

EVALUATION OF INDIVIDUAL CONTRIBUTION TO EXECUTIVE MBA TEAM PERFORMANCE USING ANALYTIC HIERARCHY PROCESS

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ABSTRACT

The evaluation of individual performance on teams has been approached using many different measurement instruments. Each instrument brings new information and exposes additional nuances of team dynamics. In this paper, we apply the subjective decision making tool of the Analytic Hierarchy Process to further enhance our ability to quantify individual contributions to teams in an Executive MBA program. The EMBA faculty performed criteria comparisons to establish their importance while the students evaluated themselves and their team members. Evaluations were performed at mid-term and end of term not only generating individual contributions, but also reflecting growth as a team.

INTRODUCTION

Instructors have used team peer evaluations for three primary reasons: to provide mid-term developmental feedback on team processes, to dissuade social loafing, and to evaluate individual contributions to team efforts. When assessed mid-project or mid-term, peer evaluations can constitute valuable developmental feedback from a student's peers on his or her strengths and weaknesses in the team setting [2]. Instructors can conduct the evaluation, feed the results back to the individual students and their teams, and encourage the teams to reflect on how to improve their team functioning. Social loafing, also known as the free rider effect, is a phenomenon whereby team members fail to contribute their "fair share" to the team, knowing that others in the team will take up their slack [1], [9]. Team peer evaluations can be employed to disincentivize social loafing, since students would know that such free riding would be punished by poor evaluations at the end of the semester. Finally, since individual student learning is most often indicated by individual student grades, many educators use team peer evaluations to capture, at least in some part, the individual contribution to the overall team's learning and performance [2], [5].

The evaluation of peer performance presents faculty members with a distinct challenge. Not only is it difficult to quantify performance in the eyes of other team members, often assessments of performance are clouded and inconsistency of judgments results from personal biases. In an effort to mitigate assessment issues, and particularly because of the inconsistency issue, we chose to create an evaluation model using the Analytic Hierarchy Process (AHP).

AHP addresses the problem of selecting a single alternative when faced with competing decision-making criteria. It provides us with a way of considering qualitative and quantitative factors. It synthesizes measurements, perceptions, and judgments together to generate the rank

and magnitude of each decision alternative. AHP is a problem-solving framework that provides a systematic procedure for organizing and assessing decisions [13].

The evaluation of team performance strays from the typical nature of an AHP application. We were not in search of a single preferred alternative, rather an assessment of every team member where the ultimate magnitude of each alternative provided a measure of his or her participation and effort in project work.

Our hierarchy, as is typical, has been broken down into three levels. The top level was the goal, the second level included performance and evaluation criteria, and the third category includes the alternatives or members of the project groups. Separate but consistent models were created for each group. EMBA faculty members acted as participants, examining the criteria while the members of each EMBA group also acted as participants, examining the performance of their team members and themselves. Participants evaluate the completed hierarchy by comparing items in pairs. In our case, the faculty completed these pairwise comparisons on the criteria, while the students completed the pairwise comparisons of the team members. The synthesis of all comparisons produced rankings for individual faculty members as well as an overall ranking reflecting the consensus faculty ranking.

TEAM PEER EVALUATION METHODOLOGIES

In a recent review of the use of peer evaluations in student teams, Baker [2] noted that there are four methods that educators commonly use, the first two of which being more common than the latter two. The methods are: rating scales, wherein team members rate peers on desired behavioral components; allocation of points, where students use a fixed sum scale and divide some pot of points among team members; peer comparisons, having team members conduct paired comparisons on behavioral dimensions; and project diaries, where students maintain logs of who contributes to which critical tasks. Some educators, we should note, use multiple types of evaluation schemes [5], [10].

Rating scales most often use a set of predetermined, commonly theoretically driven, desirable team behaviors [1]. These team behaviors commonly include such components as attending team meetings, being dependable, contributing high quality work, exerting effort, getting along well with others, managing team conflict, making cognitive contributions, and providing team structure [2]. Similarly, Paswan and Gallokota's [12] factor analysis of peer evaluation data highlighted factors such as competence, task and maintenance orientation, domineering behavior, dependability, and free-riding behavior. Educators commonly provide a list of such behaviors along with their descriptions and ask a student to rate peers on each dimension on a given scale.

The fixed sum approach used in the "allocation of points" technique varies in the specifics of application [2]. For example, instructors may ask students to divide a pot of 100 points across the team without restriction. Others may stipulate that at least one person must have either a higher or a lower score than others must, in an attempt to force a distribution and to avoid leniency effects [2].

