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USE OF ANALYTIC HIERARCHY PROCESS MODELING IN THE MILITARY DECISION MAKING PROCESS FOR COURSE OF ACTION EVALUATION AND UNIT COHESION

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Summary: *This article is intended to illustrate how an Analytic Hierarchy Process (AHP) model may be used by military commanders to better integrate staff, understand higher command's mission and intent more clearly, and decide more objectively than other methods used between various courses of action (COA). Additionally, I suggest that AHP modeling minimizes the influence that distracters have on decision-making. I propose that AHP lends itself to the creation of a learning system such that as one gathers additional data or reference points, the model becomes more accurate and reactive. This paper illustrates a way whereby the Army may integrate AHP modeling into its decision-making process to reap greater results from its training through the integration of a knowledge based system (KBS). The intent of this paper is to stimulate interest in AHP usage coupled with KBS for long-term training, learning and COA evaluation.*

1. INTRODUCTION

> "Decision making is knowing *if* to decide, then *when* and *what* to decide. It includes understanding the consequence of decisions. Decisions are the means by which the commander translates his vision of the end state into action." (FM 101-5, p. 5-1)

The intent of this article is not to prove or disprove various COA or to validate various elements of an offensive movement. My intent is to illustrate how AHP may be used by a commander to better integrate his staff, understand higher command's mission and intent more clearly, and decide more objectively amongst various COA. Additionally, I intend to illustrate how AHP when used in combination with a knowledge based system may assist the Army to make better strategic decisions, train the force with greater efficacy and learn more rapidly than current training environs allow.

There exists within the military certain schools of thought within which the leaders argue that priority generation based on numerical assignment is more subjective than other methods available. In fact, these leaders argue that evaluation methods such as the Franklin[1] method are more objective and hence lead to better decision making over-all. The genesis of this paper came from an internal training situation at the battalion staff level in which the argument for the "+" and "-" system for COA evaluation was presented as a more objective evaluation tool than numerical assignment.

I argue that the Franklin method is a subset of AHP and therefore one may still use this method in conjunction with the AHP model but that the AHP system produces more consistent results and better decision-making overall. Additionally, as previously stated, the AHP method allows for consensus building that facilitates cohesion amongst the staff and a better understanding of the mission requirements for all parties involved. Given the time, human and material constraints placed upon the commander as well as the

[1] The Franklin method is a way to evaluate alternatives by comparing the positives and negatives in an accounting style spreadsheet.

consequences of a poorly chosen COA, a well-evaluated decision is a must. The question for the commander, given these constraints, is how to decide between the various alternatives in an objective manner that maximizes resources and minimizes losses while constrained by time.

Until recently there was no singular way to make objective decisions between various courses of action. Hence, decisions were often influenced by pride, money, social obligations and political aspirations to name only a few of the distracters that influenced a leader's decisions. Previously, the Army employed 'experts' to make decisions at critical junctures. The method the Army or any military used was to place its Generals in a strategic command with subject matter experts subordinate to him that provided valuable information in a timely manner to the Commander so that he can affect movement on the battlefield in such a way as to ensure success. The problem with this is that leaders may have been ill prepared to take the position, the leader may have had ulterior motives that clouded the Military Decision Making Process (MDMP), inter-personal conflicts, or an over-estimation of the units abilities that interrupt sound decision-making. Additionally, the transfer of knowledge from subject matter experts to the commander implies the transfer of heuristics that only comes through experience. The difficulty is in the transfer of heuristics form experts to the decision makers, those individuals placed into positions without the experiences that provide the expertise necessary to make appropriate decisions.

The competitors have not been removed but there is a method to minimize the influence that these distracters have on multi-criterion decision making. "There is one and only one way to assign objects meaningful relative magnitudes and that is to compare them in relative terms" (Saaty, p.15, 2001), namely, decision making through AHP and the more generalized format of the ANP. Additionally, if the Army works to integrate the knowledge learned from its various training exercises such as JANUS and WAR FIGHTER as well as its historical data and future lessons learned into a KBS, then, I argue, better decisions may be made more rapidly through better prioritization based on larger data sets. The KBS will provide the commander with information about tactics, force ratios, strategy and various COA previously used against anticipated competitors more rapidly while allowing better integration of the command group and more time for subordinate units to plan; KBS use will allow for a truer 1/3 : 2/3 time allocation that the Army strives for.

