Creating a Learning Infrastructure
Where Every Soldier Can Be an Instructor

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ABSTRACT

In recent years, web sites featuring user-created content have become some of the most popular sources of information for the general population. Users consult *Angie's List* and *Yelp!* to locate vendors and services, *DIY Network* to learn how to fix or create something, Wikipedia for information on more than four million topics and numerous LinkedIn communities of practice to enhance their professional skills and networks. Fourteen of the twenty top web sites are populated in part or entirely by content created by users. By contrast, the collaborative support networks for warfighters are often fragmented, difficult to access and navigate and limited in useful content. And when experienced warfighters report lessons learned in the field, it can take two years or more for these lessons to be reflected in formal training. This often results in gaps between official training and best practice.

Under the Army Research Laboratory's *Soldier-Centered Army Learning Environment* (SCALE) program, a social media test bed was developed to identify crowd-sourcing strategies that can be adopted to ignite a similar revolution in military knowledge management. Our research has identified technologies, affordances, incentives and user attitudes that have helped to create the wealth of accessible user-generated knowledge available on the World Wide Web. In this paper, we will discuss our research and propose changes to Army technology and organizational culture that could improve the speed and effectiveness of managing and disseminating crowd-vetted knowledge for performance support.

ABOUT THE AUTHORS

Ed Sims is Chief Technology Officer of Vcom3D, an Orlando-based company that develops innovative mobile, Web, and game-based learning. Since 1997, his work has focused on the innovative application of Web and game-based technology for simulation, training and education. Prior to co-founding Vcom3D, Dr. Sims held the positions of Chief Scientist and Technical Director for Lockheed Martin Information Systems Company. Dr. Sims holds a Bachelor's Degree in Mathematics from the College of William and Mary and Master of Science and Doctorate of Philosophy degrees in Systems Engineering from Rensselaer Polytechnic Institute. He has been awarded five patents in the areas of real-time visual simulation and human behavior modeling.

Rodney Long is a Science and Technology Manager at the United States Army Research Laboratory, Human Research and Engineering Directorate, Simulation and Training Technology Center (STTC) in Orlando, Florida. He is currently the STTC project lead for the Soldier-Centered Army Learning Environment (SCALE), investigating technologies to support the Army Learning Concept for 2015. Mr. Long has a wide range of simulation and training experience that spans 25 years in the Department of Defense (DoD) and has a Bachelor's Degree in Computer Engineering from the University of South Carolina and Master's degree in Industrial Engineering from the University of Central Florida.

Charles Amburn is a Senior Instructional Systems Specialist for the United States Army Research Laboratory, Human Research and Engineering Directorate, Simulation and Training Technology Center in Orlando, FL. After obtaining both a Film degree and a Master's degree in Instructional Systems Design from the University of Central Florida, he began his Department of Defense (DoD) civilian career in the Advanced Instructional Systems Branch at the Naval Air Warfare Center Training Systems Division (NAWCTSD). There he worked on special projects for the Navy and Marine Corps for 10 years and then became the Lead Instructional Designer for the Army's Engagement Skills Trainer (EST) program at the Program Executive Office for Simulation, Training and Instrumentation (PEO STRI), in Orlando, Florida. Since 2011, Mr. Amburn has also been the Senior Instructional Systems Specialist for the Soldier-Centered Army Learning Environment (SCALE) research program.

Irene T. Boland is the Learning Development Director at Vcom3D. She has over 10 years of hands-on experience in applying emerging education science to real-world issues faced by enterprise organizations. Dr. Boland leverages her Doctorate of Philosophy in Education in combination with proven social media technology to create innovative methods for accelerated learning and knowledge transfer. Her expertise enables Vcom3D clients to solve performance issues, maximize use of resources, and improve profitability.

Dan Silverglate is Director of Software and Graphics at Vcom3D. He has over 15 years of experience in digital media production and software development. As Director of Software and Graphics at Vcom3D, he leads the development of serious games for education and training featuring lifelike virtual humans. Mr. Silverglate holds a Bachelor of Art in Film Studies from the University of Florida, where he graduated with High Honors and was inducted in the Phi Beta Kappa Honorary Scholastic Society, and a Bachelor of Science in Computer Science from the University of Central Florida, where he graduated Magna cum Laude.

