Analyzing Community of Practice Metrics to Enhance Organizational Effectiveness

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ABSTRACT

As a result of advances in telecommunication and the rapid tempo of current military operations, the US military has increasingly turned to means of sharing best practices, lessons learned, and experiences that do not require extensive vetting of information. One widely used tool is communities of practice (CoPs). Critical to assessing the impact of a CoP and shaping the effort of community leaders is the collection and analysis of metrics. Conducted over a two year period of time, this research has analyzed the Battle Command Knowledge System's (BCKS) communities of practice, known as professional forums. BCKS hosts over 60 professional forums, with a total membership exceeding 130,000. This paper will describe a systematic approach for analyzing CoP metrics. Armed with an understanding gained through a thorough analysis of metrics, CoP leaders can shape community behavior in a manner that improves human performance and ultimately organizational effectiveness.

There are three principle categories of metrics: System Measures, Output Measures, and Outcome Measures. Each of these provides unique insight into communities of practice. The ideal metrics tool would be able to measure the actual transfer of knowledge from "who knows" to "who needs to know" as well as provide an assessment of performance improvement as a result of the CoP effort. Instead, many of the metrics available are merely indicators pointing in the direction of an intended outcome or objective to be measured. Metrics must often be paired or combined in a manner that removes undue influence of variables or accounts for external factors. Simply studying raw metrics in isolation can lead to some very incorrect conclusions. However, when equipped with the increased understanding gained through a considered approach to metrics analysis, CoP leaders can modify their facilitation efforts in order to shape community behavior and enhance organizational performance.

ABOUT THE AUTHOR

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INTRODUCTION

Since the terrorist attacks of September 11, 2001, the US Army has been engaged in a protracted conflict with an enemy who has continually changed and adapted their methods of operations. However, the traditional doctrinal development process is a deliberate process that takes years to incorporate change. In order to meet the requirements of a dynamic and ever changing battlefield, the Army has turned to a number of different means, such as communities of practice (CoPs), to share best practices, lessons learned, and experiences within the context that they were learned. CoPs provide the advantage of making the observations and insights of the members open and available for comment and dialogue. Furthermore, CoP members can exchange tools and techniques without being slowed by a deliberate vetting process.

The Battle Command Knowledge Systems (BCKS) hosts over 60 communities of practice, known as professional forums, for the Army. With a total membership exceeding 130,000, the BCKS professional forums reach an exceptionally large audience. BCKS professional forums range in size from under 100 members to over 40,000 members. As CoPs represent a substantial investment in resources for organizations supporting them, it is vital to ensure CoPs are closely tied to the organization's objectives. The relationship of the CoP to the organization is best captured within the concept of Practice. At its core, a Community of Practice exists to advance a particular Practice within a given Domain. The Domain of a CoP is simply its topic area where Practice "is the specific knowledge the community acquires, creates, maintains, and shares from a common set of perspectives to respond to a common set of situations and to solve a common set of problems" (Battle Command Knowledge System [BCKS], 2008). Hence, the advancement of the Practice of a community should be tied to organizational goals. Therefore, it is essential to understand both community activity and the relationship of the community to the organization. With a thorough understanding of community activity, community leaders can make informed decisions geared towards shaping community behavior that enhance the impact of the CoP on organizational objectives. An approach to metrics that addresses both activity and impact is vital to a complete understanding and implementation of an effective CoP.

Establishing the Objectives

In order to have a systematic methodology for looking at CoP metrics, the treatment of metrics begins at the very beginning of the CoP's development. Although there are many different models for developing a CoP, they all contain the same basic phases: defining the problem, identifying possible solutions, designing the community, and launching the community. The lifecycle of a community is completed with a period of maintenance and the eventual closing of the community. In the define phase, careful attention must be paid to the development of the forum charter which contains a mission and purpose for the CoP as well as the objectives the effort is intending to achieve. "Communities thrive because they deliver value to the organization, to the teams on which community members serve, and to the community members themselves" (Wenger, McDermott, & Snyder, 2002). Accordingly, the mission and objectives of the community should be expressed in a way that addresses the relationship of the CoP to the organization as well as to the community that it serves. Through the prism of the mission and objectives, community leaders can analyze CoP metrics from the appropriate perspective.