2. AHP

> The Analytic Hierarchy Process is a general theory of measurement. It is used to derive ratio scales from both discrete and continuous paired comparisons in multilevel hierarchic structures. These comparisons may be taken from actual measurements or from a fundamental scale that reflects the relative strength of preferences and feelings. The AHP has a special concern with departure from consistency and the measurement of this departure, and with dependence within and between the groups of elements of its structure. […] In its general form, the AHP is a nonlinear framework for carrying out both deductive and inductive thinking without use of the syllogism by taking several factors into consideration simultaneously and allowing for dependence and for feedback, and making numerical tradeoffs to arrive at a synthesis or conclusion. (Saaty, p.25, 2001)

The AHP model allows for the development of a multi-criterion decision making model with dependency and feedback, consistency measurement, and sensitivity, and that lends itself to a KBS such that as one gathers additional data or reference points, the model becomes more accurate and reactive. The challenge in the development of this model, as with any decision making network, is the selection of subject matter experts in order to develop the primary model.

The Army manual for *Staff Organization and Operations*, FM 101-5, states that a commander's involvement in the military decision making process (MDMP) will be dependent on several factors to include his preference, time available and the experience and accessibility of the staff (FM 101-5, p.5-1); the less experienced the staff, the more time intensive or less accurate the outcome may be. This is not to say that the staff is deficient in decision making but rather that the staff may lack some of the heuristics that come from time, education and experience. Hence, the development of the AHP model should initially be heavily dependent on subject matter experts. The criteria for what constitutes an expert are dependent on the field and on the professionals within the field. For instance, in tactics, one would likely want to choose a combat veteran with proven tactical proficiency. Fortunately, the Army has a vast library of lessons learned and doctrine to assist the command staff in this process.

2.1 Development of the Model: Mission Analysis

> "The result of mission analysis is defining the tactical problem and beginning the process of determining feasible solutions." (FM 101-5, 5-5)

The first process in the development of the model is assembling a panel of experts; I call each step a process because this is an on-going event that will adapt to the protean environment as time, situation and priorities change. The Commander assembles his staff for an initial MDMP process and tasks each of his sections to conduct efforts in the same manner that they normally would with the exception that one of the products that they produce during the MDMP process is an AHP model with the purpose that it will be included in the war-gaming process.

The initial development of the AHP model may be conducted congruently with the MDMP process and therefore not take away from the limited amount of time available. Ultimately, I argue, that the database that the Army may maintain of information from years of 'learning' will actually allow for a more rapid mission development and a more responsive military to changing environment. The current military doctrine allows for this in part already: "staff officers should develop a generic list of requirements for particular types of missions to help them prepare for the mission analysis process" (FM 101-5, p.5-3). I argue that if the Army adopted a KBS based on the AHP format, the "generic list of requirement" would be readily available for any commander with trends and priorities assigned thereby allowing for a more battle-focused staff. However, at this point, let us assume that the staff received the mission and has begun the MDMP process by issuing a warning order to subordinate units and is ready to begin the mission analysis. The warning order informs subordinate unit of an impending mission to allow them to begin their necessary movement while the Command Staff exercises the MDMP process in order to finalize its operation order.

An important expectation of the mission analysis process is that the staff must 'nest' all aspects of its operation within vertical missions and must be congruent with horizontal units' mission. In FM 101-5, the Army identifies 17 steps to mission analysis that provide either data points for entry in the mission evaluation or provides the framework for the AHP model itself. For instance, in step 2, "Conduct Initial Intelligence Preparation of the Battlefield (IPB)", information such as force ratios, travel rates and weather are determined that may be input as either direct data or as verbal assessments into the system for evaluative purposes. Additionally, as the battle progresses, changes in ratios and conditions may be fed into the model to reevaluate COA. Additionally, during the IPB, the Intelligence staff develops the enemy's most likely, least likely and most dangerous COAs that become part of the AHP model and directly influence the selection criteria for the friendly COA. Typically, the Command Staff, constrained by time and resources is only able to war-game one of the various enemys' COA and hence the Staff is unable to fully consider the various contingencies that it may face.

