

# MULTIPLE VANTAGE POINTS FOR EMPLOYMENT-RELATED FEEDBACK

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**Abstract** -- Perhaps the most important goal of any engineering program that seeks to gather employer and alumni feedback is to get a clear picture of the work performance strengths and weaknesses of an institution's graduates. A basic problem in such assessment concerns the variety of data sources and types of feedback used. Different data sources have different bias characteristics, so that depending on only one or two sources has the risk of compromising reliability and validity. Supported in part by SUCCEED Coalition funding to the Georgia Institute of Technology, we are addressing issues of gathering and interpretation of data from employers and recruiters by means of a comprehensive and longitudinal approach involving several sources. A description of this ongoing effort, methodological concerns, and some of the results obtained will be the foci of this paper.

**Index Terms** – Employer feedback, assessment, measurement, survey research, reliability and validity

## INTRODUCTION

As engineering schools across the United States strive to move towards continual improvement in curriculum planning and renewal, the need for consistent, systematic feedback from the employment community on the performance of recent graduates has never been greater [1]. The unfortunate situation for many schools is that no systematic process is in place to obtain such feedback. At best, only anecdotal or superficial information may be available, usually through occasional visits by an advisory committee or through informal business contacts.

How might an engineering program get a clearer picture of the strengths and weaknesses of program graduates in the workplace? A basic problem in such assessment relates to the selection of possible data sources and types of feedback used to appraise the employability and career development of graduates. Different data sources and measurement techniques have different bias characteristics and other limitations, so that depending on only one or two sources brings the risk of getting information that may have very restricted usefulness. Multiple sources may provide more consistency in characterizing and tracking students' abilities. However, even multiple sources of feedback data can still be difficult to interpret and may lack a cohesive or coherent

pattern. One needs to examine critically the measurement procedures and data sources to evaluate the consistency and thus the credibility of employment-related feedback.

Supported in part by SUCCEED Coalition funding to the Georgia Institute of Technology, we are engaged in comprehensive and longitudinal data gathering and analysis from several sources including co-op supervisors, recruiters, students, alumni(ae), and employers of alumni(ae). A description of the approach undertaken, challenges encountered, and a brief explication of results to date will be the foci of this paper.

## Conceptual Framework: Relating College and the World of Work

At the conceptual level, our point of departure for this research is to ascertain how those skills relevant to the world of work may be assessed against those skills our students are gaining through their programs of study. Several steps are involved in this process. Determining at the outset what skills may be viably assessed is an essential consideration. ABET's *Criteria 2000* deal with a broad range of technical and work-related knowledge and skills. Authors such as Eveslage [2] and Mentkowski and Rogers [3], for examples, have long emphasized the need to evaluate the knowledge, skills and abilities that form a common ground between the goals of academia and those of employers, most notably technical skills, communication, problem-solving, and team work.

Successful transition from an academic program to the workplace depends critically on understanding the performance demands of work. For many engineering schools, a co-op program can be an important source of this information. Additional information may be gathered from recruiters, employers, and alumni (ae).

The next step to consider is that of translating evaluative information from one context to another. For example, how can we connect employment-related performances with academic experiences?

A third step is to create an effective bridge between academic and employment-related evaluation. This forms the substance of the remainder of this paper. The conceptual scheme we have created to guide our efforts is shown below in Figure 1.

