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Measuring Common Intent during Effects Based Planning

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Abstract

Common Intent (CI) describes a socio-psychological phenomenon that seems to be evident amongst a team that achieves a common objective. In the context of Effects Based Planning, a team of planners generate a plan that encapsulates Commander's intention to achieve various strategic objectives and desired effects. The hypothesis is that high CI will lead to an effective plan while low or no CI will lead to an ineffective plan. The Multi-National Experiment 3 (MNE 3) provided an opportunity to measure CI in a Joint Interagency Multi-National (Public) environment, and to compare the independent measure of CI to other key dimensions including EBP process, organization, technology, Sleep Deprivation, and Workload. During this event CI was measured between medium and low, and recommendations were made to improve CI for the next event. The key result is that CI is a robust method for measuring team effectiveness in complex environments.

Common Intent

Common Intent (CI) describes a socio-psychological phenomenon that seems to be evident amongst a team that has a singular purpose. A sports team may have a common aim of winning the game. A business company may have a common objective of increasing returns. A military unit may have a common goal of capturing territory and maintaining civil order as a desired effect. The aim, objective, goal, or desired effect should be more than a written statement or a Commander's order, but it should find its way into the hearts, minds, and souls of each team member so that consistency of thought and behaviour prevails and the team performs effectively.

Pigeau and McCann (2000) define Command and Control as follows: "*Command and Control: The establishment of common intent to achieve coordinated action*", where Common Intent is the combination of the explicit awareness or perception of Commander's Intent plus the implicit or internal expectation of Commander's Intent. Explicit Intent and Implicit Intent, together, may lead to a shared understanding of Commander's Intent. Common Intent also implies that team members understand each other's roles and responsibilities. Thus members can properly interpret the intent with respect to their roles. An outside observer may see different behaviours, but these actions would be coordinated and consistent with respect to the intent.

In the context of a military planning staff, Explicit Intent is Commander's Intent. It is publicly stated for all the Headquarters (HQ) staff members to perceive, think about, and act upon. The HQ staff should be able to reiterate Commander's Intent at any point during their activities. The first part towards having Common Intent is being aware of Commander's Intent.

Secondly, Implicit Intent is an internal expectation of Commander's Intent. For example, if Explicit Intent is "*to capture the hill*", then Implicit Intent might be "*to capture the hill with minimal battle damage*" or "*to capture the hill with Air Force assets only*." These implicit expectations depend on the staff position (e.g., planner, operator, commander, etc.). The members interpret Commander's Intent from personal expectations based on style and

experience, military expectations based on training, doctrine, tradition, and ethos, and cultural expectations based on societal values, cultural morals, and national pride as proposed by Pigeau and McCann (2000).

One might argue that Common Intent is closely related to Shared Situational Awareness (SA). Endsley (1995) proposes three aspects of individual Situation Awareness – perception, comprehension, and projection. Staff members need to perceive (Explicit Intent) and comprehend (Implicit Intent) Commander's Intent, as well as understand how Commander's Intent will impact future events in order to generate an effective campaign plan. Shared SA implies that team members with similar awareness of the environment and Commander's Intent will produce effective team performance. On the other hand, CI emphasises that team members with similar expectations and values will shape their individual awareness in a way that leads to coordinated action and goal achievement.

Effects Based Planning

Effects Based Planning (EBP) is a new concept being explored by US Joint Forces Command and partner nations. Traditional planning starts with strategic objectives and ends with several plans of action from which the Commander chooses one. Once executed, the chosen actions yield both desired and unintended effects.

EBP aims to generate a single plan that considers desired effects and potential unintended effects during the planning stage. Desired *effects* are generated from strategic objectives and the Operational Net Assessment (ONA). The ONA is a database that contains political, military, economic, social, information, and infrastructure (PMESII) descriptions of the adverse system. A person, place, or thing in the database is called a *node*. The ONA contains nodes and *links*, where the links describe the relationships between nodes. Potential effects are also associated with the nodes and links. Needless to say, the ONA is complex.

In light of the strategic directives and Commander's Intent, the HQ staff assesses the desired effects and the *actions* required to modify the nodes and links in order to produce the desired effects. The actions may produce unintended or side effects, and so the staff must reassess the effects and actions until they converge to a reasonable solution. *Resources* are assigned to the actions, and further iterations may occur if the resources are not available. Once the desired effects, nodes, actions, and resources (ENAR) are identified, the staff prioritizes and sequences the effects and actions, and then produces an Effects Tasking Order (ETO) for the tactical components to execute.

Commander's Intent and guidance are interwoven throughout Effects Based Planning (MNE, 2003). The Commander formulates her intention from the strategic aim and objectives, and provides guidance throughout each step of the process. There needs to be a high degree of CI for EBP to produce an effective ETO, since the ETO is an expression of Commander's Intent. Stated negatively, if the HQ staff does not internalize Commander's Intent then the ETO will be sub-optimal and potentially diverge from the strategic aim. There is no doubt that Commander's Intent is central to EBP.

Multi-National Experiment 3

Multi-national Experiment 3 (MNE 3) examines how an ad hoc coalition would conduct an Effects Based Planning. US Joint Forces Command led the experiment and invited partner nations Australia, Canada, France, Germany, and United Kingdom to participate in the experiment from their own country. They formed the Coalition Task Force Headquarters (CTFHQ), which is based on the US Standing Joint Force Headquarters structure with Boards, Centers, and Cells (BCC). NATO conducted the same experiment at the same time over the same secure computer network, except that the NATO planning staff was co-located in a single facility. They formed the NATO Response Force Headquarters (NRFHQ). This allowed the analysts to examine differences between distributed and co-located planning, keeping in mind that there were at least 18 confounding variables as given in Table 1.

Table 1. Confounding variables for MNE 3.