System, Output and Outcome Measures

There are three broad categories of metrics: System Measures, Output Measures and Outcome Measures. System Measures are perhaps the most readily understood as they "relate the performance of the supporting information technologies to the KM [knowledge management] initiative. They give an indirect indication of knowledge sharing and reuse, but can highlight which assets are the most popular" (Department of the Navy Chief Information Officer,

2001). System measures generally are those measures that the supporting information technology can directly report, usually in the form of countable units. Typical examples include: unique visitors, page visits, the number of members, the number of contributions, number of discussions, etc. These measures can be thought of as giving an indication of the potential for knowledge transfer. As a simple example, if membership in a CoP has increased from 1 member to 1000 members, it can be reasonable asserted that the potential for knowledge transfer occurring has increased to some degree.

Output measures "direct process output for users, give a picture of the extent to which personnel are drawn to and actually using the knowledge system" (Department of the Navy Chief Information Officer, 2001). Typical examples are anecdotes detailing time saved. Some System Measures, such as document downloaded, replies to discussions or emailed pages from a CoP, may also overlap into this category since they point toward knowledge members are receiving as a result of an output from the CoP. Whether they are classified as either System or Output Measures is of much less importance than the recognition that they must be addressed. Output Measures provide an indication that knowledge transfer has actually occurred, although it cannot be definitively concluded that learning has occurred.

Finally, Outcome Measures "determine the impact of the KM project on the organization [and] help determine if the knowledge transfer processes are working to create a more effective environment" (Department of the Navy Chief Information Officer, 2001). These measures get to the heart of the linkage between the CoP and organizational objectives. Due to difficulty required to show a causal relationship between CoP participation and performance, Outcome Measures may often have to be assessed through surveys against proxy measures.

ANALYZING SYSTEM AND OUTPUT MEASURES

Tracking Membership

Studying raw membership numbers, particularly over a time continuum in a run chart, provides insight into the effectiveness of efforts to increase membership in the CoP. Community leaders use these insights to align future efforts with those that have been successful in the past. An assessment of membership, done within the context of the size of the targeted community, provides an appreciation of the potential impact the CoP can make on the community. Community leaders focus less on the total number of members in a community but on the percentage of the targeted audience has joined the CoP. For example, an organization may be quite satisfied if its CoP had 100 members out of a targeting population of 200 people. However, it is unlikely the organization would have the same degree of satisfaction with a 100 member CoP if the target population had 3000 people. The degree to which CoP membership penetrates the targeted population will control the CoP's influence on the learning and business processes of the organization.

Understanding Visit Metrics

The success of a CoP hinges directly on whether the community finds the content relevant and engaging. Accordingly, community leaders may choose to analyze CoP Page Visits and Unique Visits by members, both readily available System Measures. If the CoP is relevant to the community, it can be assumed that visits by members would increase. Understanding context is essential. Analyzing run charts in conjunction with conducting a thorough Root Cause Analysis can reveal those internal and external factors influencing variation on the CoP. Factors internal to the CoP such as member behavior, community leader behavior, the frequency of community events, the amount of uploaded content, and the number and types of discussions all have significant impact on CoP activity. External factors including holidays, weekends, and world events can also dramatically impact community participation. An incomplete analysis of the environment, both within and outside the CoP, could lead to invalid conclusions about the meaning of certain metrics.

"Vibrant communities of practice… have a rhythm" and "finding the right rhythm … is key to a community's development" (Wenger et al., 2002). In figure 1 below, the run chart of daily forum page visits shows the impact of newsletters as well as that of weekends and holiday. Community leaders can use this information to adjust the rhythm of the CoP by timing forum events or the release of newsletters to influence community participation.

