Development of a Cognitive Competency Model using a Hybrid Methodology

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ABSTRACT

Competency models explain the nature of effective performance within an organization and are often used as a framework to guide the development of training interventions. Competencies reflect a person's potential to meet cognitive demands in learning and behavioral domains (Hartig, Klieme, Koeppen, & Leutner, 2008). The application of Competency Models has been rapidly growing in popularity; however, research has not kept up-to-date with these advancements leading to criticisms over their effectiveness and scientific underpinnings. Researchers debate the over generalization of competencies such as "Teamwork" and "Communication" that make it difficult to apply the results to training development because they lack concrete behavioral or cognitive indicators. The models that include indicators tend to focus heavily on discrete behaviors, which make it difficult to transfer to cognitively complex domains. The most serious limitation is the lack of a standard methodology that is accepted in the literature that can ensure valid and reliable inferences. Researchers have suggested the need for a hybrid approach that capitalizes on the strength of different methodologies. To date, no research has been done towards this solution.

This paper takes the first step at addressing these limitations by applying a hybrid methodology. This procedure draws on the strengths of Cognitive Task Analysis (CTA), Traditional Job Analysis, and Competency Modeling methodology to develop a performance model that provides the detail necessary to develop training interventions. We conducted 12 interviews, a series of card sorts, developed and distributed task and KSA surveys to eight Subject Matter Experts (SMEs), and performed qualitative and quantitative analyses. The final model consisted of 11 competencies that were specific to the domain of military planning with their associated knowledge, skills, cognitive abilities, and tasks. The model has been used to restructure performance appraisal systems, to develop defensible job position descriptions, and to evaluate current training of military planners.

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Iris D. Rivera is an Industrial Organizational Psychologist for the Cognitive Performance Group. Her research practice focuses on the application of cognitive competency modeling to support cognitive skills training and assessment. She conducts qualitative and quantitative analysis of simulation-based and cognitive task analysis interviews to produce models of expertise, development, and performance. She uses cognitive competency and other analyses to create situational judgment tests and other cognitive metrics. Dr. Rivera is currently supporting the Marine Corps Small Unit Decision Making initiative by developing a SUDM assessment battery. Other recent efforts include construction of a Joint Decision Training Toolkit and modeling of military planner expertise for purposes of personnel selection and training. Dr. Rivera previously held positions at the U.S. Army Research Institute for the Behavioral and Social Sciences, The Center for Organizational Effectiveness at Florida Tech, and Adecco Spain.

William A. Ross is a Principal Research Scientist at the Cognitive Performance Group, of Florida. His research interests include investigation into the nature and acquisition of cognitive and intuitive abilities for tactical decision makers and the application of experiential learning to support the development and assessment of small unit leaders. He is currently performing research involving the development and application of methods for mapping, assessing, and influencing individual and team mental models within Irregular Warfare and Counterinsurgency operational contexts. He also served as a cognitive scientist supporting the spiral development of the Future Immersive Training Environment, a prototype experiential mixed reality system for improving cognitive abilities within small tactical units.

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BACKGROUND AND PURPOSE

Across the military forces, an increasingly popular methodology for analyzing job performance and examining readiness of the force is Competency Modeling (CM). Its lure comes from the quick turnaround of results, in contrast to Traditional Job Analysis (TJA), and the model's dual purpose as a gold standard for success and a communication or branding vehicle that can be easily disseminated to the troops. Competency models explain the nature of effective performance within an organization and are often used as a framework to guide the development of training interventions. More specifically, competencies reflect a person's potential to meet cognitive demands and express cognitive agility in learning and behavioral domains (Hartig, Klieme, Koeppen, & Leutner, 2008). The application of competency models has been widely practiced; however, research has not kept up-to-date with these advancements leading to criticisms (Figure 1) over its effectiveness and scientific underpinnings. In fact, CM often produces incomplete descriptions that fail to support selection, training, or appraisal processes. This is an inadequate representation for military leaders who must be agile and function within complex, adaptive job contexts. For this reason, this paper proposes and tests a hybrid CM procedure that includes TJA, Cognitive Task Analysis (CTA), and CM to form a Cognitive Competency Model (CCM).