Jeff Cashion is the Lead Web Developer at Vcom3D. His work focuses on the research, design, and development of all web-based projects. In prior years, Jeff has worked as an Embedded Software Engineer at Northrop Grumman, where he contributed to many large-scale projects. He also served six years in the United States Navy as an Electronics Technician aboard the USS John F. Kennedy. He received a Master's Degree in Computer Science from the University of Florida and is currently a Doctorate of Philosophy Candidate at the University of Central Florida.

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INTRODUCTION

The United States (U.S.) Army trains and educates over a half million individuals per year in a course-based, throughput-oriented system. Despite becoming an early adopter of distributed learning (20 years ago), much of the Army's web-based instruction is in the form of PowerPoint presentations, with little tailoring to individual soldier needs. Current instruction is based on individual tasks, conditions, and standards, which worked well when the Army had a well-defined mission with a well-defined enemy. 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. Furthermore, "significant changes to learning programs require planning cycles of three to five years, a timeframe that is not rapid enough to adapt to evolving operational demands" (TRADOC, 2011).

To meet the needs of the evolving Army, the U.S. Army Training and Doctrine Command (TRADOC) has developed the Army Learning Model (ALM), described in Army Learning Concept 2015 (ALC 2015; TRADOC, 2011). ALC 2015 introduces a learner-centric, experiential learning environment designed to promote initiative, critical thinking, teamwork, and accountability along with mastery of learning content. In addition, ALC 2015 requires "the capability to encourage peer-to-peer learning through use of online social media to facilitate problem solving, collaboration, information needs, and provide virtual learning opportunities." To support ALM implementation, the Army Research Laboratory, Human Research and Engineering Directorate's Simulation and Training Technology Center (ARL HRED STTC) established the Soldier-Centered Army Learning Environment (SCALE) research program. The SCALE program is exploring advanced training technologies and methodologies that transform the soldier training process. Instead of traditional lecture-based training, soldiers will be engaged in collaborative learning exercises, receive tailored, blended training, and have anytime, anywhere access to instructional material. In addition to formal learning, this environment uses emerging web-based social media technologies to support peer-based learning. This paper presents research results from experiments conducted within the SCALE Social Media Framework (SMF) which have surfaced and illustrated best practices in peer-based learning that can be leveraged throughout the Department of Defense (DoD). It also examines the unique requirements and constraints of the military learning environment and how successful commercial models for social learning can be adapted for military applications, creating an environment where every soldier is an instructor.

OVERVIEW

The objectives for this project were to: identify lessons learned from commercial, academic, and government applications of social media to knowledge management and learning; and develop a SMF Test Bed to demonstrate technical feasibility of a proof-of-concept learning environment. Specific goals of the project included:

- Examining and describing soldiers' current social media knowledge, skills, attitudes, and use.
- Investigating social media state-of-the-art and its potential for improving the development, update and dissemination of knowledge and instruction.
- Demonstrating the use of social media to elicit feedback on existing learning content to support timely updates that reflect current field operations and conditions.

- Identifying best methods to engage soldiers in the process of improving and disseminating effective learning content through the use of social media tools.
- Identifying and designing learning architectures that facilitate the integration of social media-based learning with other forms of learning (such as lecture-based courses, hands-on simulation task practice, etc.) to enable a rich learning experience that incorporates real world experiences.
- Identifying system architectures and concepts of operation that enable soldiers to continuously improve the accuracy, topicality, and usefulness of learning content.

This research project followed a sequence of overlapping/spiral events including literature review of current research into social media for learning, experiential (hands on) review of existing tools inside and outside the Army, creating a test bed to enable original research into social media for learning within the Army, and original research into both soft and hard skills content for different Army audiences. Activities within the project included:

- **Literature Review:** To understand the existing body of knowledge and ensure that our proposed research furthers the research for learning and knowledge sharing.
- **Experiential Review:** Hands on examination of tools available (inside and outside the military), to understand the current state of the art, the strengths and weaknesses of each technology under consideration, and to ensure that the affordances we test are extending the state of the art.
- **SMF Test Bed Development:** Efficiently pulling together the suite of affordances that the research suggests will best support soldiers in sharing their knowledge and learning on demand.
- **Data Collection:** Participants throughout all branches of military used the affordances and provided feedback on their experience, their preferences, and what cultural supports need to be in place to support rapid and validated knowledge sharing.
- **Findings:** Sharing the results of the research in formats intended to support the rapid sharing of the insights.

