

Adaptive Planning, Understanding Organizational Workload to Capability/Capacity Through Modeling and Simulation

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Abstract. In August 2003, the Secretary of Defense (SECDEF) established the Adaptive Planning (AP) initiative [1] with an objective of reducing the time necessary to develop and revise Combatant Commander (COCOM) contingency plans and increase SECDEF plan visibility. In addition to reducing the traditional plan development timeline from twenty-four months to less than twelve months (with a goal of six months)[2], AP increased plan visibility to Department of Defense (DoD) leadership through In-Progress Reviews (IPRs). The IPR process, as well as the increased number of campaign and contingency plans COCOMs had to develop, increased the workload while the number of planners remained fixed. Several efforts from collaborative planning tools to streamlined processes were initiated to compensate for the increased workload enabling COCOMS to better meet shorter planning timelines. This paper examines the Joint Strategic Capabilities Plan (JSCP) directed contingency planning and staffing requirements assigned to a combatant commander staff through the lens of modeling and simulation. The dynamics of developing a COCOM plan are captured with an ExtendSim® [3] simulation. The resulting analysis provides a quantifiable means by which to measure a combatant commander staff's workload associated with development and staffing JSCP [4] directed contingency plans with COCOM capability/capacity. Modeling and simulation bring significant opportunities in measuring the sensitivity of key variables in the assessment of workload to capability/capacity analysis. Gaining an understanding of the relationship between plan complexity, number of plans, planning processes, and number of planners with time required for plan development provides valuable information to DoD leadership. Through modeling and simulation AP leadership can gain greater insight in making key decisions on knowing where to best allocate scarce resources in an effort to meet DoD planning objectives.

1. INTRODUCTION

Secretary of Defense Donald Rumsfeld originated the Adaptive Planning initiative in August 2003 to improve the joint operation planning system. Secretary Rumsfeld believed that the joint operation planning process was too lengthy, existing plans were out dated in the new strategic environment, existing contingency plans could not quickly transition to execution, and the planning system was unable to coordinate military operations within the context of a whole of government response to a contingency or crisis situation [5].

Overcoming the shortcomings of the legacy joint operation planning system, the AP initiative included the following objectives [2]:

- Produce plans on demand in 1 year or less with plan revisions as needed,
- Shape plans throughout development through periodic dialogue among DoD leaders and planners,
- Perform planning in parallel and concurrent at strategic and operational levels,

- Link planning, readiness and force management processes and data in a virtual environment,
- Provide a full range and menu of military options to meet changing circumstances,
- Prioritize plans and planning effort to enable seamless transition to execution
- Determine force, logistic, transportation and operational feasibility throughout the planning process.

The AP initiative increased the workload in the planning community by reducing planning time, increasing planning visibility, increasing the number of plans and increasing the level of detail desired in the planning process.

Leadership in the AP community was sensitive to the increased workload with shorter planning timelines. However, they lacked tools necessary to quantify the increased workload and measure its impact on the existing planning capacity.

This paper addresses the adaptive planning workload to capacity study from a modeling and simulation perspective. Study details are initially presented. The value of modeling and simulation

as it supports complex process analysis is summarized at the conclusion of this paper.

2. ADAPTIVE PLANNING WORKLOAD TO CAPACITY MODEL

AP leadership initiated an adaptive planning workload study to assess the capacity of COCOM planners to develop contingency plans within the guidelines of the AP objectives.

Establishing a common framework from which to look at challenges brought on by AP initiatives was an important first step of this study. Defining metrics, variables and the relationship of those variables to each other was essential in providing a quantitative assessment of workload to capacity. AP documentation discussed timelines for plan development. Additionally, legacy plan development has also been interested in planning timelines. For these reasons, planning timelines was selected as the underlying metric to measure goodness within this study. Planning timelines was selected to become the dependent variable. There were many issues that affected planning timelines. These issues were divided into four themes or independent variables; number of plans, level of plans, number of planners, and white space. Figure 1 provides a graphical representation between independent variables, the work at COCOMs and the dependent variable in the AP Workload Model.