During step one of the 17 steps to mission analysis, "analyze the higher headquarters' order", the elements that will provide the framework for the model are generated as in figure 1. The battalion staff determines key elements to the success of the mission such as tasks, constraints, risks, available assets and the area of operations (FM 101-5, p.5-5). In determining these factors from the higher headquarters' warning order (WARNORD) or operations order (OPORD) the staff is also able to begin the process of determining some of the subsets of criteria necessary for evaluation that will be integrated into the over model evaluation. One crucial element of information are the commander's critical information requirements (CCIR) that include priority information requirements (PIR), information requirement (IR), friendly forces information requirements (FFIR), and essential elements of friendly information (EEFI)[2]. Gaps in knowledge in any one of these various areas affect COA selection and as information is gathered may alter priorities. Hence, a model that is reactive to changes in the battlefield environment is a must.

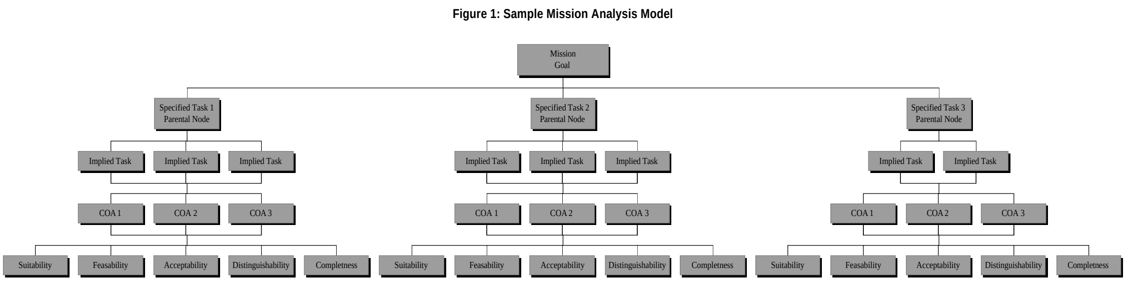

Figure 1: Sample Mission Analysis Model

Priorities are generated based on ratio scales developed from relative measurements of nodes in relationship to "parental" nodes and an ultimate goal. When evaluating COA, the Goal, which is derived from the command authority's mission statement, is broken down into its various specified and implied tasks such as the model in figure 1. For instance, the Goal may be "Seize and hold Objective Dog with no more than 10% loss no later than 1000 hours 30APR03." A specified task in this Goal is that the Commander accomplish this mission by 10am on the 30th of April; an implied task is that the Commander must move his troops from their current location to the Objective by a time that allows him to accomplish everything necessary in order to accomplish the mission by the specified time.

In the evaluation of the COA, the Staff asks a series of pair wise comparison of the sort: "with respect to the Specified Task 1, Implied Task 1 is more or less important than Implied Task 2 and to what degree?" This is done for each set of children per parental node. The questions may be ranked on a numeric scale or by verbal rankings; this is done based on commander preference and may be selected based on one of the various decision support matrices presented in FM 101-5, pp.5-25-26. The comparison of the nodes allows for alternatives to be ranked based on a standard that has been developed through individual experience. With unconstrained time and full participation of the Command Staff, the evaluation process takes place in the form of a complete war-gamming effort. Typically, the staff is limited by time and is forced to war-game only the most likely COA in an abbreviated COA evaluation. The full process would allow the Staff to war-game all three COA – most likely, next most likely, and most dangerous – such that as the Staff evaluates each Battle Operating System (BOS) by phase through the entire battle, then the corresponding outcome may be input into the AHP system. The result of the full war-game is a more robust model for the particular mission.