LITERATURE REVIEW

The first step in this project was to conduct an extensive review of published research related to using social media for instruction, learning and knowledge sharing. Great learning starts with great content that addresses users' needs. Therefore, our first exploration of how to support soldier-centric learning addresses the problem of eliciting information that others will use. Results of this review are summarized below.

Top Websites with User-created Content

In recent years, web sites featuring user-created content have become some of the most popular sources of information for the general population. Users consult *Angie's List* and *Yelp!* to locate reliable vendors and high quality services, *DIY Network* to learn how to fix or create something, *Wikipedia* for information on more than four million topics, and numerous *LinkedIn* communities of practice to enhance their professional skills and networks. Nine of the fifteen top web sites worldwide (Alexa) are partially or entirely populated by content created by users. User-created content can be substantial (such as an original video, blog post or photo) or incidental (such as a *like* or up-vote). Eighteen of the top thirty sites offer built-in affordances (such as *share* or *like* buttons) for sharing their content with social networks (Alexa). The collection and display of user-generated content (such as is done by search engines) is not in itself user-created content for the purposes of our research.

Motivation to Share

The *quality* and *quantity* of user-created content on these web sites are key success factors for the popularity and usefulness of the sites. Understanding what has motivated these contributions is essential for architecting an effective SCALE Social Media Framework. A study of 2,500 content sharers, conducted by the New York Times, investigated the motivations for medium to high levels of content sharing. The study likened the sharing of content to sharing and community-building activities we have always done – for self-actualization, at the top of Maslow's (1943) Hierarchy of Needs. Ninety-four percent of the study participants indicated that they give significant thought to how useful the information will be to recipients before deciding whether to send it. Sixty-eight percent said that what they choose to share helps shape how others perceive them (self-presentation). Seventy-eight percent said sharing content enables them to have a reason to stay in touch with people to whom they wouldn't otherwise stay connected. Comments from

participants also indicated that they enjoy the feeling that they have helped others with whom they shared content. To have a robust community of peer-to-peer education, the Army will need to use a regular *drumbeat* of publicity to ensure that positive contributions to the learning and knowledge sharing network are recognized in *meaningful* ways.

Game play and Learning Engagement

In 2012, Pareto et al., confirmed that students engaged in game-play that involved the students teaching a math concept to a digital agent significantly increased the students' comprehension of math concepts and their confidence in their ability to explain those concepts to a peer, but did not seem to change their attitude toward math. The researchers found that game play itself was motivating (students wanted to play more games), but the motivation did not transfer to the subject of the game (students were not more interested in math). Those findings echo a similar result from a study done by Huizenga et al., in 2009. In the Huizenga study, secondary students were taught about medieval Amsterdam using a mobile app-based game. The student achievement and confidence grew along with their interest in playing games – but not their interest in history. The lines from motivation to play games to motivation to learn are not yet clear.

Micro-credentials as Proof of Expertise and Motivators

Micro-credentials are small forms of recognition for specific, narrowly focused accomplishments. In the world of learning and knowledge management, micro-credentials appear as points, levels and badges. They are earned for learning, sharing knowledge, and being recognized by peers as a contributor of useful information. We have not yet found a research-based support for the idea that micro-credentials motivate people to make better and more frequent contributions to learning and knowledge sharing sites. To determine if micro-credentials can motivate contributions and help establish the credibility of contributors, we have begun to test the use of badges based on a point system. Participant responses to the experience of earning badges were mixed. Most reported liking to earn a badge while also responding that a person having earned a badge is not necessarily a sign that they know what they are talking about. This research lays the foundation for future inquiries comparing the perceived value of real world credentials (such as rank or Military Occupational Specialty (MOS)) and in-world credentials, e.g. badges. It enables us to further investigate whether there is a suppressive effect on participation, given the presence of a real-world high ranking person in the social media system. It would be helpful to know if people more knowledgeable but lower ranking would self-censor so as to not offend the higher ranking person.