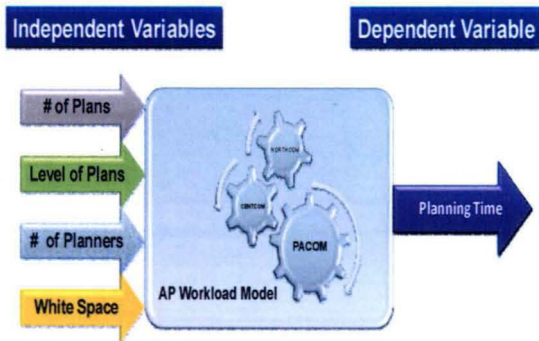


Figure 1: AP Workload to Capacity Model

2.1 Variables

Number of Plans was the first independent variable defined as the quantity of JSCP, Chairman of the Joint Chiefs of Staff (CJCS) and COCOM directed plans assigned to a combatant commander. This includes both the number of plans requiring development and those under review.

Level (Types) of Contingency Plans was the second independent variable defined by the JSCP, CJCS or COCOM directed planning level

(i.e. Level 1, 2, 3, 3T, 4). Contingency planning includes the preparation of four levels of planning detail. Planning levels are further defined as follows:

Level 1 planning (Strategic Concept) requires the least amount of planning detail and is normally completed in the shortest amount of time. Generally, COCOMs complete Level 1 planning in 10-12 weeks. From a COCOM perspective, completion of level 1 planning, documents an initial concept of operations.

Level 2 planning (Base Plan) require completion of strategic concept planning. A level 2 plan contains paragraphs one through five of the standard Operation Plan (OPLAN) format with annexes.

Level 3 planning (Concept Plan) require completion of strategic concept and completion of the base plan planning. A Level 3 plan is an abbreviated OPLAN that would require considerable expansion to be considered an OPLAN or Operation Order (OPORD). A Concept Plan (CONPLAN) contains the base plan, the commander's CONOPS with the appropriate annexes (A, B, C, D, J, K, S, V, Y and Z) and appendixes. If directed by the JSCP, planners do not calculate detailed support requirements or prepare detailed support requirements or prepare Time Phased Force Deployment Data (TPFDD) files. A level 3 plan that contains a TPFDD typically requires more detailed planning for the phased deployment of forces.

Level 4 planning (Operational Plan or OPLAN) contain the base plan, all required annexes with associated appendixes and a TPFDD. The OPLAN identifies planning assumptions and the specific forces, functional support, deployment sequence, and resources to execute the plan. The combatant commander may initiate contingency plans not directed by the JSCP. The format and content for a contingency plan is prescribed in Joint Operation Planning and Execution System [6].

The number of planners was the third independent variable defined as the quantity of planners and subjective quality of planners assigned to a COCOM staff developing and reviewing plans.

The last independent variable is defined as white space. White space was a measurement of the calendar time that it took for a planning function to be completed. More detail defining white space is presented in the next section of this paper.

The AP Workload to Capacity Model had one dependent variable called planning time. Planning time was defined as the calendar time

that it took to complete a planning cycle for the JSCP, CJCS and COCOM self directed plans. In reality, the planning cycle never ends since as soon as a plan has been approved, it goes into upkeep and refinement stage to remain relevant in the changing global environment.

2.2 Adaptive Planning Processes and White Space

In its simplest form white space is a gauge of planning process inefficiencies measured in calendar time. Figure 2 presents a graphical representation of the numerous plan development and review processes and functions that occur and the organizations that participate in those events.

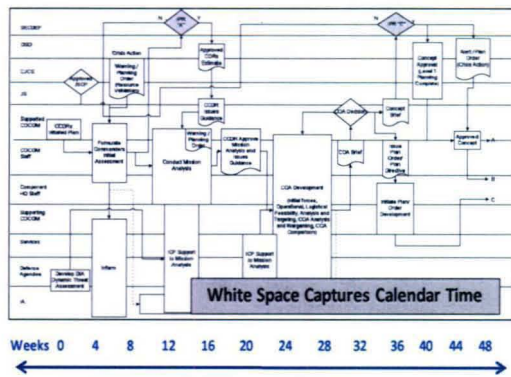


Figure 2: Planning Processes and White Space

Examples of white space occur when plan development or review is halted waiting on a decision brief, additional analysis, or a planning conference where aligning schedules becomes the overriding factor. White space occurs in the time involved in collaboration between organizations. White space occurs in vetting and agreeing to assumptions, enemy threat and force allocation.