Potential Confound	**CTFHQ (Distributed)**	**NRFHQ (Co-located)**
Concept familiarity	US good - partners minimal	Minimal
EBP experience	US good - partners moderate	Minimal
SJFHQ/BCC experience	US good - partners minimal	Minimal
Experience in collaborative tools	US good - partners minimal	Minimal
Familiarity with co-workers	US good - partners minimal	Moderate to good
Familiarity with command group	US moderate - partners minimal	Moderate to good
Leadership style	Varies with individual	Varies with individual
Staffing level	More	Less
Staff skill sets	Varies with individual	Varies with individual
Non-native English speakers	More	Less
Training	US good - partners moderate	Moderate
Adherence to EBP Tactics, Techniques, and Procedures.	Both process and organization deviated significantly from originally planned.	Some different process steps and performed in different sequence.
Different mission/objectives	Yes	Yes
Different area of operations	Yes	Yes
Different organizational agendas	Yes	Yes
Different work hours	Mixed	Same
Inter-agency, medical, ISR support	Played	Not Played
Use of Collaboration Tools	High	High plus face-to-face

Experiment Purpose

The MNE 3 objectives were to (in order of priority):

a. Develop and assess the EBP process
b. Develop and assess the EBP organization
c. Identify technology requirements to support EBP.

Figure 1 is a simplified depiction of the EBP process. Note well that:

1. Commander's Intent surrounds the entire process.
2. MNE 3 analysis focused on four priority steps: Effects Assessment, Action Assessment, COA/Wargaming, and Effects Synchronization.
3. The process is not serial but has parallel process steps and feedback loops.

4. About 64 people in the CTF HQ, and about 48 people in the NRF HQ performed this process over a two-week period, 5 days a week, 12 hours a day.

CI Hypothesis

EBP process should improve the ability to broaden the range of effects and actions considered leading to an ETO. The effects and actions and subsequent unwanted effects can explode exponentially during the planning process. Commander's guidance and intent narrows the ENAR branches to a manageable set. And so, if Common Intent is high then the staff's will have Commander's intent internalized while assessing, prioritizing, and synchronizing the effects, which should lead not only to a manageable plan but also the plan that the Commander intended.

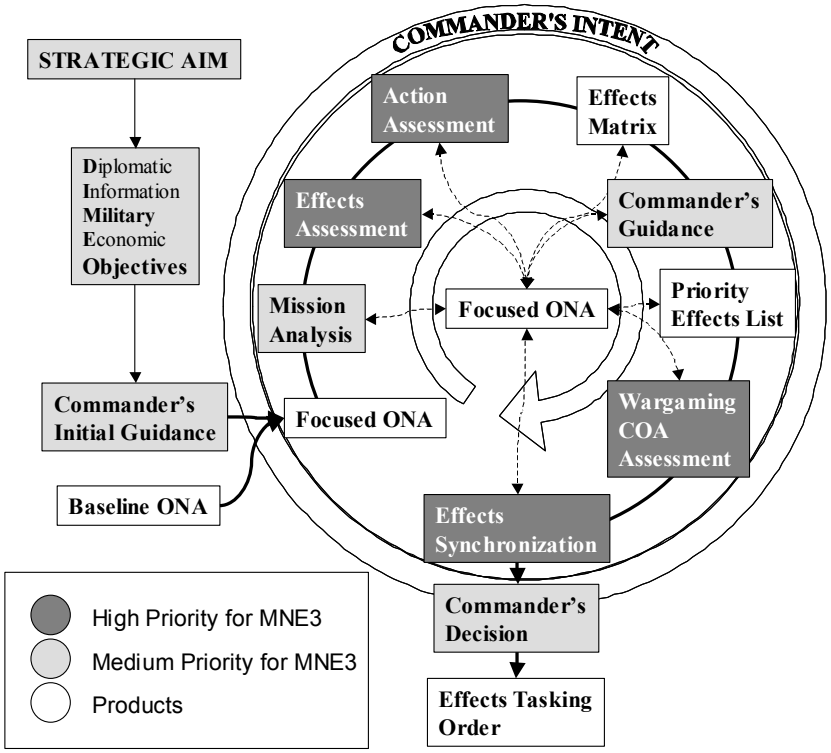


Figure 1. Operational Effects Based Planning Process explored in MNE 3.

Also, the organizational structure should facilitate the awareness and internalization of the Commander's intent. The EBP organization consisted of five staffs within the Headquarters: Command Group (CG), Planners (PN), Operators (OP), Information Superiority (IS), and Knowledge Management (KM). From these staffs, various members with the required skill sets were to form Boards, Centers, and Cells (BCC) to perform the process steps. The BCC structure morphed into ad hoc working groups that performed Decision-making, Planning, Advisory, and Coordination functions. The CI analysis was performed using the staff structure, which did not change during the event.

Technology should augment the human ability to conduct EBP through a suite of tools, and promote CI amongst the HQ staff. Identifying the technological requirements was the lowest priority. However, it became very clear that the process, organization, and technology are tightly linked to each other. The lack of tools and insufficient functionality directly impacted the performance of the process steps and the way the HQ personnel worked with each other.

The CI hypothesis is that a strong relationship exists between EBP Process, Organization, and Technology (POT) and Common Intent. Furthermore, relationships exist between CI and other variables that impact EBP such as Decision-Making (DM), sleep deprivation (SD) and workload. The experimental design collected data on all the variables independently, and a post-analysis was performed to determine whether there was a relationship between variables. Unfortunately, the preliminary DM results were not available when writing this paper.

CI Analysis

The relationships between CI and all other variables may be expressed as follows:
CI = CI(P, O, T, SD, workload), P = P(CI,O, T, SD, workload), and so on. In this form, the relationships are implicit and complex. To simplify the analysis, the experimental design captured independent measures of all the variables, and then the relationship was found between two variables at a time as shown using the axes in Figure 2.