Using Automated Programs to Maintain and Improve Content

The *Wikipedia* article on *Tank (armored combat vehicle)* has been edited or commented on over 4,000 times through the contributions of hundreds of editors. Interestingly, in recent years, more than half of the contributions to the *Tank* article were not made directly by the human editors, but by *bots*, small, autonomous programs that scan the pages and provide such services as correcting spelling and grammar, flagging improperly attributed information, and providing links to related articles. As reported by Daniel Nassau (2012), "…they delete vandalism and foul language, organize and catalog entries, and handle the reams of behind-the-scenes work that keep the encyclopedia running smoothly and efficiently and keep its appearance neat and uniform in style." Using bots may help the Army automate some of the mundane tasks of content management, but will require careful thought as to their implementation within systems containing sensitive information.

EXPERIENTIAL REVIEW USING MILSUITE

The DoD has been swift to adopt social media as a tool for recruiting and public relations. As of May 2014, the DoD Facebook page had over 387,000 *likes*. However, the military has been much slower to adopt social media as a tool for individual users for collecting, vetting, managing, formalizing and disseminating knowledge within the DoD. At the same time, publicly accessible portals such as military.com, as well as community of practice sites such as corpsman.com, are attracting large numbers of active, reserve, and retired military users, as well as prospective recruits.

In 2009, Program Executive Office for Command, Control, and Communications Tactical (PEO C3T) introduced milSuite, a collection of social media tools for the exclusive use of warfighters and DoD organizations. According to PEO C3T:

This change in culture that is spreading across private industry comes in direct conflict with the Military tradition of sharing [only] with those who have a "need to know."Military information is being shared across the Web in a non-secure setting, and the security ramifications are real. MilSuite offers the same social media applications that are being used in the public domain, but allows users to share through secure CAC [Common Access Card]-authentication-based applications (Miller, 2011).

As of 2013, milSuite has about 400,000 users among the approximately 3.5 million holders of Common Access Cards (CACs) that are eligible to access the tools (U.S. Army PEO C3T, 2013). There has been considerable growth of the milSuite community, but the numbers remain quite small when compared to the users of external sites such as military.com, which boasts over 10,000,000 users.

In order to evaluate how social media is currently being used by military personnel to share information, and how it could be leveraged to enhance soldier readiness, we selected one hard skill example and one soft skill example and worked closely with the communities of practice that could benefit from knowledge sharing on these topics:

- As an example of a *hard skill*, we selected the operation and maintenance of the AN/PRC-148 JEM (Joint Tactical Radio System [JTRS] Enhanced Multiband Inter/Intra Team Radio [MBITR]). The 235th Signal Company of the 7th Sustainment Battalion, stationed at Fort Eustis, provided access to representative users of the radio.
- As an example of a *soft skill*, we selected Equal Opportunity (EO) content which can support new EO Advisors in the administration of the Defense Equal Opportunity Management Institute (DEOMI) Organizational Climate Survey (DEOCS). The DEOCS measures organizational culture perceptions within a unit including the likelihood that undesirable behavior such as prejudice, sexual harassment, or favoritism may be occurring. For this study DEOMI provided access to their instructors and researchers, and to students of their Equal Opportunity Advisor (EOA) course.

We considered what the user experience would be for our participants if they tried to use milSuite to get information on the JEM/MBITR radio. As a first finding, we discovered that searching for "AN/PRC," for example, does not show the radio in the quick results. Multiple searches were required to find the radio. Naming conventions are inconsistent (for example AN/PRC or AN PRC, or PRC) leading to multiple pages for the same radio. Technical manuals, troubleshooting guides, and similar documents are being stored as attachments, and as a result, are not searchable or indexed, thus reducing the visibility of information. Comments, which are essential to a healthy online discussion, are rarely used. The comment functionality lacks threading, which would make an online discussion easier to follow.