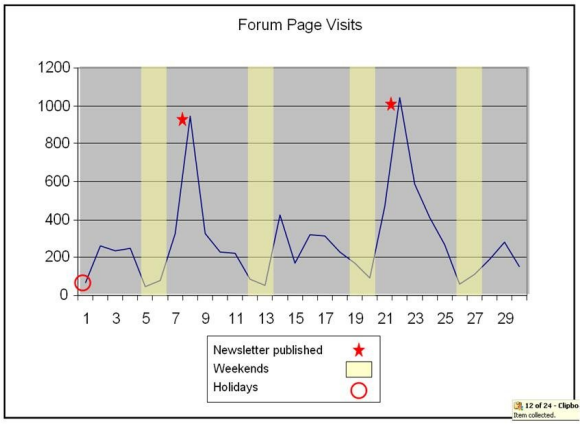

Figure 1: Forum Page Visits

Assessing visits in isolation can lead to very inaccurate conclusions. Once again, context is critical. In the two charts below taken for the same CoP, what seems to be a positive trend in CoP visits is more than accounted for by the increase in membership during the same period. In fact, the run chart of the page visit to member ratio (figure 3) shows a decided downward shift in activity relative to each member. In essence, the potential for knowledge transfer for each member in the CoP has decreased over time.

Figure 2: Visits by Members

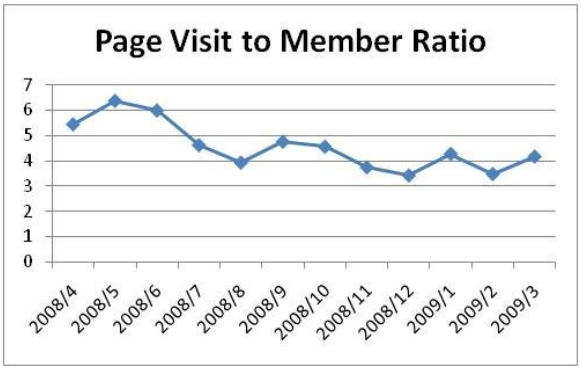

Figure 3: Page Visit to Member Ratio

Tracking Contributions and Discussions

Tracking the various components of active member participation is useful in order to gain a general sense of what is important to members. As with the previous examples for membership and page visits, analysis of run charts or bar charts is a powerful technique. However, member activity metrics are much more useful when analyzed in comparison with one another or in combination with other metrics. While an analysis of visits to the CoP indicates the interest of the community in the CoP content, analyzing the various aspects of the CoP activity demonstrates what the members find relevant or engaging.

A significant difference between a CoP and a knowledge repository is that while a knowledge repository's purpose is to store documents for later retrieval, a core function of a CoP is to foster collaboration through dialogue. One of the most useful metrics is the replies to discussions (answers to questions) ratio. As demonstrated by the figure 4 below, discussions in this CoP typically receive 4 to 5 replies. The chart also shows a particularly active period for discussion content during November 2008. Community leaders can use this data to analyze the discussions in November to determine what made those different than discussions in other months. The topics during November may have been more engaging, signaling the community to leader to steer future discussions in a similar direction. Analysis may also reveal that a few discussions received an unusually high number of responses, accounting for the upturn. In either case, it is essential that the community leader understand what piques community interest.

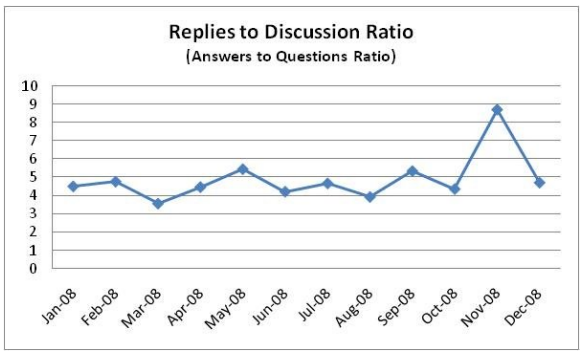

Figure 4: Replies to Discussion Ratio

Like all of the measures discussed to this point, replies to discussions are a System Measure, a simple count provided by the CoP software. Yet a count of replies begins to blur the distinction between both System and

Output Measures, since it provides an initial glimpse into the flow of knowledge out of a community.