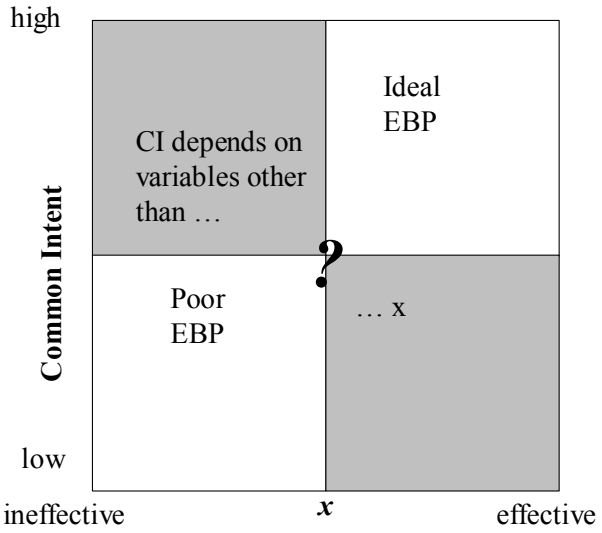


Figure 2. Effectiveness relationship between CI and other variables.

Figure 2 is mis-leading since the variable, x, is shown as the independent variable and CI is the dependent variable. The axes can be reversed and the hypothesis will still hold. Only one treatment was done for process, organization, and technology and therefore the model has only one point for each pair. When more experiments are performed, then trajectories can be plotted in this space that will indicate the model dynamics. Measuring CI during MNE 3 is an important demonstration for Common Intent, since is had never been done in a Joint Interagency Multi-National (Public) environment.

CI Measures

Four independent measures of Common Intent were designed. First, it was proposed that Common Intent would be related to the length of time, discussion content, as well as body language for the Commander's Guidance process steps. That is, if the time was short, there were few clarification questions, and body language showed an understanding of Commander's Intent, then one might conclude that CI was high amongst the staff members. Observers in each country took notes during the Commander's Guidance process steps. They were asked to complete the spreadsheet given in Tables 2 and 3.

Table 2. Observation Form (Part A)

Proposition: Common Intent (CI) is the combination of explicit awareness and implicit expectation of Commander's Intent. High levels of Common Intent is essential for CTF/NRF HQ staff to effectively perform Effects-Based Planning via the dimensions of process, organization, technology, and decision-making.				
Observer	**Date of Meeting**	**When**	**Where**	**Who**
(name)	SELECT	(ZULU time)	SELECT	SELECT
Farrell, CA	09-Feb	12:00	Auditorium 102	Space Planner - Canada

Table 3. Observation Form (Part B)

Look for physical indications of (dis)agreement with the Commander's Intent. Choose from the Pick List. If necessary, add your own dimensions in column J.	Record discussion content observations that would show (dis)agreement with Commander's Intent.	Record discussion content observations that are **NOT** related to Commander's Intent, but may provide insight into Common Intent	Record any additional observations that show general (dis)agreement with Commander's Intent.
Body Language	**Relevant Discussion Content**	**Non-relevant Discussion Content**	**Other Observations**
SELECT	(enter observations)	(enter observations)	(enter observations)
stares at computer screen (can't tell)	Discussion was one way! No opportunity for questions and discussion		

Second, the frequency and type of interventions (or course corrections) may indicate a global CI value. In this case, the number of interventions would be inversely related to Common Intent. An Experimental Controller's log was kept that recorded all activities of the Control cell. This contained official interventions made by the Control cell. However, Concept Developers and Analysts also intervened, and each country was asked to provide a summary of the number and type of interventions. These two methods provided a global, but indirect measures of CI.

Third, players rated each other about their perceptions of action consistency with respect to their own action. For example, Planners were asked, "To what extent do you believe the Command Group actions are consistent with your own team's actions?" Their response to this question indicated that Common Intent existed amongst players, but not necessarily if it was consistent with Commander's Intent. Thus, a second question allowed players to rate each other about action consistency with respect to Commander's Intent: "To what extent do you believe the Command Group actions are consistent with Commander's Intent?" Note that, coordinated action is an indirect measure of CI.

It was decided early in the MNE 3 design meetings that the data collection and analysis would concentrate on four areas of the process: Effects Assessment, Action Assessment, COA/ Wargaming, and Effects Synchronization. The action consistency probes were administered

after each of these steps. Each staff group had eight questions to answer (4 staffs × 2 questions) on a seven-point scale where 1 meant "totally inconsistent" and 7 meant "totally consistent."
A vector analysis technique was used to analyze the action consistency data instead of statistical methods (Farrell, draft). The vector method is similar to dimensional and principal component analysis methods. Figure 3 shows answers from three players that form a vector, **u**, although this method can be extended to any number of dimensions. **u** is compared to an ideal vector, **v** (i.e., all three players give an answer of 7 meaning "totally consistent"). **u** and **v** have a magnitude and an angle that separates them that can always be plotted on a two-dimensional plot. In this case, the x-axis represents the percent consistency and the y-axis represents the difference of opinion or the spread in the answers.

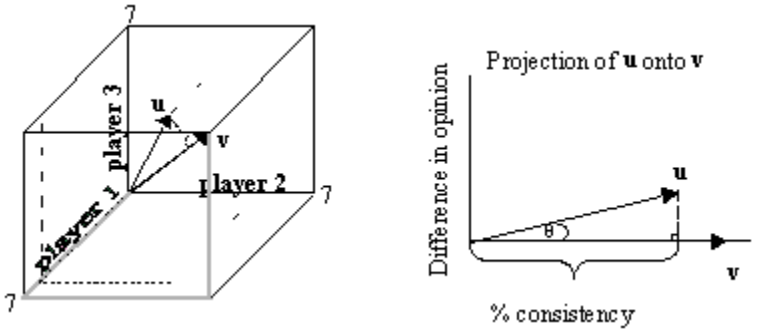


Figure 3. Illustrating the vector method.

