, etc.

Using annotation-style commenting, the social feedback is collected and stored within the SMF for crowd-comment and review after the course is completed. In addition, the GIFT tutoring user interface (UI) has been modified to allow other GIFT transitions (surveys, learning materials, after action reviews) to collect social feedback in a similar manner. This feedback, too, will be available within the SMF for crowd-comment and interaction.

3.4 Experimental Research

Vcom3D research for the ARL in Social Media-enabled Learning and Knowledge Management has three major phases in 2014-2015, each with a data collection. The recently completed (February 2015) data collection 1 focused on having an Instructional Systems Designer (ISD) and SMEs use a Learning Content Management System (LCMS) to enter content and build a course. The research test bed is a combination of three government-sponsored systems: SMF, GIFT, and an LCMS.

The second data collection (Summer 2015) will involve learners taking the course and providing granular feedback about how they think the course can be improved as well as using social media tools to discuss the feedback of others. Then, in data collection three (Fall 2015), the ISD and SMEs who built the course will review the feedback from learners and decide what improvements they will make to the course. This three-part research demonstrates the speed with which experts in the field and fleet can provide real-world feedback that is then promptly incorporated into the official doctrine course by the schoolhouse. This addresses key goals of the Army Learning Model (ALM) which seeks, among many other goals, to include the ever-evolving knowledge of the field and fleet into the official training as quickly as possible.

Data Collection 1 Procedure. Expanding on the existing SMF, a 'headless' instance of ARL's GIFT platform was created, allowing it to run independently of a specific workstation. Utilizing this, we deployed the GIFT Survey Authoring System (SAS) and GIFT (CAT) Course Authoring Tools through our existing Apache Tomcat web application server. Using nginx to serve the existing SMF and act as a proxy to the GIFT instance on the same server gave the participants the experience of a seamless, consolidated system with Single Sign On (SSO) for each subsystem. The experimental test bed was hosted on a dedicated server off site from the research location. Each participant received login credentials and used a separate work station in their lab to access the test bed though the internet from a standard browser.

The researchers guided participants through standard tasks involved in creating learning content. The session was videotaped to allow for detailed analysis afterward. We described the system to our participants as an experimental learning content authoring system the Army has asked us to build and test. We explained that our long-term goal is to grow the system into a powerful tool that is useful to them (and other users) in creating adaptive learning experiences that are easy to update. Having their formative feedback at this early stage will enable us to develop it in the direction that's most useful to users.

We designed their data collection experience to simulate a collaboration to create the course. So, each participant was asked to create a different scenario and then we had them work together to tie it all into a complete course.

Data Collection 1 Results. Each of our recommendations has its basis in the time-tested and research-proven principles of UI and User Experience (UX) professions. Our recommendations are meant to help move GIFT closer to its goal of being useful to SMEs who want to author effective courses on their own. The Nielsen/Norman Group of UI/UX professionals defines useful as the result of usability and utility. Utility speaks to the extent that the system has the features the user wants and needs. Usability can be described as having 5 criteria: (1) easy to learn to use, (2) user can complete tasks quickly, (3) user can remember how to use it after being away from it for a while, (4) errors the user makes are few and easily rectified, and (5) the system is enjoyable to use.

Recommendation 1: Sell the utility, immediately. Users found that the system contained a large number of steps compared to other systems they had used to build adaptive training or surveys. Some of those steps were unclear in meaning or purpose. The naming conventions used are not consistent with what SMEs would name the features, buttons, and other controls. As a result, they expended a great deal of mental effort (cognitive tolls) to work in the system. Although the researchers explained the long term purpose of the system (to creative adaptive training suited to each individual), the perceived benefits of the system were not sufficient to motivate the users to want to continue using the system in its current state. For all of these reasons, we recommend an early intervention of Selling the utility – making the benefits of the system so clear that new users will be motivated to expend the needed effort to understand and master the system.

We recommend the system provide a short but impactful explainer video that helps users understand the system and what's in it for them. Specific questions that should be answered include: (a) What is Adaptive Learning? (b) Why should I use Adaptive Learning with my learners? (c) What is GIFT? And, why is it better than my other options? (d) How have others similar to me used it (compelling real success stories/visuals)? and (e) How do I use GIFT to create Adaptive Learning?

The military has a long-standing tradition of rigorous ISD which follows a standard ADDIE model (analysis, design, development, implementation, evaluation) of activities. We can reasonably expect a SME to have extensive knowledge of the content being taught. Based on their experience, they may also bring knowledge of the audience (having been a trainer) and the related organizational goals that lead to the SME being asked to share their knowledge. However, there are significant knowledge gaps in ISD for most SMEs. To achieve the long term goal of an independent SME creating effective training, the system must provide the education and support needed by the SME.

Recommendation 2: Use the process and vocabulary native to the SME. The current process flow and vocabulary used in the system is not reflective of how most SMEs

think or work. As a result, they are burning significant brain power simply trying to understand the system rather than feeling the reinforcement of accomplishing their goals. To illustrate both of these concepts, we examined a short process – Adding a question to an assessment – as SMEs are accustomed to doing it compared to how SMEs attempt to do it in GIFT.

For this very short sub-process of the larger course creation process, we can compare the expected versus experienced using the scorecard shown in Table 1.