Among researchers and practitioners there is little agreement or established processes for developing competency models. Additionally, a recent study conducted by the Society of Industrial and Organizational Psychology (SIOP) task force compared CM and TJA and found that CM was consistently less rigorous than TJA (Schippmann et al., 2000). In CM the focus has been on how quickly subject matter experts (SME) can identify the competencies needed to perform complex tasks. In fact, instead of analyzing competencies, a less rigorous approach commonly used consists of selecting competencies from a pre-determined competency library. This approach is flawed because any deficiencies in scientific methodology will translate into deficiencies in later applications and measures.

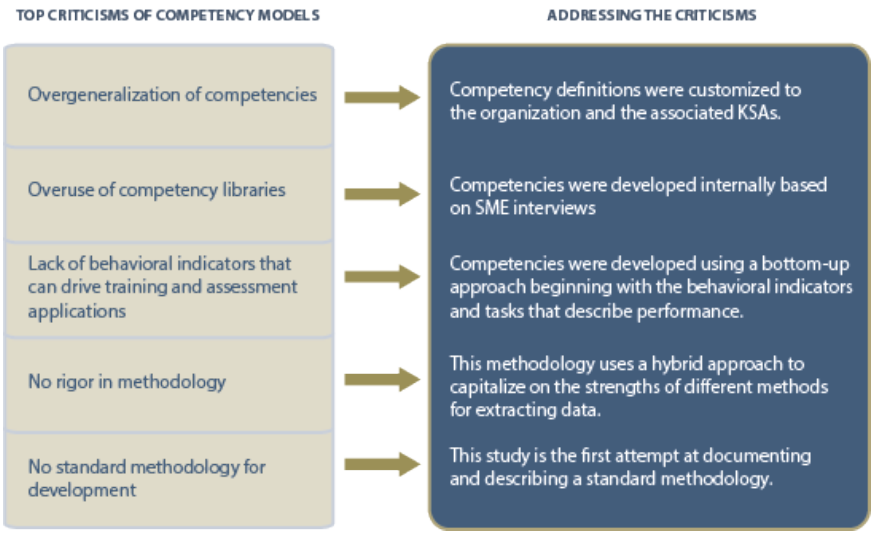

Figure 1: Competency Modeling Criticisms

Another criticism of current CM practice is the tendency for the competency to be overgeneralized, which makes it difficult to meaningfully apply the results to training or assessment that are expected to yield an agile and adaptive military force. Consider the following competencies from a large U.S. manufacturing company: Technology, Large-scale operations, Research development, and Product development. It is clear that these competencies do not clearly distinguish the organization from other manufacturing competitors. Additionally, there is insufficient detail for training developers or assessors to apply the results to training development because they lack concrete behavioral or cognitive indicators. The models that include indicators tend to focus heavily on discrete behaviors, which make

it difficult to transfer to cognitively complex domains. The most serious limitation is the lack of a standard methodology that can ensure valid and reliable inferences. Researchers Catano, Darr, and Campbell (2007) have suggested the need for a hybrid approach that capitalizes on the strength of different methodologies. To date, no research has been done towards this solution.

In light of the criticism, this study focuses on a set of highly specialized military planners and implements a blended approach to CM. The benefits of a blended approach include improved accuracy and quality of the inferences made from the CM because it capitalizes on the strengths of each method (Catano, Darr, and Campbell, 2007). The addition of the CTA methodology adds a cognitive dimension to the analysis of job tasks that are increasingly needed in the complex, cognitively challenging, and rapidly changing world of the military planner. The CTA outcomes document the cognitive demands, decision requirements, and human cognitive processes associated with proficient performance. Furthermore, this blended approach provides flexibility by allowing the user to focus on the appropriate level of detail. This increased flexibility supports a greater range of applications from assessment or training scenarios to a generalized set of descriptors to support organization development processes (Shippmann et al., 2000).