Active Participation Rates

Another powerful way to analyze CoP activity is to assess active versus passive participation rates in a CoP. Most CoP activity is typically passive: reading discussion posts, downloading documents, viewing member profiles, etc. In all likelihood, this type of activity is quite valuable to the passive lurker. Members engaged in passive activity still reap the benefits of learning from other members' experiences and insights. However, they do nothing to promote the richness and vibrancy of the CoP; after all, these same activities can be done on static web page or a knowledge repository. Increasing active participation, where members contribute to the CoP, is essential to establishing a sense of community among the members and ensuring the long term success of the CoP effort. Dividing the individual components of active participation by the unique visits to the forum, we can estimate what percentage of those visits resulted in some form of active participation by the members. Experience has shown that active Army Professional Forums typically have active participation rates above 5%. The example data below for Warrant Officer Net shows a very healthy forum trending upward in a very positive fashion. As desired for a CoP that emphasizes collaboration, conversation content (discussions started, replies, blog entries, and comments) account for the greatest portion of member activity.

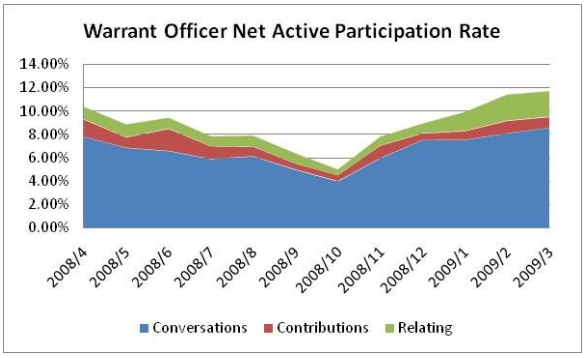

Figure 5: Warrant Officer Net Active Participation Rate

Activity Mapping

Once a CoP has been launched and is moving towards maturity, community leaders should conduct periodic reviews of CoP activity in relation to its objectives. As discussed above, a CoP's mission, purpose and objectives are found within its charter. Graphically mapping CoP activity provides a tool to make an assessment of the relationship between activity and the charter.

Consider the case of Warrant Officer Net. Its charter states that it exists for members to "connect, share ideas and experiences." The CoP's objective is to provide a forum for members to "express professional, credible, and mature thoughts, opinions, and recommendations in reaching solutions" and asks members to "participate; learning from the experience of others, while sharing your expertise and knowledge." This mission and objective clearly identifies an emphasis on collaboration and community interaction.

Figure 6: Warrant Officer Net Activity Map

As constructed in the example above (figure 6), the approximate balance between explicit and tacit knowledge exchanged on the CoP is illustrated. Furthermore, the Activity Map provides a snapshot of the flow of knowledge both into and out of the community. While all entries into the Activity Map fit the definition of System Measures, the count of Documents Downloaded points directly to an Output Measure of the community. Positioned directly opposite Answers (replies to discussions) on the map, it demonstrates how members are learning from their community involvement.

By comparison, consider S1 Net's Activity Map in figure 7. S1 Net is an equally successful CoP yet the balance between tacit and explicit knowledge is entirely different from Warrant Officer Net, reflecting a dissimilar focus expressed in the forum charter. Rather than placing the emphasis on member collaboration, S1 Net's objectives include "providing a mechanism for top-down dissemination of knowledge... and a means

for the institutional force to obtain feedback from the field." Had the Activity Map for S1 Net mirrored that of Warrant Officer Net, the community leader would need to consider taking action to rebalance activity to better reflect the CoP's objectives.