Table 1. Cognitive Load Comparison

Measure	***GIFT Experience***	***Usual SME Experience***
Steps	20 (steps 7-9 repeat 3X)	9 or less*
Cognitive Load	High	Low
Time	Slow	Medium
Other	Process incomplete. Feedback to be added using additional steps, time and cognitive load in another part of GIFT.	* Ability to upload can make process even shorter.

Recommendation 3: Incorporate extensive, yet lean, on-demand contextual support for SME. We recommend two approaches to providing support to SMEs. First, provide them some fast and simple support when they first arrive. This help should display automatically the first time the user experiences a screen. Afterward, it should be available for the user to display on demand).

Second, offer mouseover-based help for each control, vocabulary term or other element that the SME might not be familiar with. The example in Figure 2 shows that a vocabulary improvement has been made – changing the word Transition to Content, and then providing a mouseover that explains what particular types of content are and alerting the user if they will need to use another part of the system to create that content before trying to use it here.

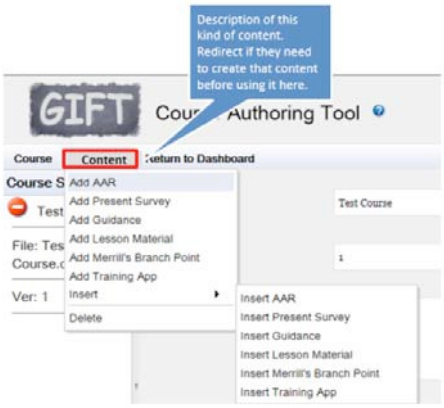

Fig. 2. Mouseover Help Example

Data Collection 2 Procedure. The SMF will be expanded to include course topics and the actual courses in the training tab. Once launched, courses will be played through the GIFT framework. In GIFT, a course is a series of transitions which might include Surveys, Learning Materials, and Training Applications. To enable a Training Application to play lessons comprised of web-based content, we will implement a new gateway interoperability module. Unlike standard web-based lessons, however, any element of the content can be selected and commented upon. Showing those comments in close proximity to the lesson content could negatively impact the flow of the course for future learners; so instead, the comments will automatically appear as a new conversation thread under the feedback tab of the containing topic page for this course. We will add similar social media commenting capability to other GIFT transitions such as Surveys and Learning Materials. The course material will be furnished by DEOMI ISDs and will be selected for its relevance to the target student participants for specific use in the experimental research. The content will then be prepared for playback by the web-based lesson Training Application and other GIFT transitions.

During the data collection event, multiple sessions of approximately 20 student participants each will access the experimental test bed from work stations in their lab through the internet from a standard browser and using credentials provided by the researchers. Participants will be asked to navigate to a particular topic and take the course associated with that topic. Participants will be encouraged to generate questions or feedback on any content they encounter. After completion of the course, participants can review their comments on the topic page and also see the comments of other participants. They will be able to up vote and down vote the questions, answers, and feedback generated by others as well as contribute to the discussions. Participants in subsequent sessions will the accumulated contributions of all preceding participants. At the end of each session, the participants will complete a survey to provide feedback of their experience.

Data Collection 3 Procedure. The third phase of research will explore techniques and algorithms for analyzing the user-created content, surfacing the most relevant comments and activity and connecting them to the most relevant stakeholder. For this data collection with content authors and content owners, the user management section of the SMF will evolve to display a user digest specific to each user and their role in the system. An activity section will highlight the latest contributions by the user. Back-end data analytics will look at factors such as up votes, down votes, and general activity to prioritize the contributions of others relevant to this user. The goal is to highlight trending and actionable issues pertaining to course content owned by this user. Participants will then evaluate the efficacy of the system in surfacing errors, identifying gaps, suggesting content, and reducing ISD work-load.

4 Implications for Future Research

At the end of the third phase of the current research, we will have investigated the efficacy of crowd-sourced and crowd-vetted content for applying field knowledge to improve learning content, while reducing instructor workload and turn-around time. However, we believe that social media can provide additional benefits to the learning environment, and to GIFT in particular, by (1) harnessing crowd inputs for the creation and refinement of a Domain Model, or the body of knowledge for a topic and (2) mining social media data to enhance an individual's Learner Profile (or personal history of learning, demographics, and achievements). We have also identified the need to make the user experience more intuitive to its intended end-users (SMEs). At the end of the current research, we will make recommendations for these additional means for applying social media to the integrated learning environment.

Additional areas of research we intend to explore include: (1) harnessing crowd inputs into the creation and refinement of a domain model, or the body of knowledge for a topic, (2) mining social media data to enhance an individual's Learner Profile (or personal history of learning, demographics, and achievements), and (3) developing the user experience to be immediately intuitive to its intended end-users (fielded sub- ject matter experts).

References

1. Advanced Distributed Learning (ADL). Experience API: Research Summary. Retrieved May 13, 2013 from http://www.adlnet.gov/tla/experience-api
2. Nielsen, J. Usability 101: Introduction to Usability Available. 2012: http://www.nngroup.com/articles/usability-101-introduction-to-usability/
3. US Army TRADOC (2011). The US Army Learning Concept for 2015. Retrieved November 15, 2012 from http://www.tradoc.army.mil/tpubs/pams/tp525-8-2.pdf