For instance, the Executive Officer of the Battalion, responsible for managing the war-gamming process, may start the process indexing the process at 'H'-hour minus 48 where 'H'-hour is defined as the time of the anticipated main battle. The process may begin with what occurs in the Intelligence cell at H-hour minus 48 on the friendly side. In response to how the Intelligence cell acts at this time, the Staff then attempts to anticipate how competitor forces will react to the Intelligence cell's action and the resulting consequences that will precipitate the Intelligence counter-action. This process continues through each of the various BOS through each of the various anticipated phases of the anticipated battle. Therefore, the process may proceed Phase I – BOS 1 – action, reaction, counteraction; Phase I – BOS 2 – action, reaction, counteraction; etc. This is a time intensive process is carried out from beginning to end.

Typically, the Commander has a limited amount of time and must decide on one friendly COA based on his *belief* in what the competitor is going to do and how he will be arrayed based on information that the S-2,

[2] I will not go into detail at this point on the differences and functions of each of these CCIR but further details may be found in FM 101-5, FM 34-8-2 or FM 34-130.

the primary Intelligence Advisor to the Commander, provided. The Commander and his staff are often able to War-game only one set of COA. The entire war-game process is becoming increasingly difficult as the pace of the battle field increases, global threat mobility rises, and political events move more rapidly. Once, it would take armies months to move into engagements. The time to contact would allow Commanders opportunities to gather the necessary intelligence to make decisive actions on the battlefield or at least learn more about the enemy that they would face. In today's combat environment, an army may move across the world in short intervals bringing the battle to the commander in less time. Additionally, with terrorist activities and limited engagements, the commander may have amore difficult time anticipating the threat. Hence, more timely analysis of all of the options available to the commander is necessary. The ANP model allows for the commander to take past engagements and input the data into the decision making model along with new knowledge about the enemy and additions to his own combat force in order to make a well informed decision.

The current speed with which the most current attack against Iraq took place provides exemplary paradigms for how the AHP system may be utilized with current fighting forces. The Commander's who directed the efforts of the units that participated in the events could take information available from unit safety and training databases, historical data from the first Gulf War, and more recent efforts in the Balkans would provide necessary data points to evaluate various courses of action. Additionally, the information provided would provide negotiators with necessary evaluation criteria to assist in the global arena to build consensus amongst allies and partners. The primary evaluation model would provide information illustrating the use of subordinate units with global missions.

Ultimately, a Commander may be a subset of a larger unit in which decisions are being made and his actions must ultimately fit into the goals of the parent elements. The ANP model allows for a process whereby the parent unit is able to take the data from the subordinate units and incorporate that information into their own ANP model to predict how the course of the war is proceeding and to make timely decisions of their own by allocating appropriate priorities. The net result of the implementation of this type of decision making is that the National level commanders are able to make recommendations to the President that take into consideration both tangible and intangibles. For instance, it allows for the President to weigh public opinion against economic development with regards to some ultimate goal such as completion of a campaign within a certain time frame.

2.2 COA Comparison

> "Planners must not develop and recommend COAs based solely on mathematical analyses of force ratios. Although some numerical relationships are used in this process, the estimate is largely subjective. It requires assessing both tangible and intangible factors, such as friction or enemy will and intentions. Numerical force ratios do not include human factors of warfare that, many times, are more important than the number of tanks or tubes of artillery. The staff must carefully consider and integrate the intangible factors into their comparison." (FM 101-5, p. 5-12)

I went at some length to quote Army doctrine because it makes a valuable point that often gets lost by the staff in the COA analysis: evaluation of the intangibles. AHP allows for the seamless integration and measurement of intangibles with the tangibles. The tangibles a commander can easily put mathematical equations to and in fact the Army Intelligence School out of Ft. Huachuca, AZ, has developed force ratio calculators that allow the commander to assess, for instance, how many M1A1 Abrams are necessary to destroy BMP-1s. However, what the force calculators do not take into consideration are commander's experience, terrain, weather, morale or other such intangibles; the force calculator assumes equality of all things *except* for the equipment itself. AHP allows for the measurement of the intangibles and may integrate the force ratio calculators into the process as well. The end result of any decision making process in the Army is for the Commander of a unit to compare various COA with each other in relationship to a specified goal in order to determine which of the various COA has the highest probability of success with the least expenditure of resources.