The resulting CCM will supplement the use of CTA/TJA rather than displace it. However, there are some distinct differences between the final CCM and traditional CTA and job analysis that must be noted. The major differences can be summarized within the areas of (1) marketing approach, (2) view of the job, and (3) focus of the model. A key difference is that the CCM representation was purposefully designed to be eye-catching and simple to remember with the goal of being able to easily market the model across the organization. In this way, the model is clear to the employees and they can effortlessly apply its components to their work lives. On the contrary, results of a CTA and TJA often require a trained analyst or scientist to be able to decipher the meaning of the long and complex tables and figures. This in turn makes buy-in and application more difficult. Another difference lies in the way the job is viewed during the analysis. In TJA the job is viewed as a fixed entity where the job does not change from employee to employee (Sanchez & Levine, 2009). Instead, during the development of the CCM the job is considered to be influenced by the personal characteristics of the employee and in turn this impacts the job. The last major difference is the focus of the model. As implied by the name, TJA and CTA focus solely on the job and do not consider other factors beyond the formal responsibilities and equipment prescribed by the job (Sanchez & Levine, 2009). CCM however builds on the job by working off the premise of organizational themes that apply across the organization and are tied to the organizational goals.

This paper details an innovative CCM development process, which we have pioneered and demonstrated. The research includes 12 critical incident interviews, team ranking, and simulation interviews; a series of card sorts to identify tasks and KSAs for the model; a task and KSA survey developed and distributed to eight SMEs; and, qualitative and quantitative analysis. The results and discussion will summarize the findings and describe the final model as well as provide recommendations for future application of this methodology.

DEVELOPMENT PROCESS

The development process for the Cognitive Competency Model of a Specialized Military Planner involves innovative strategies for collecting data and unpacking the cognitive and behavioral elements of high performing, cognitively agile individuals. These strategies are not typically implemented for competency modeling but they provide the bridge that connects broad and general competencies to more informative descriptors.

Participants

The subject pool consisted of 12 highly specialized military planners, who demonstrated a unique ability to effectively manage ill-structured operational problems. Although, this may seem like a limited sample size, it reflects the small number of individuals who make up the population for this job position. Additionally, the types of interviews conducted are specifically tailored to small sample sizes. For the post-interview surveys, eight of the 12 participants responded to the scaled items.

The participants in this study were field grade officers or senior Government civilians who operated on planning staffs in Joint headquarters. The participants had Army, Air Force, or Marine Corps experience. All had multiple

deployments, where they reported using specific abilities to make sense of complex situations, conceive of solutions, take the perspective of others, and communicate recommendations to others. They possessed diverse military backgrounds and educational achievements. They were knowledgeable of military doctrine and its application; grasped policy and its implications; and worked effectively in team settings with little direction or supervision.

Materials

The following materials were the primary tools used for extracting and analyzing the knowledge and lived experiences of highly proficient military planners, who were identified as having a knack for problem solving, systems thinking, and working with ill-structured problems. Data collected using these materials served as the foundation of the Cognitive Competency Model for this population.

Informed Consent Form
The interview participants were asked to sign an informed consent form stating that they were participating in the interview as volunteers, that they could discontinue the interview at any time, and that they understood that no classified information was to be discussed during the interview.

Interview Protocols
We administered three types of interviews that focused not only on the tasks and discrete behavioral actions required on the job but also the challenging cognitive elements that are typically difficult to describe. The goal was to adopt a multi-method technique that would fully capture the elements of a top performing military planner. An interview protocol was developed for each interview consisting of a Critical Decision Method, team ranking, and simulation interview.

The Critical Decision Method (Hoffman, Crandall, & Shadbolt, 1998) is an interview technique that focuses on the major decisions conducted during a critical incident. The protocol guides the interviewer through lines of questioning that focus on highlighting the unique cognitive elements that are often overlooked during competency modeling interviews. Some examples of elements the questions highlight are cues in the environment, reasons for difficulties, and expectancies.

Team ranking interviews ask participants to describe the attributes of highest and lowest performing peers and rate each on a scale from 1 to 10, where a rating of 10 is the very best performer. No identifying information was requested. Additionally, they are asked to rate themselves on the scale and describe their strengths and limitations as planners. The protocol consists of items that focus on understanding the behaviors, knowledge, and skills of high and low performing military planners from the perspective of the participant.

The goal of the simulation interview was to present a novel problem to the participants and have him talk us through his problem solving process. The simulation interview protocol consisted of a “day in the life” scenario during which participants are asked questions at various points along the trajectory of the scenario. The protocol was developed closely with an SME and consisted of six segments that addressed the key decision areas for highly specialized military planners. Information from each segment was used to characterize performance of the best performers as well as isolating challenges that less experienced planners would encounter.