SMF TEST BED DEVELOPMENT

The SMF Test Bed was created to explore the utility and best uses of social media for peer-to-peer learning and knowledge management in the Army. The social media test bed is a major component of a prototype integrated learning environment, shown in Figure 1, being developed under the SCALE research Program. When fully realized
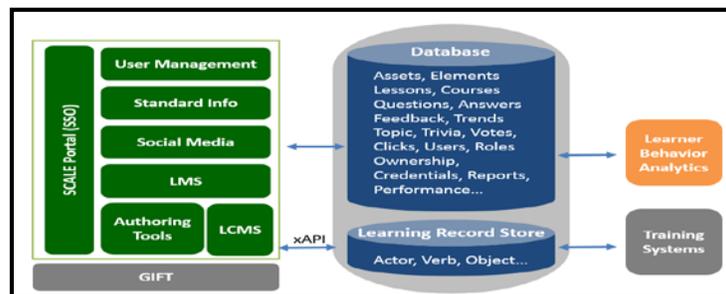

Figure 1. SCALE Architecture

this platform will include an integrated database to store granular learning content, learner performance data, learner inputs in the form of ratings and, feedback and new learning content, as well as an Experience Application Programming Interface (xAPI) Learning Record Store. The platform will also include Learning Management and Learning Content Management Systems (LMS and LCMS), authoring tools, and support for learner behavior analytics. Together these features support sharing and analyzing soldier-generated content and feedback and provide an accelerated pathway for migrating vetted field content into formal training.

In the SMF Test Bed, a search for a topic, such as the JEM radio or EO, takes the user to a Topic Page, as shown in Figure 2. The user is able to quickly view standard information on the topic (such as specifications and manufacturer information), or to access Questions and Answers (Q&A), Reviews, or crowd-sourced Assessments. Reviews function much like product reviews on Amazon.com, allowing soldiers to share information about the equipment that they have learned through experience e.g. defects, procedural issues, etc. This could prove to be a helpful source of information, shaping future training, maintenance procedures, and purchase decisions.

Figure 2. Topic Page for the JEM Radio in SCALE

The Q&A affordance, shown in Figure 3, enables soldiers to ask and answer questions. Additionally, the best questions and best answers can receive up-votes, which help the best content to become more visible to all users. The person who asks the question also has the ability to select one answer as the best answer. Quickly understanding the power of social media, DEOMI users began to use this functionality to explore the reasons behind what they perceived to be weaknesses in their course content.
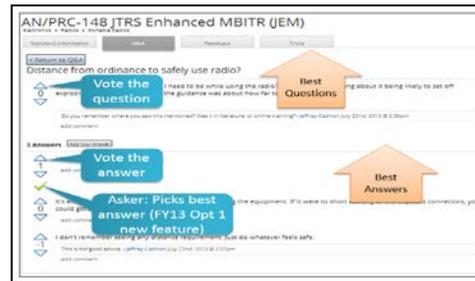

Figure 3. Q&A in SMF Test Bed

A key part of the ALM vision is peer-to-peer learning. Since many soldiers possess knowledge, but don't hold Instructor positions, they get little opportunity to share what they know. By creating multiple choice questions, answers and feedback (as shown in Figure 4), any soldier can share what they know and start a conversation about it.
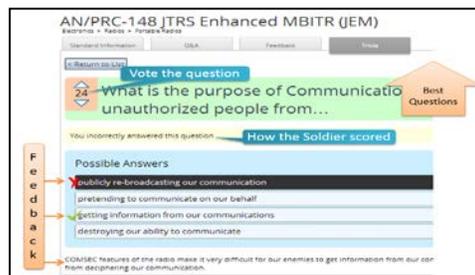

Figure 4. Crowd-sourced assessment

DATA COLLECTION

Our experimental research used a balanced combination of soliciting information, opinions and conducting hands-on testing of the prototype SCALE platform. To prepare for each data collection event, our team created (or enhanced) the Social Media Framework to support the activities and questions participants would be asked. Our first data

collection was done with 20 members of the Army's 235th Signal Company (7th Sustainment Brigade) at Fort Eustis, Virginia. These participants work in a variety of Information Technology (IT) roles for the Army including field communication, cable and satellite installation and maintenance. Because this audience uses the JEM/MBITR radio, the prototype SCALE platform was populated with structured and unstructured educational content about the radio.