Peer comparison was studied by Johnson and Smith [10], who argued that such a comparison tool was less prone to leniency effects and grade inflation. Their approach to peer comparison, which is also used by many other educators, was to present students with team behavior dimensions (effort, cooperation, initiative, technical knowledge, and overall contribution) and ask students to conduct pairwise comparisons for all team members. They then allocated points for each time a team member was circled across all comparisons across all dimensions. While this approach is most similar to the approach we describe in this paper, we will spotlight the ways in which the method we have used is, in our opinion, preferable.

The last approach discussed by Baker [2], project diaries, is probably the least used method to conduct team peer evaluations. Not only is this approach more labor intensive, but it also is more driven by discrete tasks than by overall team behaviors. That is, to the extent that managing team conflict is a highly desirable team behavior, there is no discrete project or task milestone associated.

ANALYTIC HIERARCHY APPLICATIONS

AHP has been used extensively to make subjective decisions in the face of conflicting criteria. The most relevant work to date however, presents applications of AHP that apply more directly to team peer evaluations. These applications include those ranking individuals or teams in order to predict downstream outcomes.

The axioms of AHP were discussed by Thomas Saaty [14] as an extension of his work as the originator of the AHP technique [13]. We relied on these axioms in development of our own model. Judgments must be reciprocal, meaning participants must remain consistent when comparing *option a* to *option b* versus comparing *option b* to *option a*. Any option is equally preferred to itself. Weights of elements that fall lower on the hierarchy are independent of the weights of their parent elements in the overall achievement of the goal. Exceptions to our consistent judgments must be allowed and accepted.

Saaty's [14] axioms were further supported [8] in the face of criticisms [4]. Harker and Vargas [8] provided additional clarification of the theoretical axioms, asserting that failings in AHP were based on misunderstanding of the theoretical basis. In doing so, they further supported our use of AHP in the ranking of team members. Dyer [4] went on to object again to the axioms as being unrealistic; he viewed the rankings produced by AHP as being arbitrary and thus not independent. He asserted that the addition of concepts utilized in multi-attribute utility theory would make AHP stronger, and we would be assured of independent rankings between levels of the hierarchy. The authors accept the theoretical basis of the axiom of independence between levels. We do however plan to extend this research to include ratio scale estimation [8] for the alternatives, thus overcoming Dyer's issue.

Applications of AHP provided additional insight. Golden and Wasil [6] evaluated sports records using AHP. They examined individual single event records, individual season records, and individual career records. Grandzol [7] examined faculty selection in universities, again providing a cumulative ranking that reflects many unrelated criteria. Chang, et. al. [3] evaluated software quality and Melón, et.al. [11] assessed educational initiatives. The importance of these

applications is that they all examine human characteristics in some way. They are not just in search of an apparent winner, but in the ranking of the alternatives. In addition, these evaluations are not as subject to levels of risk aversion in the individual participants, rather they are subject to personal standards or performance, values and ethics.

TEAM EVALUATION DESIGN

Historically, the team evaluation process has been completed by the authors using survey instruments. These established instruments contained questions of various types, which examined dimensions of the evaluation. A hierarchy of these dimensions was identified as a first step toward creation of an AHP model.

When developing the behavioral dimensions to be included in the AHP model, we turned to scholarship concerning what are effective team behaviors. Researchers have considered such factors as dependability, quality of work, conflict management skills, exertion of effort, and attention to both task and relationship management [1], [2], [4], and [12]. Similarly, our model included factors that contributed to the quality of the team's work outcome, as well as the qualitative determinants of the process by which that work was done.

The dimensions, or criteria, in our model were time considerations, support, quantity of work, overall contribution and value to team, and team ideals. Each criterion also had sub-criteria; the entire hierarchy is presented in Figure 1. These criteria were intended to reflect the degree to which each team member met their responsibilities in work output, work quality, timeliness, supportiveness and creativity, and relationship management skills (to include conflict management).

Ultimately the strength of the AHP approach lies in its ability to synthesize all comparisons together, assess their consistency and produce rankings which accumulated all criteria and weighted them according to the importance placed on them by faculty members. The treatment of these evaluations was therefore much more robust than that of Johnson and Smith [10].

TEAM EVALUATION IMPLEMENTATION

Pairwise comparisons were completed at two distinct echelons: the comparison of criteria, and the comparison of performance of alternatives (team members) on each criterion. The criteria comparisons were performed by EMBA faculty members, where first the high-level criteria were compared to each other, and then the sub-criteria, within each high-level criterion, were compared to each other. The sum of the ranks for each set of sub-criteria is 1.0, which was also the sum of the ranks for the high-level criteria in achievement of the goal.

Each faculty member was asked to consider their own opinions and experiences when comparing criteria. Though all of the EMBA faculty members evaluated every criterion, they were asked to reflect their own values in this procedure. The collective consciousness of the entire faculty relative to what constitutes effective student team behavior was derived from the responses of the individuals.