The commander must decide which of various courses of action the enemy is likely to use and then based off of that determination, decide which of various courses of action he will employ. Take for example the sample decision matrix based off of a numerical analysis taken from FM 101-5 provided in appendix 1. The commander must decide between the various course of action selected for the war-gaming with respect to the following criteria: Maneuver, Simplicity, Fires, Intelligence, and Air Defense Artillery (ADA), Mobility/survivability, Combat Service Support (CSS), Command and Control (C^2), Residual Risk, and C^2W. Fortunately, the Army provides standardized definitions for all of the terms such that when the comparison is taking place during the war-gaming process, all of the participants understand what is meant by each term in order for everyone to have the same basis to work from.

The first part of the model that must be developed is the evaluation criteria model that evaluates the relative importance of each of the various criteria to each other with respect to the goal such that the model will look like Figure 2.

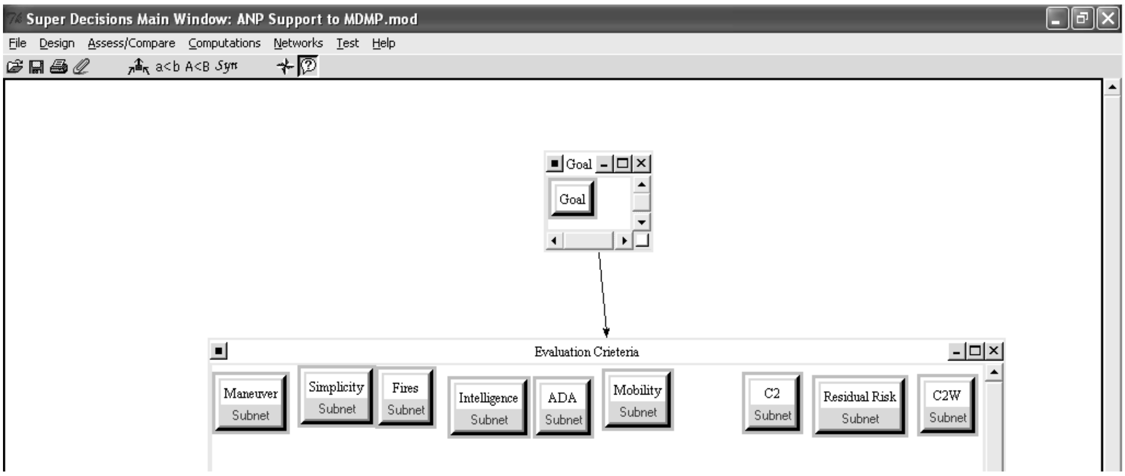

Figure 2: Sample AHP model evaluation criteria for MDMP

This model is rather simplistic and does not necessarily take into consideration all of the elements that go into the determination of each category with respect to success of the mission. However, this model lends itself to a more in-depth analysis of how an AHP model may be beneficial for long-term training for the Army and uses as a basis the previously developed model in FM 101-5, *Army Organization and Operations*. Nonetheless, a more in-depth analysis may be conducted by breaking each of the criteria into subcomponents and although the model is currently built as an analytic hierarchic process model (AHP), by taking into consideration dependency and feedback between the children of the parental nodes, the command may develop a more accurate and rich analysis in the MDMP through employment of an Analytic Network Process (ANP) model.

Given the current model and the problem under consideration, we will focus on the AHP model given and leave a more complex consideration for the future; future models may consist of larger structures of which figure 2 is just a subset and of which figure two has many subordinate nodes. The net result of a more complex model will allow for commanders at all levels to make decisions that allow for various trade-offs by evaluating the impact that the trade-off will have on the overall mission. Hence, when a commander states that he is willing to assume risk, he makes this statement knowing ahead of time the probability of the risk rather than some vague unknown.