Our second and third data collections were done with 57 members of the EO Advisor Course at the DEOMI at Patrick Air Force Base , Florida. About half of these participants were from the Army or Army Reserve. The remaining half was from the Air Force, Navy, Marines, Air National Guard and Coast Guard. They were enrolled in the DEOMI course to prepare them to serve as EOA. The EOA role includes providing guidance and education to a unit to ensure that EO principles are being applied in the leadership and management of that unit. The prototype was populated with unstructured content related to the DEOCS. Each of these participants, once they've completed the EO Advisor course, will take on several EO responsibilities including supporting their commanders in completing and responding to the required DEOCS. EOAs identified a gap in their ability to share information about how they approach the unique and sensitive issues that become evident as a result of the information gathered through the DEOCS process, as well as in their day to day activities. As a result, the SCALE server has remained open for our DEOMI participants and any other EO Advisor who would like to use the system to share questions and insights.

What social media tools and sites are military personnel using today?

Our participants provided information about what social media tools they use, how often, and about what kind of device they use. Those shown in the upper right quadrant of Figure 5 are the ones used most often, by the largest number of people. Notice how the largest usage is clustered at the intersection of mobile device and daily use. To enable frequent use of Army social media tools, a deliberate effort needs to put properly secured mobile devices into soldiers' hands and ensure that essential information is mobile-friendly. Currently, the mobile devices used by our participants are their personally-owned devices. Nearly all participants had never heard of milSuite.
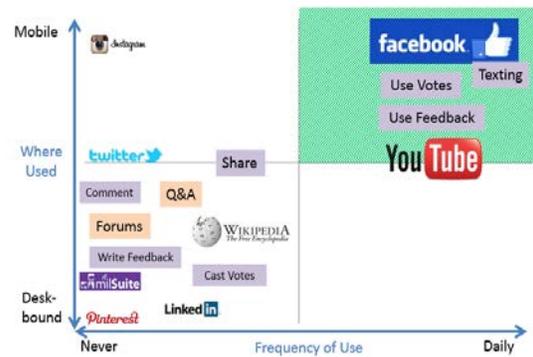

Figure 5. Participants Current Use of Social Media

Can social media sites and tools be useful for learning?

Participants were asked, at the outset and closing of data collection, to provide their opinion on how useful social media tools and sites might be for learning and other related activities. Participants started with attitudes that social media is useful for learning and related activities. By the end of their participation, attitude had improved further on all uses except "getting an answer." The charts in Figure 6 have varying values on the vertical axes, reflective of the data spread. The meaning of line trends in each graph should be viewed in the context of the chart's vertical axis values.
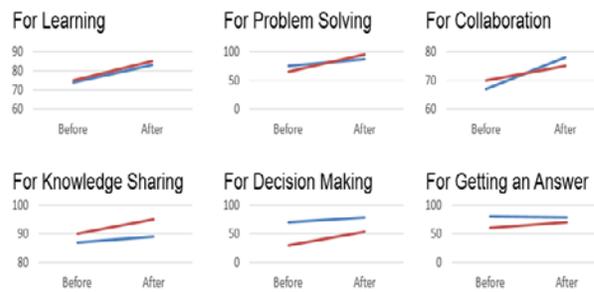

Figure 6. Participants' opinions on specific uses.

What motivates participants to contribute content to a social media site?

To know whether there is cause for optimism that soldiers will use social media for learning, we inquired into motivation levels for sustained contributions of content and feedback. In Figure 7, there is a strong relationship between contributing content voluntarily and being happy to do so regularly. This is consistent with what we found in the literature review – people contribute content because they like to help others. Participants were most likely to be happy and be regular contributors if there was a relationship between contributing content and their performance reviews. While a forcing function of a leader requiring

contribution would result in the highest levels of contribution, it would not likely be sustained because it takes all the joy out of it.
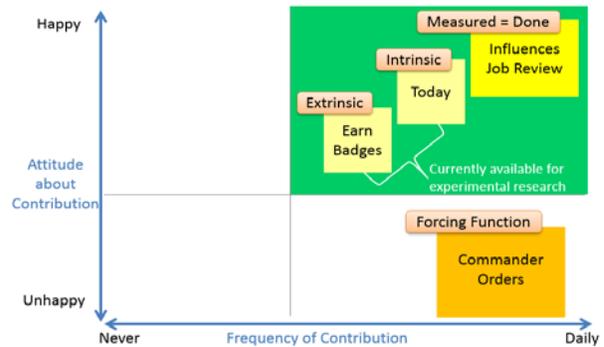
Figure 7. Motivations to contribute content to social media sites