Fourth, players answered a series of true/false questions on Commander's Intent. The questions were designed in consultation with the Commander himself. This is a more direct measure of Explicit Intent and Implicit Intent to some degree, but this measure does not address action consistency. The true/false questions were administered directly after the probes. Players also indicated their level of confidence in their answer on a seven-point scale where 1 meant "50% confidence or guessing" and 7 meant "totally confident."

The four independent measures of CI provide redundancy for two reasons. First, as stated earlier, measuring CI in a JIM(P) environment is a high risk activity, and several probes will increase the chance of interpreting the results. Second, comparing the different methods would provide insight on how to more efficiently design a CI measure for the next experiment.

Results and Discussion

After the first day of the two-week experiment, it was clearly evident that individual nations had different expectations of Effects Based Planning being a "Command-led" process. Germany expected the Commander to provide some high level guidance, UK expected the Commander to be intimately involved in the planning tasks, while the US was somewhere in between. The Commander's Initial Guidance and Intent re-iterated the strategic objectives, but did not explicitly indicate the desired effects, and it was left for the staff to derive the desired effects during the Mission Analysis step.

Thus, Mission Analysis became a critical process step, and although the steps were performed successfully, it did not produce a clear way ahead for the rest of the EBP process. During these first two days, the Headquarters staff moved away from the BCC construct and towards ad hoc

groups (which was expected by the Concept Developers and Experimental Designers). Common Intent was threatened by not only different expectations and a significant re-organization, but also insufficient EBP training and rehearsal.

On the fourth day significant changes were made to the Effects Assessment and Action Assessment procedures that caused the two steps to be worked in parallel primarily by Planners and Operators. The Command Group was busy in trying to determine how to get the EBP process back on track. The Information Superiority group tried to contribute, but there were few requests for information. IS spent most of their time developing Tactics, Techniques, and Procedures (TTPs) for their expected activities. Knowledge Management, conceptually, was a late entry to the experiment and most of the time was spent in determining their role was in EBP. In general, Planners consulted the Operators and required minimal input from CG, IS, or KM.

On the eighth day, CTF HQ struggled with how to proceed with the COA/Wargaming and Effects Synchronization steps. For example, despite efforts to explain what Effects Synchronization entailed, Planners were asked to submit an excel spreadsheet that listed effects, their precedent effects, and associate actions to the Effects Synchronization experts in Canada. The experts worked offline, produced a MS Project schedule of effects and presented it to the CTF HQ the following day. Only those experts truly understood the intent behind this processing step. Finally, the clearest indication that EBP was crippled was the inability of the staff to produce an Effects Tasking Order. This happened for both CTF HQ and NRF HQ. Clearly, the ETO needs more conceptual development.

Observation and Intervention

The Commander's Guidance lasted approximately half an hour each time. However, the briefs were one-way and therefore no discussion was observed. Players sat at their computer terminals, stared at the screen, and listened to the Commander and other CG members give PowerPoint briefs on Commander's Guidance and Intent. There were no indications of whether players understood Commander's Intent (as there potentially could be with face-to-face interaction). Thus, for a distributed staff using computer tools to communicate, direct observations is an ineffective way of measuring Common Intent.

Many interventions took place over the two-week experiment but the Control cell formally documented a small amount. The Concept Developers and Analysts intervened informally because the players required more guidance, but most interventions came from the players themselves who morphed and developed TTPs in order to generate products and complete the process. This situation produced a significant confound between the development and assessment of EBP. That is, analysts will be assessing a moving target since EBP was being developed throughout the experiment. It will be difficult to determine whether Common Intent was low because there were so many interventions, or that there were so many interventions because Common Intent was low. Never-the-less, the high number of interventions indicates that Common Intent tended towards being low.

Action Consistency

The action consistency probes yielded a wealth of information that could be analyzed with respect to the process step (date), position, staff, CTF HQ, and NRF HQ. It is possible that

players confused the word "action" in the probe questions with "action" in the ENAR concept. A better word might have been "activities."