Content Analysis Code Form
The purpose of the content analysis code form is to have a central database where all the data elements from the interviews can be grouped and manipulated. The code form included the subject identification number, data from the team ranking such as the rating and team ranking concepts, elements from the Decision Requirements Table (DRT) analysis, tasks, and potential KSAs.

Survey
The surveys administered to participants listed the final tasks and KSAs and asked participants to rate the importance of each for effective job performance. Each item was on a 5-point Likert scale ranging from 1(Not important) to 5(Crucial). An example of a task item is, “Mentor and train incoming planners in order to facilitate learning and integration into the field.” An example of a KSA item is, “Knowledge of terminology used by military and non-military agencies.” Each participant was provided three surveys to reduce the cognitive load. They were given 1 week to complete all three surveys.

Procedure

The Cognitive Competency Model was developed following a five-step process, where each step built on the outcome of the previous. Step 1 consists of conducting a variety of interviews. In Step 2, the interview data undergoes a content analysis. Based on the content analysis of Step 2, the necessary tasks and KSAs for a military planner are identified in Step 3. Step 4, the validation surveys are developed, administered, and the data are analyzed. In the final Step 5, the team meets to determine and finalize the set of enabling and operational cognitive competencies. This process is illustrated in Figure 2.

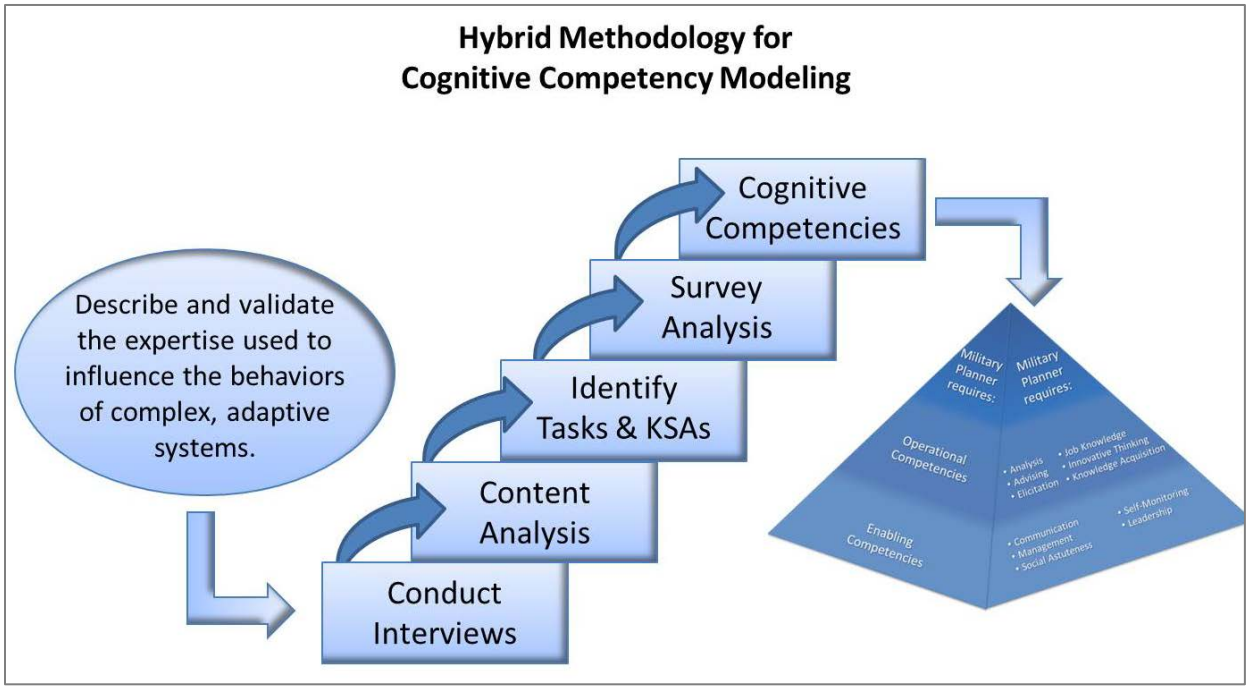

Figure 2: A Design for Creating Enabling and Operational Competencies

Step 1: Conduct Interviews

Typically competency modeling interviews involve stakeholders describing the general competencies they believe are required of top performers or discussions regarding general incidents that describe good and poor performance on the job. These techniques often result in gaps in knowledge of the cognitive elements required on the job. For this reason, we adopted a multi-method approach that extracts information from SMEs using different avenues of data collection.