To gauge how effective different motivators might be on participants' likelihood to contribute content (or ratings), we asked them to consider how often they would contribute based on their current workload (no extrinsic incentive). In Figure 8, participants start with a strong desire to help others by contributing content. The possibility of earning a badge contributing content valued by peers had mixed results – with the IT professionals in Fort Eustis indicating they would contribute less if they earned a badge than if they received only the intrinsic satisfaction of helping others. If required by their leaders to contribute content, more people will contribute – but still not 100%. The best option is to tie valuable contributions to the individual's performance review. A truism oft cited in business is that "what gets measured gets done" (Haire, in Peters & Waterman). As an organizational culture, if we want soldiers to believe that we value their contributions in learning with and from each other, we need to demonstrate our appreciation by rewarding constructive behavior in tangible, respected ways.
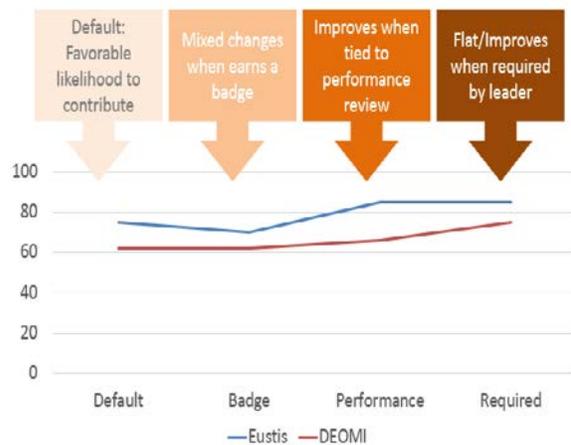
Figure 8. Likelihood of contribution based on motivating factors

FINDINGS

Major findings of this research include:

A. Participants in this study, who span all branches of service, are already *highly social* learners (seeking information from peers, colleagues and friends) and are *frequent* users of the *Internet for research*. If all military personnel are equally pre-disposed to social and technological forms of learning, then use of social media for learning should be well accepted throughout the military.

B. Participants rated themselves as *very comfortable* and *strongly competent* in using the Internet, computers, and smartphones. If all military personnel are equally skilled and confident, then use of these technologies for on demand learning in the field should be well accepted.

C. Participants have a *strong preference* for using Facebook (social connection), texting (immediate information exchange) and YouTube (learning and entertainment). They are less likely to use other social media tools including LinkedIn, Instagram, Twitter, Wikipedia, Pinterest, and Reddit. When using social media, the preferred device is a mobile phone. For the Army to capitalize on these strong preferences, each soldier would need to have a DoD-approved mobile phone that can access DoD sites. For example, the social media tools offered through milSuite require CAC authentication. Given the remote nature of much of the military's

work, the mobile phone would also ideally store offline content for us when the soldier has no connectivity. This may be a challenge in the investment and time needed to roll out the hardware and required security.

D. Affordances that our literature review revealed are *important* to the creation and sharing of knowledge include social media tools such as: forums; Q&A sites; and the ability to write reviews, vote on content, and comment on articles or blog posts. Participants indicated that they are *infrequent* users of these types of tools. Additional research into the reasons for limited use of these tools may help determine what actions the Army can take to encourage use of these tools. It could be as simple as the fact that most forum, Q&A, review and blog sites are not optimized for the participants' preferred device – mobile phones. If so, the Army would need to evaluate the mobile-readiness of key Army sites and upgrade them as needed.