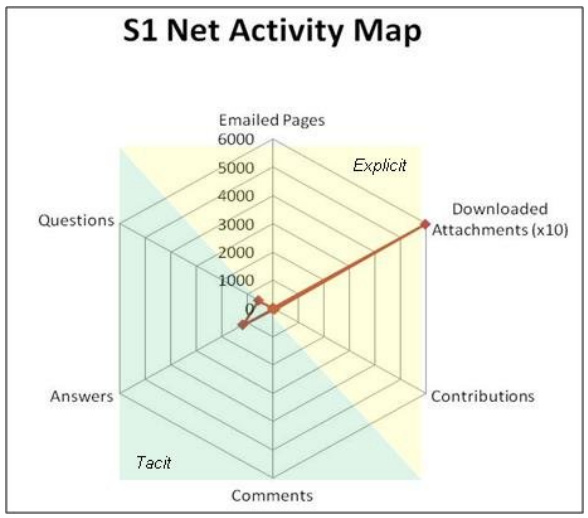

Figure 7: S1 Net Activity Map

Comparing Communities of Practice

The preceding section on activity maps was the first attempt in this paper to show a direct comparison between two CoPs. If those responsible for CoPs feel it necessary to conduct such a comparison, considerable judgment must be used to ensure invalid conclusions are not reached. Because every CoP has a unique Domain, Community, and Practice, they are very different from one another. As in the example above, CoP objectives may vary significantly. Thus, making a head to head comparison on a given metric or set of metrics to determine which is CoP is performing better would be prone to error. Furthermore, the communities may be entirely different in demographics. In a community composed largely of 18 to 25 year olds, one would anticipate a higher comfort level with using online technology than with a membership comprised of 40 to 50 year olds. The difference in comfort levels would likely result in very different participation levels. Moreover, the sheer size of a community will influence system measures such as the number of discussions, replies, and the ratio between them.

GETTING TO OUTCOMES

The ultimate measure of community of CoP success is an improvement in organizational effectiveness. For the Army, Outcomes are best expressed in terms of improved performance of the organizations or individuals in relation to particular tasks. Accordingly there should be a correlation between an effective CoP and an improvement in organizational or individual performance. Directly measuring this improvement and isolating the impact of a CoP from the numerous other factors influencing performance may not be practical or even feasible. Even if it were possible to establish a firm linkage between performance and the CoP, quantifying the degree of the linkage would likely be problematic.

Forum Value Survey Method

An alternative to directly measuring unit task performance is to use of proxy measures. Organizations may improve their effectiveness not only on the battlefield but in garrison in preparing for combat operations. A set of proxy Outcome Measures that BCKS has used is Time, Money, and Lives, the rationale being that by improving the knowledge Soldiers have, they would reduce the time required for training or to perform tasks. Similarly, equipped with better knowledge and insights, Soldiers and units would save money by reducing injuries and damage to equipment or by the more efficient use of resources. Most importantly, having more knowledgeable Soldiers, armed with the latest best practices and TTPs from the field, would result in the reduction of the number of lives lost. A positive trend in the amount of Time, Money or Lives saved, that could be attributed to CoP activity is seen as a direct result of improved performance of the unit. Moreover with ever tightening budgets, the Army is no different from civilian organizations in that it must maximize its Return on Investment (ROI). While the survey method below does not render a precise ROI, it does provide a means to quantify a portion of the value of the CoP program.

Obviously there are no System Measures available from CoP software that can do any sort of numerical tally of Time, Money or Lives saved. Consequently, in order to assess this type of impact or Outcome Measure, BCKS relies on membership reporting. One technique BCKS has used is a forum value survey method. Adapted from the work of Wenger et al. (2005) as a means to assess ROI, the BCKS forum values survey utilizes a paired question technique. This technique pairs a value proposition with member's estimate of confidence in the validity of their response. In order to assess savings, the survey asked the following pair of questions, each repeated for Time, Money or Lives:

1. As a result of something you have seen, read, or downloaded from BCKS forums, how much time (money or lives) do you think that you or your unit saved in the last year? [Raw Response]