Before each interview session, interviewees were asked to review and sign the Informed Consent Form. Participants were asked permission to digitally record the interview, with the assurance that the recording would only be used within the project team, and that remarks would not be attributed to them individually. Then, interview protocols for each interview were applied for the remainder of the interview. All interviews were conducted with two researchers; a primary interviewer that directed the flow of the interview and a secondary interviewer that took notes and verified that the interview protocol was being followed. The Critical Decision Method interview lasted two hours, the team ranking lasted 30 to 45 minutes, and the simulation interview lasted an hour. Participants were provided breaks between the interviews. Generally, all interviews were conducted within four hours.

Step 2: Interview Data Content Analysis

For the analysis process, each interview type was analyzed individually before compiling into the final coding form. Each interview has a distinct analysis procedure that focuses on extracting as much relevant knowledge as possible.

Data from the Critical Decision Method and the simulation interview underwent a decision analysis by constructing a Decision Requirements Tables (DRT) documenting the major decisions made by each interviewee. First, all

recorded interviews were transcribed. Next, an analyst individually developed a DRT for each interviewee. The process for developing a DRT consisted of multiple sweeps through the interview transcripts. Each sweep focused on the identification of different types of cognitive requirements. The first sweep identified decisions, cues, factors, and reasons for difficulties. The second sweep focused on goals, expectancies, and situation awareness requirements. As these data were extracted from the interview transcripts, they were represented in DRTs. The DRT is a format enabling decomposition and representation of data pertaining to judgments and decision making. It supports the identification of how cognitive components, such as perceptual cues and background factors, inform and guide particular decisions and judgments. The DRTs were anchored around critical decisions and judgments. That is, data in each table are in relation to a particular decision or judgment that is stated in the header of the table. The following categories of data are represented in the DRTs:

- *Decisions* – the major decisions and judgments encountered;
- *Challenges* – reasons the decision could have been difficult;
- *Factors* – information relevant to the decision that was known in advance and applied by the planner;
- *Cues* – elements in the immediate environment that were perceived by the planner;
- *Strategies* – processes or means by which experts would make the decision.

Data from the transcripts were entered into the tables so that for each decision or judgment that was identified, had accompanying cues, factors, strategies, and other cognitive components that are applicable over a range of operational contexts and situations. Key elements from this data set were then entered into the content analysis code form.

Interview data from the team rankings were also transcribed. However, during the interview the data are represented as a set of concepts, behavioral actions, and KSAs for each ranking, which make it easy to translate into the content analysis code form. Therefore, the transcripts were used as a confirmation that information was not missed during the interview. For the final manipulation of the team ranking data all the interview data were grouped so that descriptions of low performers were listed together and descriptions of high performers were listed together. Additionally, KSAs that were described as important were compiled separately to be used later during Step 3 in identifying tasks and KSAs.

All data from the three interviews were then compiled into the content analysis coding form. This form provided a mechanism for joining different types of data elements into one cohesive form. The coding form lists the general concepts, tasks, and cognitive elements from each interview side-by-side for easy comparison. These elements were listed and grouped by similarity to make identifying tasks and KSAs a seamless process.

Step 3: Identify Tasks and KSAs

The goal of this step was to have a list of tasks and associated KSAs that serve as the detailed descriptors of the Cognitive Competency Model. This stems from the data in the content analysis coding form. The final list of tasks was developed based on the concepts found across the interviews. An excerpt of the coding form is displayed in Table 1 below.

This table demonstrates the process of combining data from several interview sources to develop a task. While this table only shows one task per participant and sets of elements, the actual coding form is much longer and may have several tasks per row and compiled from several participants. As an example, in the figure above Participant S1 describes a high performing individual during the team ranking as “organized” as shown in the third column. The fourth column displays details extracted from the transcripts about that concept. The participant specifically said, “We’d go through the steps if I emphasized this to get from start to finish, you follow the process and it will lead you on a logical conclusion…” The fifth column includes elements of the DRT analysis that are similar to the team ranking concepts. In this example the participant said, “…if we are going to move your brigade from A to B, tell me about what process. What’s going to happen? What are those indicators that we did on our mission?” The last column combines all the previous columns to include a brief task that describes whom is conducting what job. This example describes an organized process, thus, the final task is worded as, “Follow an organized process to assist in identifying a logical conclusion to your problem.”