Many of the same contingency planning steps and processes employed by planners occur in crisis action planning. Contingency planning is measured in weeks to months; crisis action planning is measured in days. This time difference can be attributed to several factors. During crises action planning there is a clearer view of the threat, a greater sense of urgency in decision making, and priority alignment amongst the stakeholders. This difference in time is a form of white space, where additional layers in the planning process are often added to serve other interests.

2.3 Adaptive Planning Workload Simulation

Using a mathematical formula to conduct analysis is not always the most effective way to

gather data. Oftentimes simulations are more effective tools in analysis. Understanding the relationship between the dependent and independent variables and the large volume of calculations necessary to evaluate the range of issues lent itself to a simulation approach in this study. The simulation language, ExtendSim®, was used to build a simulation replicating the processes and interactions that occur during plan development. Figure 3 portrays two screenshots of the simulation modules that were developed for the AP workload simulation. The larger screenshot portrays the high level modules that represent specific activities within the simulation such as assigning planners to specific plans for development.

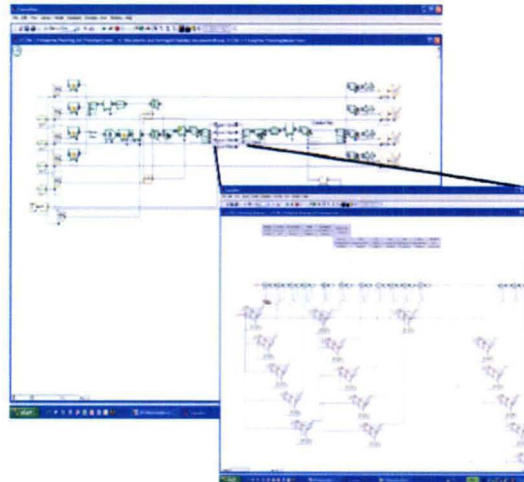


Figure 3: Screenshot of AP Workload Simulation

The smaller screenshot portrays an expansion of the activity that occurs within one module displayed in the larger screenshot. In the example presented, various activities that occur during the development of one type of plan are presented.

The AP workforce model simulation pulls data from an Excel® spreadsheet containing data collected from the COCOMs. The data was collected and triangulated by three sources; anecdotal information and document review, site visits and video teleconferences, and surveys. The survey was developed following the research phase of this study and site visits to ensure appropriate survey questions were being asked. Furthermore, sample model runs were conducted on notional data to ensure that the data collected from the survey would provide the necessary information to conduct meaningful data analysis. The data collection survey was sent out as a formal task from the Joint Staff.

Most COCOMs had their lead planner sign off on the data submission.

The purpose of this model and the underlying analysis is not to be predictive on the amount of time it takes COCOMs to develop their plans but to show the relative impact of changes in planner workload, policies and resources. The number of plans and plan level determines workload. Planning inefficiencies and resources affect the planning timelines. And the number of planners, their availability and training determines resources.

3. DATA ANALYSIS

The primary objective of the data analysis was to provide a quantifiable basis to compare variables that affect planning timelines. Four independent variables (white space, plan complexity, number of plans, and number of planners) were assessed in isolation relative to their impact on planning, see Figure 4. Additional insights were gleaned by comparing the affect of the independent variables with each other. The independent variables were adjusted in 10% increments up to 30%. Adjustments were made that positively and negatively affected the dependent variable (planning time).