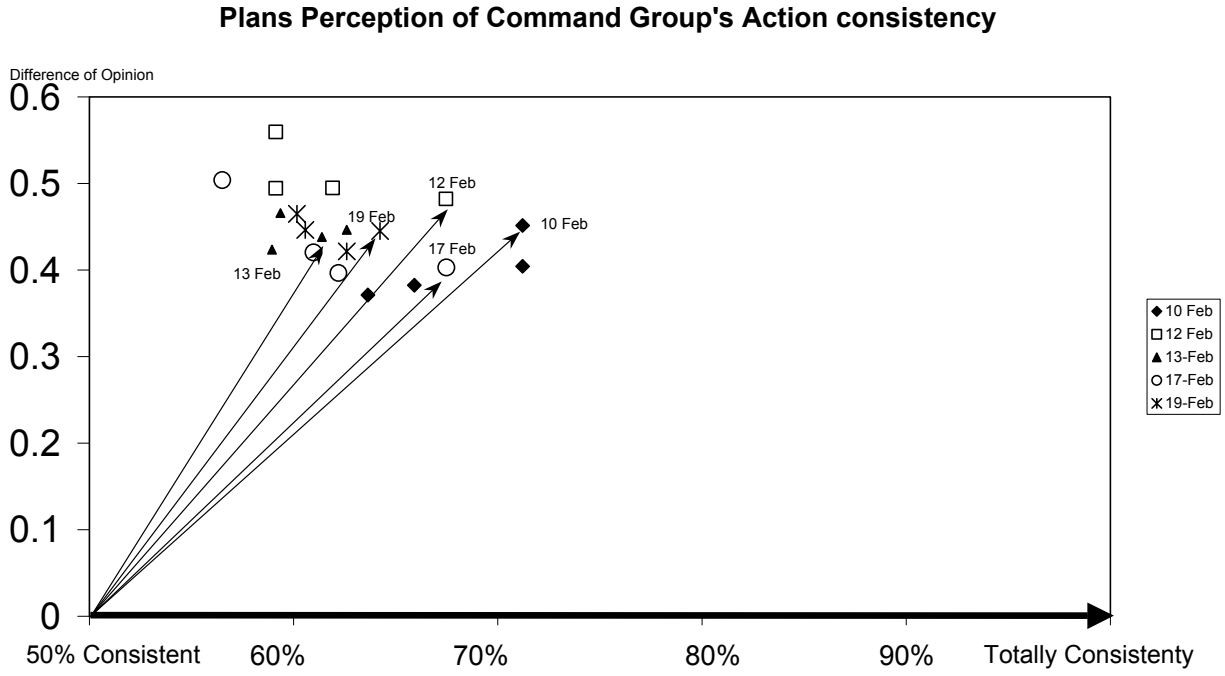


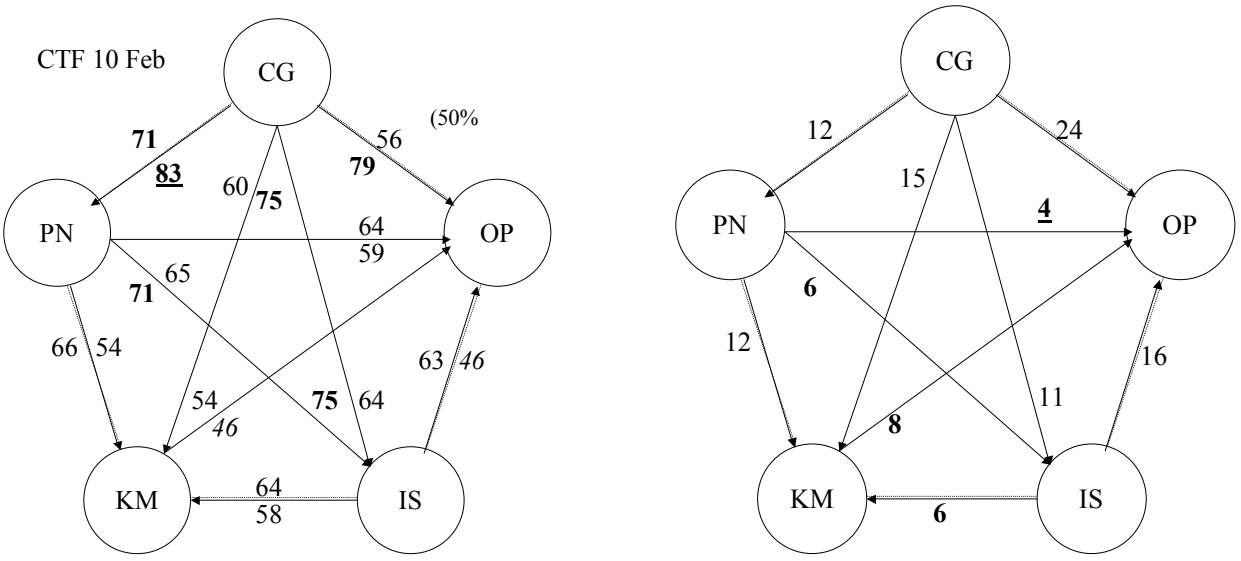
Figure 4. A vector representation of the Action Consistency Results

Figure 4 is a sample of the results that was generated using the vector method. The five vectors represent the Planner's perceptions of the Command Group's action consistency on the five occasions that the probe was administered. Action consistency between PN and CG from the planners' perspective dropped throughout the first week, increased in the middle of the second week, and dropped again by the end of the experiment. Each day has three other points representing the end point of vectors for action consistency between PN and OP, PN and IS, and PN and KM. There are a total of twenty vectors represented on this plot. Although the vector representation provides a global view of the data, it becomes difficult to look for specific patterns using this representation.

A pentagon was used as an alternative representation of the data where the nodes represent the five staffs and the links represent either the percent consistency (Figure 5a) or the difference between percent consistencies between pairs of staffs (Figure 5b). For example from Figure 5a PN believes the CG is 71 % consistent, but CG believes that PN is 83% consistent. Figure 5b shows the difference between beliefs is 12 percentage points. Thus, *percent consistency* is related to *CI level* or the amount of CI, and the *difference* measure is related to whether *CI exists*.

Pentagons were generated for CTF HQ on 10, 12, 13, 17, and 19 Feb for:

1. action consistency with respect to one's own action
2. action consistency with respect to Commander's Intent
3. difference in action consistency with respect to one's own action
4. difference in action consistency with respect Commander's Intent



a) The numbers are the % consistency calculations from vector method and indicate the amount or level of CI.

b) The numbers are the arithmetic difference between the % consistency pair and indicate the existence of CI.

Figure 5. Summarizing Action Consistency Results with a Pentagon visualization

Figure 5 shows a) action consistency and b) difference in action consistency with respect to one's own action for Feb 10. Similarly, four pentagons were generated for the NRF HQ for each day: 10, 11, and 17 Feb. Other analyses (not reported here) can look at any differences across days, and differences between CTF and NRF headquarters.

The numbers are format-coded that represent certain thresholds. For Figure 5a, if the number is greater than 80% then it is **bold** and underlined – that is, CI level is "high". If the number is greater than 70% then it is **bold** and CI level is "medium". If the number is less than 70% then it is regular text and the CI level is "low". If it is less than 50% then it is *italics* which indicates that actions are inconsistent.

For Figure 5b, if the number is less than 5% then it is **bold** and underlined – that is, there is a "high" degree of confidence that CI exists. If the number is less than 10% then it is **bold** and there is a "medium" degree of confidence that CI exists. If the number is greater than 10% there is a "low" degree of confidence that CI exists. The ranges are arbitrary and need to be validated. Given this coding scheme, patterns begin to emerge.