2. How confident are you that your estimate of time (*money or lives*) saved is about right? [Confidence]

The estimate savings are calculated by the simple formula:

$$ES = RV \times PCL \quad (1)$$

where:
ES = Estimated Savings
RV = Response Values
PCL = Paired Confidence Level

Based on our experience from previous surveys, we determined five response cells for each raw answer. In response to *how much time*, members were afforded the following responses:

a. None or less than an hour
b. 1 to less than 3 hours
c. 3 to less than 5 hours
d. 5 to less than 7 hours
e. 7 hours or more

To assess monetary savings, respondents could select:

a. None or less than $100
b. $100 to $999
c. $1000 to $4999
d. $4999 to $9999
e. $10,000 or more

Similarly, to assess the number of lives saved, respondents could select:

a. None or I don't now
b. Yes, 1 soldier
c. Yes, 2-4 soldiers
d. Yes 5-7 soldiers
e. 8 or more soldiers

For each of the raw response questions, the respondents were asked "how confident they were in their estimate," with the following possible responses:

a. Not confident, 50% or less
b. Somewhat confident, 60%
c. Confident, 70%
d. Very confident, 80%
e. Extremely confident, 90% or more

By using the paired technique, a Conservative, Midpoint, and an Optimistic estimate for the savings of each proxy performance measure was calculated. For each response cell range, the lower value in the range was used to calculate the Conservative estimate, the Median value was used to calculate the Midpoint value, and the highest value in the range was used to calculate the Optimistic estimate. For example, if in response to the first pair of questions, a respondent reported a savings of "3 to less than 5 hours" and was "Confident, 70%" in their estimate, the savings estimates would be:

a. Conservative: 3 hours X 70% = 2.1 hours
b. Midpoint: 4 hours X 70% = 2.8 hours
c. Optimistic: 5 hours X 70% = 3.5 hours

All answers are then summed to provide the total for each category of estimates. Since there is no way to estimate a median and high value for the raw responses in the top most response cells, only baseline figures are used (7 hours, $10,000, 8 or more soldiers) to calculate the Conservative, Midpoint and Optimistic estimates. This further ensures that all the estimates remain conservative. Similarly, for every response for the confidence level in lower responses cells (Not confident, 50% or less), a value of zero was used, producing an estimated savings estimate of zero; this further ensures that all survey estimates are conservative.

In May of 2009 the BCKS survey was opened for a period of 30 days. The survey was announced to 12 of the more than 60 BCKS Professional Forums (Communities of Practice) to approximately 100,000 members. Table 1 below shows the results of the survey. The top half of the table provides a tally of the Raw Responses of the members. The bottom half of the table displays the estimated savings once the paired technique was employed.

Table 1: Forum Survey Results

Raw Responses			
	Time	Money	Lives
Conservative	8497 hrs	$2.12 M	1696
Midpoint	9767 hrs	$3.26 M	1913
Optimistic	10910 hrs	$4.9 M	2130

Calculated Estimates			
	Time	Money	Lives
Conservative	6455 hrs	$1.54 M	1341
Midpoint	7269 hrs	$2.27 M	1494
Optimistic	8002 hrs	$3.31 M	1648

While the values for the amount of time and money saved are compelling, even the most conservative estimate of the number of lives saved, 1341 lives, is truly impressive, particularly keeping in mind that these results only account for members who responded to the survey. It would not be valid to conclude that the responses of the entire population are represented by those that responded to the survey. Accordingly, there is no attempt to extrapolate the results beyond the respondents' answers to the population of the community as a whole.

Telling the Story

In isolation, purely quantitative metrics fail to complete the picture of value. Qualitative metrics are often necessary to incorporate in order to give the numbers context and meaning. In fact "stories illustrate the way in which connections, conversation, and content work together to deliver value to members" (Dixon, Allen, Burgess, Kilner, & Schweitzer, 2005). While many different types of anecdotes are useful, those that can provide specific examples of savings in terms of time, money and lives, render increased continuity to the effort. When the results of the above or similar forum surveys have been briefed, inevitably the audience has asked for specific examples. There are three essential elements to a compelling anecdote: a description of the issue or problem addressed by the CoP, a description of the community actions or activity surrounding the issue, and the resulting impact of the community involvement. Here, System and Output Measures combine to describe the activity of the community and the impact section describes a quantifiable Outcome. Although not entirely necessary, this "description, activity, and impact" format can be enhanced with a graphic to further illustrate the problem or activity. The graphic in figure 8 below is an example of this technique put into a one page briefing format called a success story (BCKS, 2008).