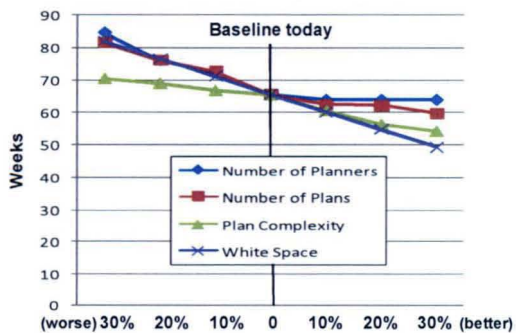


Figure 4: Comparison of Variables

The four independent variables appear fairly linear. Zero on the x axis represents status quo today. Values left of zero represent worsening conditions while values to the right of zero represent improving conditions. The y axis represents average days required for all of the plans to be processed through one cycle. This represents the total plan development and review workload. In reality, the concept of a living plan implies that plans are never complete. Once they have been approved at the appropriate level, review begins again based on changes that have occurred since the plan was initiated during the previous cycle. As discussed earlier, underlying assumptions are always being challenged. This simplistic view of averaging the time it takes for all of the plans to complete their journey from JSCP release to

plan approval (for a new plan) or plan review (for an existing plan) allows for a baseline from which to conduct analysis.

Figure 4 depicts four lines with varying slopes. Variables with greater slopes have a larger impact on planning timelines than variables with lesser slopes. For instance, changes in white space have a greater impact on planning timelines than plan complexity. In this example influencing the time it takes to complete all plan approvals/reviews has a greater impact than changing the level of some of the plans.

4. SENSITIVITY ANALYSIS

Sensitivity analysis is treated from two perspectives. The first perspective explores changes in the baseline date. The second perspective evaluates data ranges provided by COCOM surveys.

4.1 COCOM Input Data

First, the point of the exploratory analysis is based on evaluating changes in the input data collected from the COCOMs. The primary analysis of this study is based on changes to the input data in an attempt to address how sensitive the input data is to change. For example, manning level sensitivity relative to the planning timeline is tested by changing planner manning levels by plus or minus ten percent increments.

4.2 Baseline Data and Changes to Input Parameters

Second, as stated in the previous section, the COCOM data reflected a range in planning times from plan to plan and from COCOM to COCOM. Even within the same type of plan (level 3) at the same COCOM, planning times could be different. The independent (input) data was collected and placed into one of four bins; minimum time, maximum time, most likely time, and stochastic (based on Monte Carlo distribution). The minimum and maximum times bound the timeline range. The most likely data was obtained as the theoretical value that the data would represent if only one data point could be used. The stochastic data source represents the corresponding time it would take to develop and review plans averaged over 100 model runs if the time required to develop and review a plan was randomly picked between the minimum and maximum times the COCOMs provided. Since data analysis focused more on the delta between the baseline data and changes to input parameters, the sensitivity of input parameter was evaluated. Figure 5 presents a sensitivity comparison of plan quantities based on using maximum, most likely, stochastic, or minimum

planning timelines. The "X" axis represents changes in plan quantity from -30% to 30% in 10% increments. For example, if a COCOM developed or reviewed 16 plans (baseline value) with a given amount of resources, how would the planning timeline change if the number of plans varied from 11 to 21 utilizing the same resources? The "Y" axis represents the percent change in the planning timeline using the baseline COCOM data. Point A depicts that for a 20% increase in the number of plans there is a corresponding increase in the planning timeline by 11%.