For example the Command Group believed for that the staff's actions were highly consistent with their own and Commander's Intent since they often score in the **bold** range throughout the experiment. At the other end of the spectrum, Operators often scored their colleagues at 50% and lower. Clearly these two groups saw things differently, and therefore Common Intent would be low or non-existent in some cases.

The data can be further reduced again using the vector method and expressed for the entire Headquarters on a given day as shown in Tables 4 to 7. For the CTF HQ, the CI level is low to medium with medium to low confidence that CI exists. For the NRF HQ, the CI level is low with medium to low that CI exists with respect to one own action consistency, and medium with

respect to the Commander's Intent. Overall, this independent measure shows that Common Intent tended to be low, which agrees with the intervention result.

Table 4. CTF HQ percent action consistency (CI level)

Date (Process Step)	wrt own	wrt Commander's Intent
10 Feb (Commander's Initial Guidance)	64	**70**
12 Feb (Effects Assessment)	62	68
13 Feb (Action Assessment)	62	69
17 Feb (Priority Effects List)	62	66
19 Feb (Effects Synchronization)	63	67

Table 5. CTF HQ difference in percent action consistency (CI existence)

Date (Process Step)	wrt own	wrt Commander's Intent
10 Feb (Commander's Initial Guidance)	11	**10**
12 Feb (Effects Assessment)	9	11
13 Feb (Action Assessment)	13	12
17 Feb (Priority Effects List)	14	14
19 Feb (Effects Synchronization)	**10**	**10**

Table 6. NRF HQ percent action consistency (CI level)

Date (Process Step)	wrt own	wrt Commander's Intent
10 Feb (Mission Analysis)	58	65
11 Feb (Effects Assessment)	64	66
17 Feb (Wargaming)	64	66

Table 7. NRF HQ difference in percent action consistency (CI existence)

Date (Process Step)	wrt own	wrt Commander's Intent
10 Feb (Mission Analysis)	**8**	**9**
11 Feb (Effects Assessment)	12	**7**
17 Feb (Wargaming)	15	**8**

Situation Awareness of Commander's Intent

Only CTF HQ participants answered 24 true/false questions on Commander's Intent. If players were guessing, then one would expect that 50% of the responses would be correct. It was assumed that the questions were of equal difficulty, and the confidence rating could control for difficulty assuming that it is a good predictor of question difficulty. The questions seemed to be fairly straight forward, addressing Explicit Intent only. Interpretation of the questions by the Multi-Nationals may have been difficult for both native and non-native English speakers. The general consensus was that they did not sufficiently probe Implicit Intent.

The preliminary performance and confidence results in Figure 6 show no significant difference across the dates administered (standard deviation bars are displayed), which correspond to the action consistency results. On average the performance was 70% correct, and the confidence rating was 5 on a 7-point scale.

It is clear that the staff did better than guessing and internalized Commander's Intent to some degree, but because of the other factors mentioned above, it will be difficult to determine a value

for Common Intent using this method. Ideally, 100% correct would mean high Common Intent and 50% correct would mean low Common Intent, then 70% would be between low and medium Common Intent, all things being equal. Thus, the three independent measures of Common Intent seem to support each other's results.

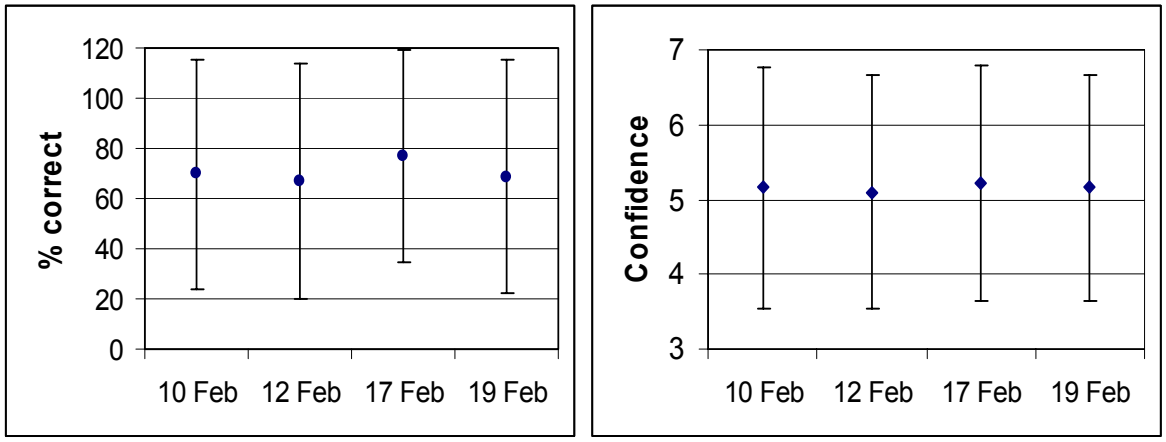


Figure 6. Preliminary Performance and Confidence Results for CTF HQ.

CI compared to Other Variables

Preliminary results for other variables, such as Process, Organization, Technology, Sleep Deprivation, and Workload, were available from the MNE 3 Analyst Workshop held at JFCOM, Suffolk, VA, 15 – 19 March, 2004. Analysts from all the participating nations plus NATO presented their first cut of the analysis they were individually responsible for, and these results were discussed and critiqued. It is anticipated that the JFCOM final report will contain the findings presented at this meeting.