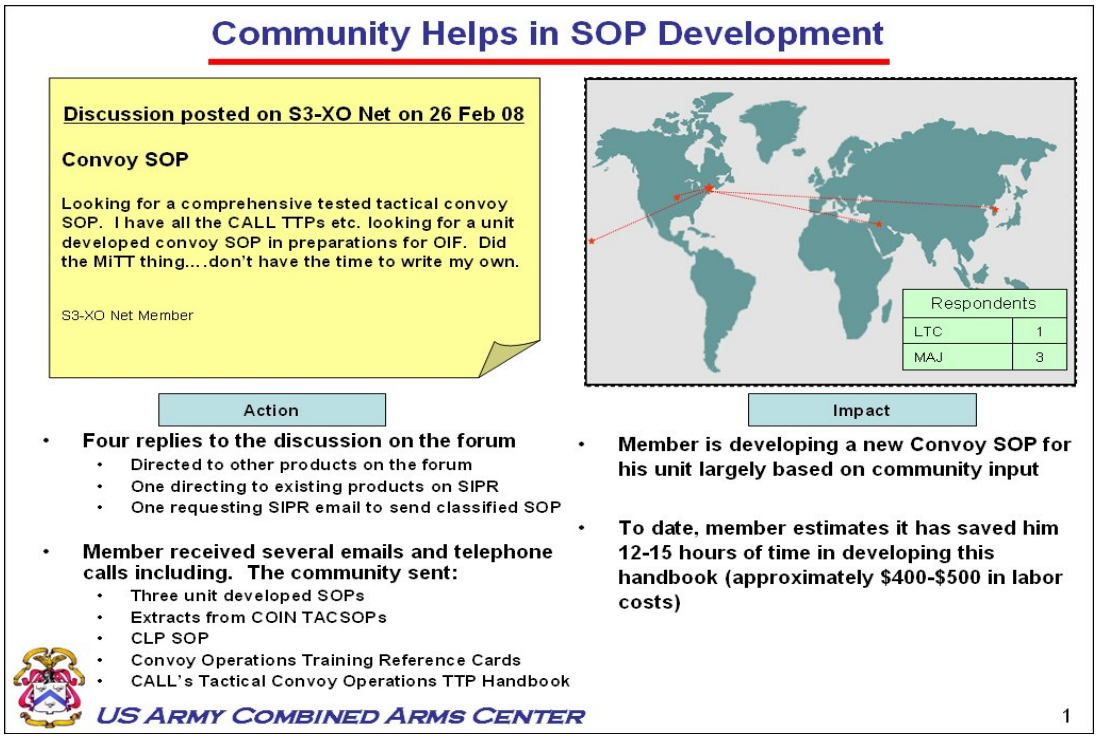

Figure 8: Example Forum Success Story

CONCLUSION

Communities of Practice have proven invaluable to the Army as it wrestles with an adaptive and agile enemy. While there are numerous metrics typically available to CoP leaders, a systematic approach is required in order to draw valid conclusions about their significance. Context is critical as the meanings of the numerical measures are often heavily influenced by factors both internal and external to the community. Often the significance of an individual metric is not understood unless it is analyzed in combination or simultaneously with one or more other metrics. The approach to metrics analysis offered in this paper addresses how to examine activity levels within the context of community objectives. With the resulting understanding, community leaders can make informed decisions on how to shape CoP activity to realign it with organizational objectives. Finally, direct measurement of the impact of a CoP may prove infeasible thereby requiring the use of proxy measures assessed through surveys or other instruments. Coupling survey results with concrete examples in the form of member stories and anecdotes provides powerful evidence of a CoP's impact on the community and ultimately on organizational effectiveness.

ACKNOWLEDGEMENTS

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