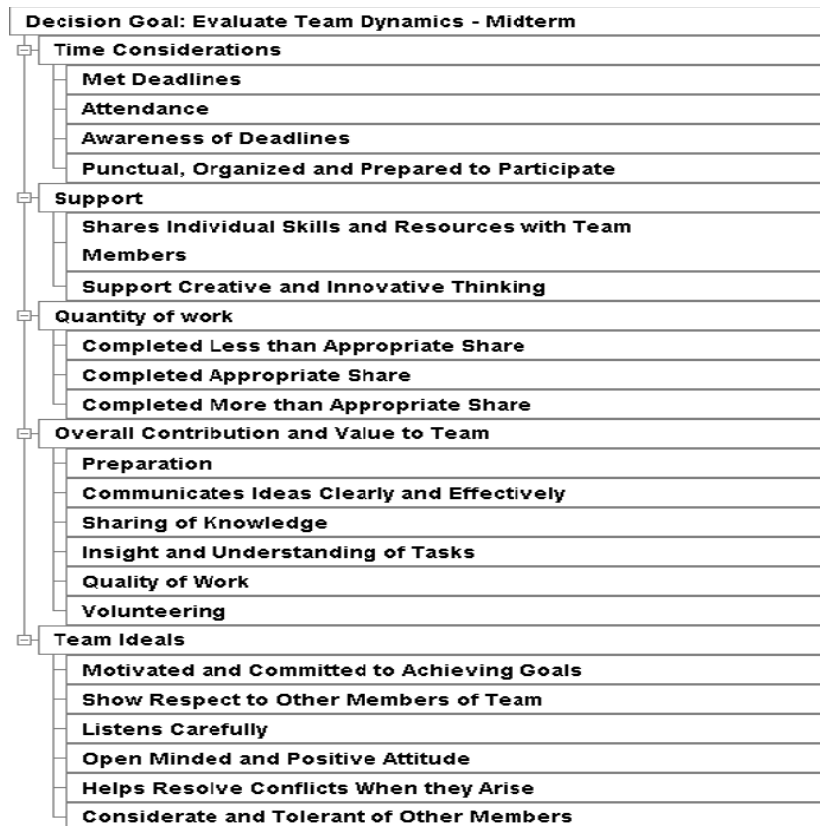


Figure 1: Tree view of team evaluation hierarchy

The lower echelon, the comparison of alternatives, was performed by the student teams. Each individual evaluated his or her group members as well as themselves. They were presented with a single criterion and asked to assess the relative performance of two individuals at a time, on only that criterion. By following this procedure, both faculty and student positions are fully reflected in the subsequent rankings.

TEAM EVALUATION RESULTS

The primary purpose of using AHP in evaluating teams was to rank the group members. The intermediate calculations within the AHP, however, also provided insights into the team dynamics. Table 1 contains a subset of the rankings of a sample team, the members of which are shown in rows 3-5, on the criterion of Time Considerations. We can identify the third team member (C) as being particularly punctual and aware of deadlines. The weights of each sub-criterion relative to the achievement of the overall goal appear in the second row of each table.

The final rankings for the entire section are presented in Table 2. Based on the faculty member rankings of the criteria, groups 4 and 6 shared the work and the credit almost equally. These teams would be identified as those that worked best together. Member “J” of group 3 is most likely to be a social loafer. The remaining teams showed discrepancies between the workload, but this does not necessarily reflect a severe problem. Further examination of the criteria rankings for these groups will help us to gain greater insight into the strengths and weaknesses of

each member. In addition, observing the criteria most important to the particular faculty member will provide deeper insights.

Team Member	Met Deadlines	Attendance	Awareness of Deadlines	Punctual, Organized and Prepared to Participate
	0.0052	0.0096	0.0028	0.0224
A	0.333	0.359	0.372	0.26
B	0.333	0.333	0.207	0.327
C	0.333	0.308	0.42	0.413

Table 1: Time Considerations

Group #	Member	Rank
1	A	0.3320
1	B	0.3113
1	C	0.3564
2	D	0.3028
2	E	0.3180
2	F	0.3791
3	G	0.3777
3	H	0.3723
3	J	0.2503
4	K	0.3244
4	L	0.3362
4	M	0.3392
5	N	0.3488
5	P	0.3176
5	Q	0.3329
6	R	0.3291
6	S	0.3356
6	T	0.3353

Table 2: Overall Team Member Rankings

CONCLUSIONS

The Analytic Hierarchy Process has proven to be a valid and useful tool in the evaluation of project teams in an academic setting. Not only are we able to generate rankings for each group, but we are also able to examine each student in detail and understand more about the functioning of the groups.

The comparisons completed by the team members carry over to each unique faculty evaluation of the criteria. This is a distinct advantage; rather than asking the teams to complete multiple evaluations, they each complete one and the faculty members simply apply their own criteria rankings to the results.

References available upon request.