E. To understand participants' view of the efficacy of social media for learning and knowledge sharing, their opinions were solicited both before and after their experience with the Social Media Framework. Participants *started with a mildly favorable* view of social media's usefulness for learning and knowledge sharing. After using the Social Media Framework, participants' attitudes *became strongly favorable*. If this trend persists, then experience with a social media suite similar to the thoughtfully crafted Social Media Framework should create a virtuous cycle of users liking it and using it more.

F. Our literature research *did not* establish a conclusive link between game-like rewards (badges, points, levels) and motivation to contribute to social media-enabled learning and knowledge sharing. Our exploratory work with badges for our participants shows that they have a *mildly favorable* view of how *motivating* those badges could be – but also an *unfavorable* view of whether badges could be a *reliable indicator* that a person possesses an expertise. We did find a positive relationship between video game usage and favorable views of badges.

G. Our first data collection clearly demonstrated that the affordances built into the Social Media Framework were intuitive and easy to use. Participants indicated that use of the affordances was fast, easy, and straightforward. This provided confirmation that our test bed software was supporting the planned research well.

H. Participants from Fort Eustis were enthusiastic about the possibility of being able to use a 3-Dimensional (3D) simulation learning tool (model of the JEM radio) in a social (though asynchronous) way by reading and writing notes that would remain in the model for the benefit of future users. Participants advised that such notes would need to be organized (not all over the place) and only accessed when the user wanted them (not pushed).

I. Participants indicated that they have a *moderately strong intrinsic desire to contribute* to content because it helps others and is a productive part of being a team. They also indicated that they would contribute more often (*but like it less*) if they were required to do so by leadership. While it may be tempting to drive participation by making it required, it may be counter-productive to the users developing a long-term habit of using the tools because it is intrinsically motivating.

J. Some users (especially EOAs) have a need to discuss sensitive topics with peers who may not be available in person. Ordinarily, social media tools mark contributions by a user with a unique identifier (such as a username). We asked the EOAs to test the affordances of anonymous posting and answering and provide us with feedback. They strongly voiced that this feature is needed to enable discussion of sensitive topics without exposing the identity of those involved, and is a feature that must be used responsibly.

K. DEOMI participants spontaneously began to use the test bed to provide feedback on training content. Future research plans will investigate matching granular learner feedback to specific pieces of training content to speed the incorporation of field knowledge into official doctrine.

L. It was possible to implement the SCALE Social Media Framework test bed using open standards for both the front-end Graphical User Interface (GUI) and the back-end database. Beyond the advantage of no licensing fees, the resulting SCALE platform is not tied to any feature set of a proprietary system. The ability to modify and expand the behavior of various features is essential to support experimentation within the test bed.

Furthermore, the use of an open, modular architecture will simplify future integration with SCALE architecture.

CONCLUSIONS

The highly social and technologically savvy participants prefer to use social media tools that are easily accessed via mobile devices. Access to DoD approved mobile devices which can access mobile-ready DoD sites will be a critical part of widespread adoption of social media-based learning and knowledge sharing in the military. Participants described themselves as infrequent users of social media tools that our research had surfaced as the most useful for knowledge sharing and learning. Further exploration into why that is would be helpful to promoting the use of these affordances.

Participants held an initial view that social media tools would be mildly useful for learning and knowledge sharing. That attitude strengthened to viewing these tools as strongly useful immediately after using the test bed in the course of participating in the research. They also rated the test bed as highly usable. The idea of using game-like rewards to motivate content contributions is muddled with mixed views of whether earning those rewards would be motivating and whether they could be trusted as an indicator of a person's knowledge. It may be possible to make independent 3D-based practice into an asynchronous experience through the use of user-generated static notes left within a 3D model. Further exploration of this idea may be useful.

Generally, people (including our participants) contribute content to a social media site or tool because it makes them feel good to do something that helps others. Motivation can be increased by tying good quality contributions to performance reviews. Other attempts at motivation, such as earning badges or being required to contribute, are not as clear motivators as intrinsic and performance-related options. The option to discuss sensitive topics using anonymous posting can enable the widespread and open discussion of issues important to the military while protecting the identities of those involved. Participants whose work regularly deals with sensitive issues found this option essential.

ACKNOWLEDGEMENT

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