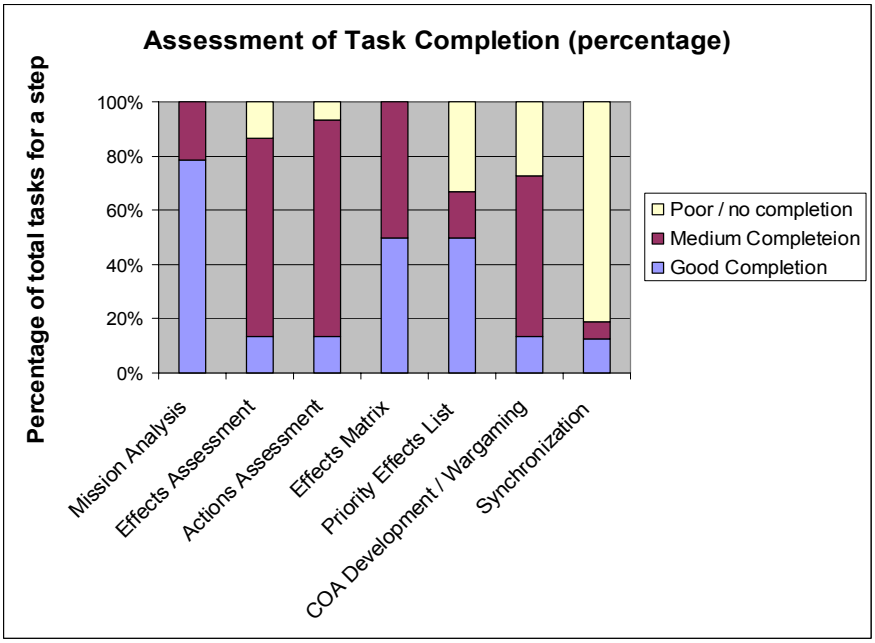


Figure 7. Assessment of Task Completion

Figure 7 summarizes how well tasks were completed during the EBP process from the observers' perspective. 80% of the steps were done well during the Mission Analysis step, while 80% were poorly done during the Effects Synchronization step. These two process steps are compared to the global Common Intent result as shown in Figure 8. The plot shows that CI depends on variables other than the MA and further improvements to MA might not impact CI. Conversely, improvements to ES may produce a more effective ES step only (horizontal arrow), or improve Common Intent at the same time as the ES step (diagonal thick arrow), which is the more likely case. So the recommendation is to refine the Effects Synchronization step.

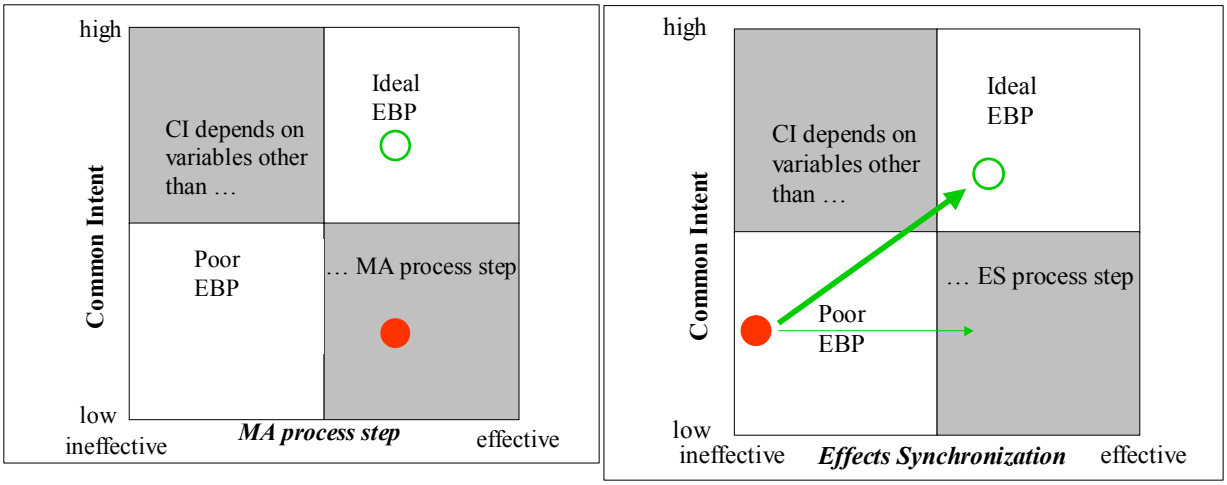


Figure 8. Comparing Common Intent and Process Steps. The grey circle is the actual result and the white circle represents the desired state.

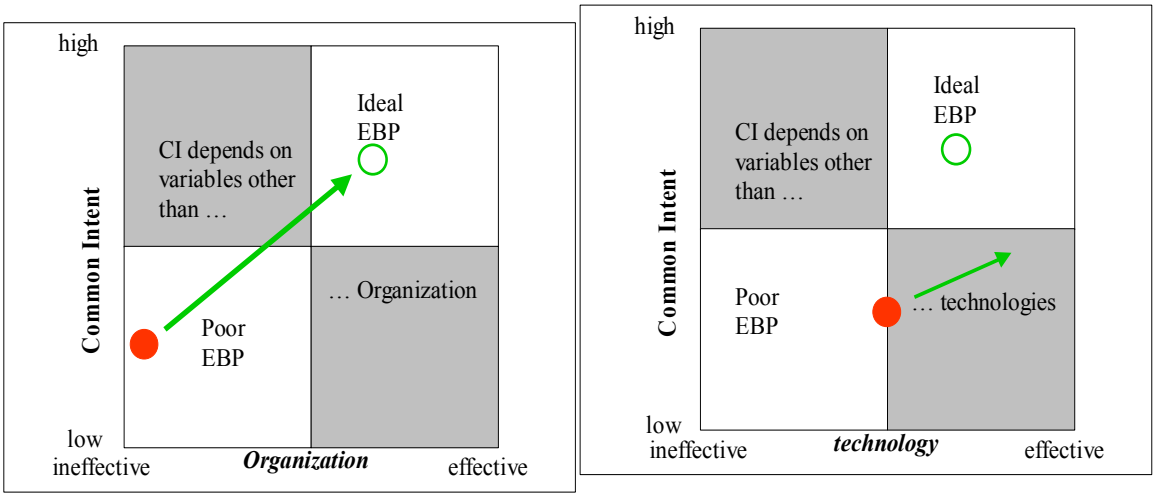


Figure 9. Comparing Common Intent with Organization and Technology.