Table 1: Excerpt of Content Analysis Code Form

Participant ID#	Rating	Team Ranking List	Team Ranking Concepts from Transcripts	DRT Elements	Final Task
D3	9.5	Resonates with judge		Planner sells the military planning action to the commander as more worthwhile than other plans of same assets, like direct action or ISR activities. Defend to commander why the plan is good and what it buys him.	Answer decision makers questions regarding the plan to ensure understanding and buy-in.
S1	8.5	Organized	We'd go through the steps if I emphasized this to get from Start to Finish, you follow the process and it will lead you on to a logical conclusion, and he's a firm believer in that. But, he's a checklist person to the extent that he follows the process.	We need to be able to identify and take a look... this is where a guy doesn't have to do it himself...he could go to an Army unit of his own or even to the Intel and say, "okay, if you were going to move your brigade from A to B, tell me about that process? What's going to happen? What are those indicators that we did on our mission? What are those big indicators of you moving?" And then we can help guide those Intel folks to watch for those key indicators, pretty much necessities in making a major muscle movement.	Follow an organized process to assist in identifying a logical conclusion to a problem.
S1	8.5	Highly Adaptive	I mean he's been a planner, he's been a pilot, yes, he's highly adaptive.	Identify the mechanism to adjust the plan, because no plan survives first contact. Adaptive: Quickly grasps the problem and arranges priorities and resources to produce solutions.	Identify and understand the problem to quickly arrange priorities and resources in order to succesfully produce solutions.

This process was used for all participants across the interviews. The final list of 102 tasks was then migrated into CMap tools for card sorting. Two analysts independently sorted the task list to similar groups of tasks. The analysts then meet to agree on the final set of clusters. There were 32 clusters of tasks that describe the major job tasks of a military planner (See Table 2). These task clusters were then matched to the KSAs needed to accomplish those tasks. The KSAs were taken from a previous literature review, from the participant interviews, and from the open-source O*Net. A final list of 126 KSAs was developed with several KSAs linked to each task cluster. Surveys of the list of tasks and associated KSAs were then developed so that SMEs could verify that the concepts were not drastically changed during analysis and manipulation.

Table 2: Results of Task List Card Sort

Military Planning Task List			
Select Team Members	Determining Success of Plan	Apply Background Knowledge/Experience	Study Relevant Literature
Form a Network	Presenting Information	Target Analysis	Manage Self-Performance
Provide Team with Tasks/ Work as a Team	Persuade, Defend, Discuss	Conduits and Collection	Design Plan
Manage Information Dissemination	Accuracy and Details	Target Perceptions and Behavior	Planning Goals
Build Relationships with Teams	Tools for Communicating	Time Management	Follow Process
Mentor and Leadership	Summarizing and Tailoring	Resource Management	Understand Environment/Baseline
Identify/ Understand Requirement	Develop Execution/ Collection Matrix	Wargaming	Identify Assets
Identify Risk	Alternate COA/ Adjusting Plan	Problem Solve	Forming Assumptions

Step 4: Develop, Administer, and Analyze Survey

Using the data set from Step 3, the survey instrument was prepared to verify the attributes and tasks of a military planner. The survey consisted of the list of tasks and KSAs in no particular order on a 5-point Likert scale. The survey was split into three smaller surveys to reduce cognitive load on the participants. The surveys were sent via e-mail to all participants and they were asked to complete it in one week. A reminder email was sent close to the deadline. Eight of the initial 12 participants responded to the surveys.

Data from the surveys were entered into SPSS for ease of data cleaning and interpretation. A frequency count was conducted to determine any missing values. Any missing values were replaced using the series mean function. However, generally the data set was complete. Additionally, rater means were averaged for each task and KSA. The

goal of the survey was to identify only the most critical KSAs and tasks for the development of the cognitive competency model. Only the KSAs and tasks with a mean of 3.0 or higher, from a Likert scale ranging from 1 to 5 were retained. Items with averages less than 3.0 were not used to construct the model.