The commander has several decisions to make at this point: does he evaluate the model based on his own consideration as the 'expert' or does he take into consideration the experience and knowledge of his staff in the evaluation. In isolation, the commander is able to focus his efforts based on his knowledge but by using the entire staff the command is able to accomplish at least two things: first, the commander is able to build consensus and hence have buy-in to the ultimate decision across the entire staff and 2, the commander is able to get more data points for a more accurate analysis. Additionally, as I have argued, ultimately the commander may free additional time because as training environments are use to determine data points in a KBS, many of the factors may be pre-weighted based off of the previously gained information and hence speed the MDMP process up.

The commander then begins the evaluation through the conduct of pair-wise comparison questions of the sort: "with respect to breeching a wire-mine obstacle, on a scale of 1-9, maneuver is more important than simplicity or the inverse," until each of the nodes is compared with each of the other where the resultant table will looks similar to that of Table 1 (for the purpose of this evaluation the information provide in appendix 1 is taken from FM 101-5 and adapted in order to provide a standard for evaluation). We see that when the criteria is evaluated with itself the resultant score is 1 and, in this case, when the commander evaluated the importance of maneuver to fires with respect to the goal, then maneuver is 1 and 1/3 times or somewhat more important than fires. Hence, when the question is asked about the relationship between simplicity and maneuver with respect to the goal, the resultant answer is the reciprocal of the previous question. Table 1 is where the commander gets his priorities for the factors that will impact his ability to complete his mission. Hence, without taking into consideration the evaluation of the various COA, one may say by looking at this table, almost intuitively, that if the commander had to sacrifice one area in order to be successful, then the COA selected may lack C2W (0.05) or CSS (0.05) since these two areas appear to have the least impact on the mission.

Table 1: Parent Node Criteria Evaluation

FACTORS	Man	Simp	Fires	Intel	ADA	Mob	CSS	C2	Risk	C2W	Priority Vector
Maneuver	1.00	1.00	1.33	0.33	0.33	0.33	0.33	0.33	0.67	0.33	0.20
Simplicity	1.00	1.00	1.33	0.33	0.33	0.33	0.33	0.33	0.67	0.33	0.16
Fires	0.75	0.75	1.00	0.25	0.25	0.25	0.25	0.25	0.50	0.25	0.21
Intelligence	3.00	3.00	4.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	0.05
ADA	3.00	3.00	4.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	0.05
Mobility	3.00	3.00	4.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	0.05
CSS	3.00	3.00	4.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	0.05
C2	3.00	3.00	4.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	0.05
Risk	1.50	1.50	2.00	0.50	0.50	0.50	0.50	0.50	1.00	0.50	0.11
C2W	3.00	3.00	4.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	0.05

To generate the priority of each of the various factors, the staff compared each against the other factors in relationship to the mission goal. The priority vector in this case is obtained by determining the weighted ratio of each of the various criteria. The result of this evaluation is the respective weights that each of the factors carries in the overall evaluation model. We now need to evaluate the pair wise comparison of the COA with respect to how much better one COA is than the other in satisfying each criterion on the parental level. In the example provided in FM 101-5, the author states that the lower the level the better the response. Since we are concerned with generating the highest priority, the reciprocal response is input into the calculation such that the COA that received a "1" still received a "1"; the COA that received a "3" for a criterion, now receives a 0.33. The resultant priorities are in the tables that follow for each criterion.

Now that the normalized and idealized priorities have been generated for each of the criteria affecting the decision with respect to the various COA, the staff may now determine the global priorities of the COA by first multiplying the priorities of each factor with reference to the COA just generated by the weighted global priorities of each factor previously generated. The results of this are show in the table below.