Preliminary data shows that the organization morphed significantly from what was designed for the experiment, and so one can conclude that the organizational structure was ineffective. CI versus Organization is plotted in Figure 9. It is predicted that optimizing the organizational structure will lead to improved Common Intent, and this is the recommendation.

Most players reported that the available technology was moderately useful (4 on a 7-point scale). Again, CI is plotted against this technology result. The assumption is that any improvements to the technology will produce only small gains in Common Intent. However, it is never-the-less important to ensure that the technology does not act as an impediment to Common Intent, and so further technology optimization is recommended.

Sleep Deprivation and Workload results show that the Headquarters was very much awake (6 on a 7-point scale) and had a moderate workload (3 on a 5-point). The Sleep Deprivation variable is close to the best value, and so it is postulated that an increase in sleepiness would lower CI. Workload is also a different type of variable affecting CI. Increasing workload would place players in an overload condition, decreasing workload would required vigilance. It can be argued that the workload in this event was at the appropriate level. Therefore, manipulating workload would be detrimental to CI.

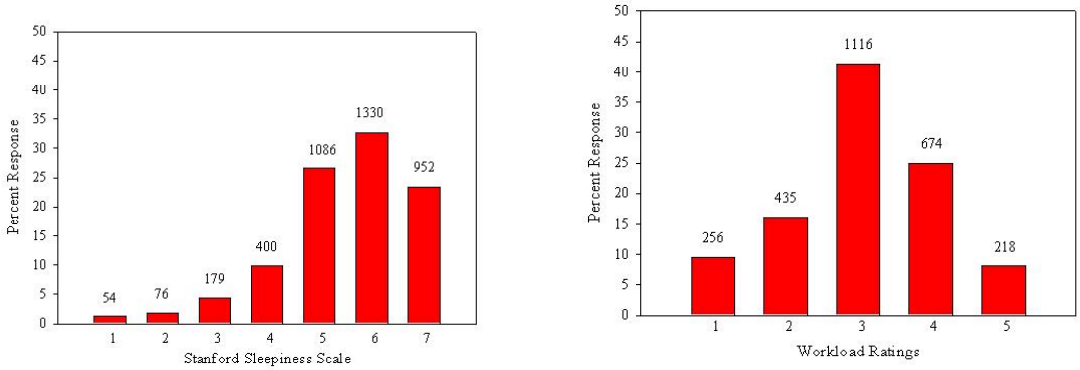


Figure 10. Combined Sleep Deprivation and Workload Results

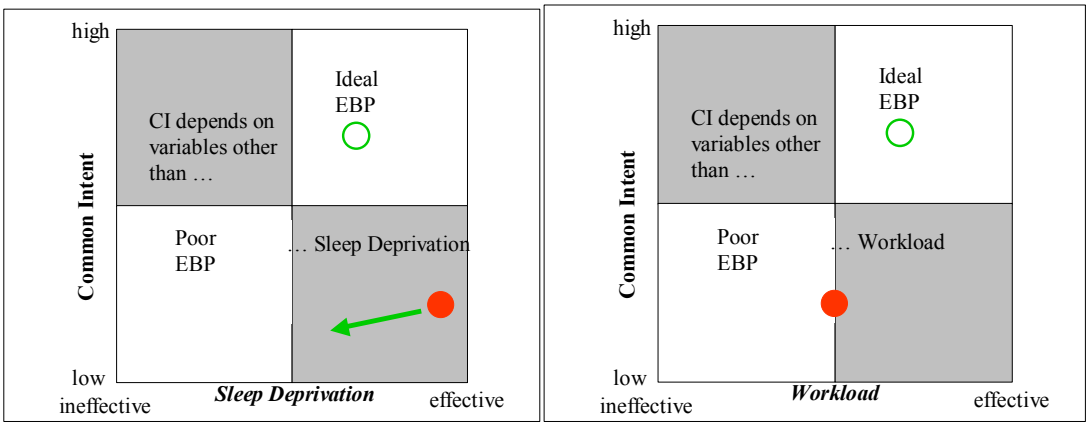


Figure 11. CI compared to Sleep Deprivation and Workload.

Conclusions

Common Intent was measured during an Effects Based Planning experiment. Four independent measures of CI were designed and implemented. Three out of the four methods produced the same result that CI was between medium and low for this event. This result was compared to

preliminary results for Process, Organization, Technology (POT), Sleep Deprivation, and Workload. The comparison helped formulate several hypotheses and recommendations for a way ahead.

The recommendations for POT based on the Common Intent results is that EBP Concept of Operations refinement is required, the organizational structure needs to be optimized, and improvements in technology can only benefit CI albeit to a lesser degree. For example, a tool to promote Common Intent may take the form of a ticker tape reminder that displays Commander's Intent (and any changes to Commander's Intent) during the development of ENAR chains.

In order to determine the relationship between CI and POT more than one data point is required, but MNE 3 yielded only one point. However, MNE 4 hopes to provide another data point. Thus, this work forms the basis for building a CI model for operational JIM(P) Headquarters. This model will help guide the development of EBP POT for future events.

The key result of this study is that Common Intent can be measured in such a complex environment. Furthermore, action consistency seems to be a reliable indicator of Common Intent, and SA probes provide insights into Explicit Intent. For future studies, a more direct method for probing Implicit Intent is required. This may take the form of a demographic survey that captures expectations and values of the players. Also, the ETO itself might also be used to evaluate the independent measures of CI, since it is an observable instantiation of Commander's Intent.

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