Step 5: Determine Competencies

Once the item pool had been reduced to the tasks and KSAs that met the cutoff criteria, the final list of KSAs was migrated to CMap tools for card sorting. The card sort was performed by five analysts, who independently clustered similar KSAs. All analysts then met to discuss, compare, and integrate the results across the team. This meeting was a two-day workshop with all five analysts.

The goal of the workshop was to determine the final list of competencies with their associated KSAs and tasks. The process consisted of an analyst identifying a KSA cluster and describing why he or she made that cluster. The remaining analysts would examine whether they had similar clusters and then discuss any necessary revisions until there was a minimum 80 percent agreement between raters. This process continued until all KSA clusters were addressed and were assigned competencies. To ensure a measurable and orthogonal model, no KSA was assigned to more than one competency. After the results were compiled and verified, the team jointly composed an operational and customized definition for each of the competencies based on the KSAs and organizational goals and mission.

RESULTS AND DISCUSSION

The purpose of this paper was to describe an effort to trial an innovative hybrid CM approach that can sufficiently codify the qualities and desired performances of a highly specialized and cognitively agile military force. Traditional competency modeling has been criticized for including overgeneralized competencies and sacrificing scientific rigor in an attempt to have quick results. Conversely, organizations that decide to invest in a customized competency model often find themselves spending hours of employee time and money in long workshops developing job tasks and KSAs. Even so, the process typically used has been criticized for minimal scientific background. It is no surprise that there is no agreed upon process in the scientific community for developing a CM. Therefore, this paper addressed a scientific methodology that provides a quicker process than traditional competency analysis but embedded within a scientific framework.

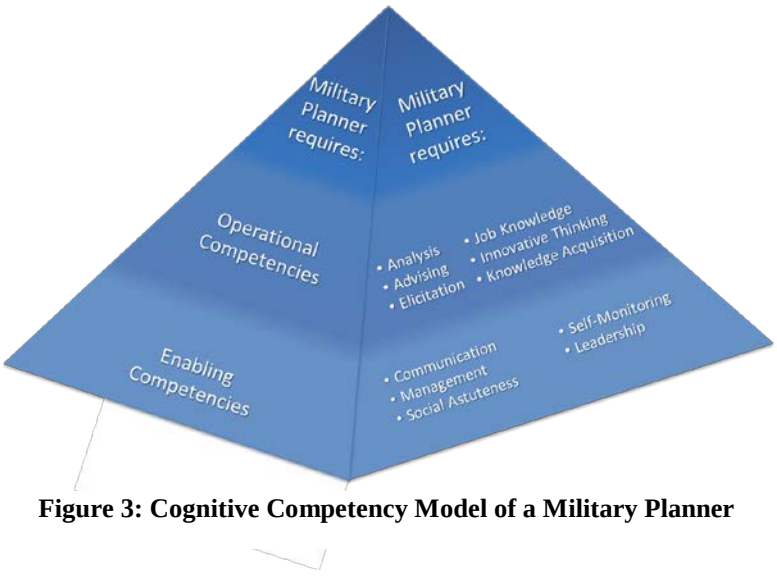

Figure 3: Cognitive Competency Model of a Military Planner

The developmental process consisted of four steps using a multi-method approach to data collection and analysis. In Step 1 a variety of knowledge elicitation methods were applied including Critical Decision Method, simulation and team ranking interviews. Step 2 was the most important because the interpretations during the content analysis laid the foundation for the model. A unique coding form was implemented to sort and analyze the data that came from the different data collection techniques. Step 3 borrows from TJA in that the tasks and KSAs that emerged from the content analysis were sorted into similar groups. Step 4 reduced the large amount of tasks and KSAs to the most essential for the job by administering a survey to SMEs. Step 5 was the final step which led to the Cognitive Competency Model. It was focused on determining the high-level cognitive competencies based on the previous analysis and customizing the definitions to the organization.

The final Cognitive Competency Model for a Specialized Military Planner is a collection of the competencies that are relevant to planning performance when problems are ill-defined, require cognitive agility, and are part of a

complex system. The competencies are an aggregation of knowledge, skill sets, and cognitive abilities with associated tasks used to describe or illustrate the observable actions on the job. Knowledge refers to an organized body of information, usually of factual or procedural nature, which, if applied, makes adequate job performance possible. Skills are the means by which one is able to perform operational tasks with ease and precision. Skills are developed both generally and in-context, and are acquired through practice and training. Ability describes a general and more enduring cognitive capability an individual possesses which is useful for performing tasks. Tasks are behavioral indicators that describe what the worker does, how the worker does it, and to whom/what and why the worker does it.