Table 2: Distributive and Ideal Priorities for MDMP

	Distributive Mode										
	Man	Simp	Fires	Intel	ADA	Mob	CSS	C2	Risk	C2W	Overall Priority
COA 1	0.01	0.01	0.01	0.03	0.07	0.03	0.04	0.07	0.04	0.04	0.38
COA 2	0.01	0.02	0.02	0.03	0.03	0.03	0.07	0.04	0.02	0.07	0.33
COA 3	0.02	0.01	0.01	0.07	0.03	0.07	0.02	0.02	0.01	0.02	0.29

	Ideal Mode										
COA 1	0.50	0.50	0.50	0.47	1.00	0.47	0.50	1.00	1.00	0.50	1.00
COA 2	0.33	1.00	1.00	0.50	0.50	0.50	1.00	0.50	0.50	1.00	0.88
COA 2	1.00	0.33	0.33	1.00	0.33	1.00	0.33	0.33	0.33	0.33	0.78

3. Conclusion

We can see based off of the overall priorities generated above that although the results shown in Figure 5-11 from FM 101-5 provided in appendix 1 illustrates that COA 2 is the best alternative, the AHP model illustrates that COA 1 and COA 2 are essentially the same in the distributive model but that COA 1 is preferred in the idealized model. The reason for the discrepancy between the AHP model and the model in appendix 1 may be due to inconsistencies in the pair wise comparisons. Although consistency has not been discussed at this point, it is an important aspect of the AHP model that the various forms of evaluation in FM 101-5 do not take into consideration. Using any one of various software programs available in the market, the command staff will be able to determine the consistency of their response and the sensitivity of various inputs. However, as I stated in the beginning, use of AHP lends itself to the implementation of a KBS and therefore ultimately mitigating the need for the command staff to put in verbal inputs except in so far as they update the system.

The KBS is a data warehouse that will make recommendations to the command staff based off of trends, mission and future operations. The KBS takes into consideration the heuristics of the experts who initially develop the system, it inputs data points from units' training, force ratios, weather and various factors that impact a successful operation and matches this information with all possible COA. The outcome of the KBS is a continuous series of recommended COA that are updated as situation changes based on mission and ever changing set of priorities.

Although the methods described in FM 101-5 are time tested and work, technology allows for better equipment on the battlefield to make more accurate, timelier and most import, consistent decisions based on a known priorities. The priorities generated are also able to give quantifiable expression to the intangibles on the battlefield and hence allow the commander the ability to fully visualize his battle space. Hence, it is vital that work on an AHP system that is integrated with a KBS begin immediately in order to take advantage of the continued training and changing dynamic of the world.

Appendix 1: Figure 5-11. Sample decision matrix: numerical analysis (FM 101-5, p.5-25)

CRITERIA (note 1)	WT (note 2)	COA 1 (note 3)	COA 2 (note 3)	COA 3 (note 3)
Maneuver	3	2 (6)	3 (9)	1 (3)
Simplicity	3	3 (9)	1 (3)	2 (6)
Fires	4	2 (8)	1 (4)	3 (12)
Intelligence	1	3 (3)	2 (2)	1 (1)
ADA	1	1 (1)	3 (3)	2 (2)
Mobility/ Survivability	1	3 (3)	2 (2)	1 (1)
CSS	1	2 (2)	1 (1)	3 (3)
C^2	1	1 (1)	2 (2)	3 (3)
Residual Risk	2	1 (2)	2 (4)	3 (6)
C^2W	1	2 (2)	1 (1)	3 (3)
TOTAL Weighted TOTAL		20 (37)	18 (31)	22 (40)

NOTES:
Procedure:
1. Criteria are those assigned in Step 5 of the war-gaming process.
2. Should the CofS/XO desire to emphasize one as more important than another, he assigns weights to each criterion based on relative importance.
3. Courses of action are those selected for war gaming. The staff assigns numerical values for each criterion after war-gaming the COA. Values reflect the relative advantages or disadvantages of each criterion for each COA action. The lowest number is best. The initially assigned score in each column is multiplied by the weight and the product put in parenthesis in the column. When using weighted value, the lower value assigned indicates the best option. The numbers are totaled to provide a subjective evaluation of the best COA without weighing one criterion over another. The scores are then totaled to provide "best" (lowest number value) COA based on weights the commander assigns. Although the lowest value denotes the best solution, the best solution may be more subjective than the objective numbers indicate. The matrix must be examined for sensitivity. Although COA 2 is the "best" COA, it may not be supportable from a CSS standpoint. The decision maker must either determine if he can acquire additional support or if he must alter or delete the COA.

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