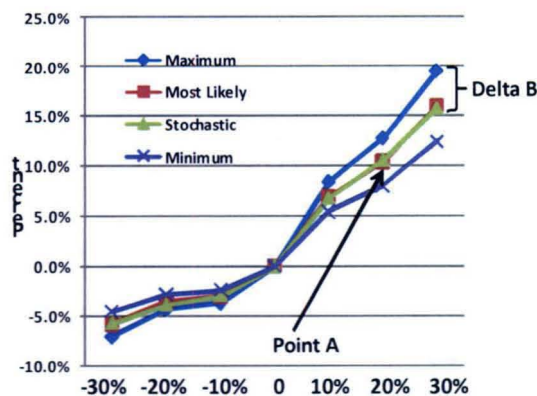


Figure 5: Plan Quantity Sensitivity Analysis

The four lines represented in Figure 5 depict different perspectives of the COCOM survey data. Point A reflects no difference between the most likely COCOM data and the stochastic data. Delta B represents the difference in using the most likely or stochastic data and maximum data from the COCOM survey. Specifically, when the number of plans increased by 30% the time required to develop and review plans increased by about 16% when using the most likely or stochastic data and increased by about 19% when using the maximum time data from the COCOM surveys. If the analysis was not sensitive to the COCOM input specifying the length of time required to develop and review a plan, there would be no delta. Inspection of Figure 5 reveals less than a 0.2% delta between the most likely data source and the stochastic data source in model runs where the number of plans was varied by $\pm 30\%$. Figure 5 also reflects a delta of up to 4% between the most likely and maximum times as depicted by delta B. The delta is less for all other comparisons of data sources.

There is some sensitivity (up to 4%) between the most likely planning timeline and the maximum planning timeline when the number of plans is increased by 30%. There is less variation for other quantities of planning changes. The overall variation is relatively small, providing a degree of

confidence that the COCOM timeline data that was used for the data analysis accurately portrays COCOM planning timelines.

5. ANALYTIC INSIGHT

The data collected from the COCOMs was based on existing planning processes. One of the tools used during the TPFDD development phase for those plans that required TPFDDs was Collaborative Force Analysis, Sustainment, and Transportation (CFAST). CFAST [7] is a portal-based, collaborative campaign planning tool that provides a set of business tools and supporting infrastructure that shortens contingency and crisis action planning, command exercises, force modernization studies, and analysis. Real time data immediately updates interactive map displays and other visualizations for continuous monitoring and effective response to dynamic situations. CFAST was plagued with various problems that prevented the tool from working as effectively as was desired. After the COCOM data had been collected, CFAST as a planner's tool was terminated.

During the socialization of this study with some of the COCOMs, concern was raised that the data analysis provided over optimistic timelines. Those timelines were based on COCOM data that assumed CFAST was supporting TPFDD development. With the cancelation of CFAST, a couple of the COCOMs indicated their planning timelines during TPFDD development doubled and that three planning conferences were now required where only one was needed before. This information provided a unique opportunity to assess the loss of CFAST from the perspective of the model developed for this study. As expected, overall plan development timelines increased as a result of increases in TPFDD development timelines, though not as much as one would expect. Not all COCOMs have plans requiring TPFDDs and those that do, only a fraction of their plan portfolio contain plans with TPFDDs. Some TPFDDs contain only a few hundred units while others contain thousands. Overall, the model showed an increase on average of 7% across all plans. The data from one COCOM that has a very complex TPFDD demonstrated a far greater impact on plan development timelines based on the model. The model indicated as much as a 42% increase in the plan development time for one plan that has an extensive TPFDD. Insights from these additional model runs imply that the use of collaborative planning tools can have a direct impact on plan development timelines.

6. ANALYTIC CONCLUSIONS

The results of numerous model runs have provided useful information to AP leadership on where to focus limited resources. The value of trained planners was reinforced. The impact of collaborative planning tools and the loss of CFAST was quantified. The importance of streamlining planning processes and eliminating white space was validated.

More importantly, decisions by senior leaders in changing the requirement for the number of plans or planning detail can now be quantified. Together, this analysis supports the AP community as they continue to update their strategic roadmap with various initiatives in assisting the planning community in the years ahead.

7. SUMMARY

Military planning has been ongoing for centuries. Changes in the geo-political landscape, the mobility of modern forces, and collaboration technologies have brought about changes in the speed of government within the DoD as it relates to military planning. AP initiatives have codified objectives in changing the visibility, quantity, and frequency of plan development within the highest levels of government.

The AP Workload to Capacity study has provided a tool to assist decision makers on the best use of limited resources in meeting the Departments planning objectives. Reaching the most efficient balance of trained planners, collaboration technologies and policy decisions that affect planning processes forms the cornerstone in meeting planning timeline objectives.

The field of modeling and simulation was instrumental in providing AP decision makers the analysis and tools necessary to assist the Joint Planning and Execution Community. Future work by the Adaptive Planning Implementation Team will leverage the foundation of analysis brought about through computer simulation.

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