The Cognitive Competency Model (Figure 3) includes foundational competencies known as enabling competencies that support and set the stage for acquiring and performing the *Operational* competencies. The *Enabling* competencies include *Communication*, *Management*, *Social Astuteness*, *Self-Monitoring*, and *Leadership*. *Operational* competencies are specific to military planning and directly support effective performance in the domain. The *Operational* competencies include *Analysis*, *Advising*, *Elicitation*, *Job Knowledge*, *Innovative Thinking*, and *Knowledge Acquisition*. These alignments were a conscious effort to foreshadow the professional development process that planners would pursue. Each competency is associated with a table that includes the competency's name, definition, KSAs, and tasks. An excerpt of this table is displayed in Figure 4. This figure provides a preview of the Communications competency in the model. The KSAs marked with an asterisk were taken from O*NET database, which is an online database that provides brief job analysis information and descriptions across jobs.

Communication	Preparing and presenting verbal and written expressions of information, tailored to the intended audience efficiently and effectively.
Knowledge, Skills, and Abilities	**Tasks**
Ability to explain technical information to supporting staff members in a way that he or she understands.	Gather, analyze, and continually share information with collection agencies in order to maintain relevant Intel.
Ability to organize facts and materials for presentations.	Maintain rapport with outside agencies (i.e., intelligence) in order to receive feedback pertaining to the plan by fostering open communication.
Oral expression; ability to communicate information and ideas in speaking so others will understand.*	Build a relationship with the commander in order to facilitate a foundation of trust.
Speaking; talking to others to convey information effectively.*	Network with leading experts in order to gain knowledge of the field.
Writing; communicate effectively in writing as appropriate for the needs of the audience.*	Provide precise and accurate information in presentations to ensure understanding of the material.
Knowledge of terminology used by military and non-military agencies.	Provide detailed descriptions of plans and activities in order to provide the audience with a vivid mental picture of the problem.
Ability to communicate with people from a broad variety of backgrounds.	Present summary findings and plans to decision makers in an easy to understand format to ensure an efficient approval process.
Knowledge of communication and dissemination techniques and methods including alternative ways to inform via written, oral, and visual media.	
Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.*	
Speech clarity; ability to speak clearly so others can understand	

Figure 4: Communication Competency Excerpt

By incorporating varying levels of detail (i.e., from higher level competencies to tasks), the model has the flexibility for different applications. The granular levels are helpful for developing training and assessment tools that demonstrate job relatedness. For training, the KSAs serve as the learning objectives for the program while the tasks guide the course content and activities that should be performed. The parsimony of the higher level competencies (i.e., *Operational* and *Enabling* competencies) makes it easier for planners to remember and actually apply the competencies in different aspects of the job (Campion et al., 2011). This parsimony is especially valuable for mentoring new planners. The competencies define the areas that leaders should focus on for developing, improving, and preparing the next set of lean, agile, and adaptable military planners.

Future Applications

The CCM was a pivotal tool for instituting organizational change but its true contribution is the application of a hybrid methodology that can be readily applied across domains and organizational interventions. The final product is a CCM that can be applied throughout the spectrum of human performance, workforce planning, and career development. Table 3 below provides examples of applications of the CCM.

Table 3: Applications of CCM Across Interventions

Future Application	Description
Recruitment	A marketing tool that clearly defines the job duties to potential candidates.
Selection	A tool to screen candidates with the aptitude for a specific job position or specialized training.
Performance Appraisal	A technique for determining the impact of performance on mission accomplishment.
Training Design	An approach for identifying and teaching the KSAs and tasks critical to individual and team performance.
Team Development	A basis for supporting organizational change and development.

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This research benefitted from the participation of highly specialized operational planners, who generously volunteered their insights and experiences. Each participant in this study spoke the language of the warfighter fluently. Despite Operations Security considerations, they contributed recent, relevant experience which allowed us to portray the context accurately. Their candor, clarity, and commitment were vital to our understanding of their roles in Joint headquarters and the critical need to reproduce their expertise in others. We are grateful to the study sponsor for granting us access to this group and supporting our numerous requests for information.

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