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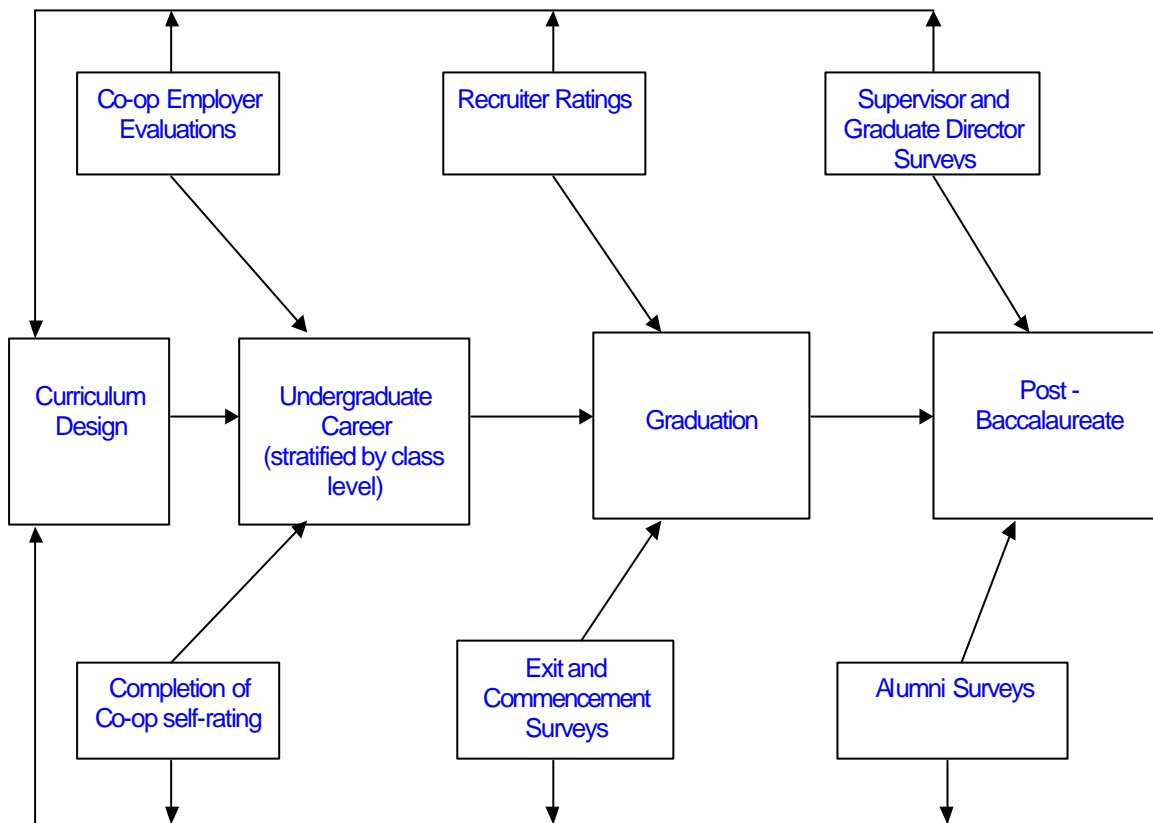


FIGURE 1.  
 GEORGIA TECH EMPLOYER FEEDBACK SCHEME:  
 MULTIPLE SOURCES OF CAREER-RELATED PERFORMANCE EVALUATION.

## METHODOLOGY

While several instruments were already in place at the onset of this project, they were lacking in significant areas. Foremost among these was that while they did contain some items relevant to *Criteria 2000* outcomes for student learning, they did not have all fourteen of the outcomes specified. Therefore, the first step was the revision of the instruments to encompass the complete set of *Criteria 2000* outcomes, and the addition of questions intended to capture more of the demographic data of the population being evaluated. For the recruiter surveys for example, we wanted to capture not only how well-prepared the recruiters found Georgia Tech students, but also to evaluate how important various skills and attributes were to the recruiters. Therefore, they were asked to rate both preparation in and importance of each area.

The recruiter survey was given to those who came on campus for interviews and who signed up through the InterviewTrak system (Spring 2000: n=176; Spring 2001:

n=84; Fall 2001: n=66). In order to get a fresh and comprehensive look at the students of Georgia Tech, the recruiters who came to campus were asked to complete a survey at the end of their interviewing day. With this survey, the demographics of respondents were difficult to ascertain, because recruiters tended not to complete that portion of the survey instrument. On the positive side, we are able to obtain a good cross-section of the recruiters on campus, with 326 total responses.

The co-op employer survey is administered at the conclusion of each work term. This instrument is sent to those designated as the immediate supervisor of the co-op student assigned to that company or firm, and it is the responsibility of the student to return the evaluation. Returned surveys used in this analysis were as follows: Spring 2000: n=222; Summer 2000: n=164; Fall 2000: n=201; Spring 2001: n=228; Summer 2001: n=358.

Recruiter data using the revised survey instrumentation have been collected and analyzed from the Spring 2000 to Fall 2001 terms. Mean ratings of Georgia Tech student preparation and the mean importance to recruiters of each knowledge or skill area were obtained and compared. Since several terms of co-

op employer surveys are also available, an analysis of data from previous terms on those items of relevance to *Criteria 2000* could be conducted.

Employer surveys from supervisors of alumni have also been received. As they are currently under analysis, these results are not reported here.

### The Approach

What follows emphasizes the dictum that no single method of evaluation can capture what is needed to characterize and improve an engineering academic program. Figure 1 shows how employment-related assessment is being approached at Georgia Tech. We should emphasize that this work, by its very nature, must be a continuing and modifiable process, but we have already collected some quite useful information (see below). Continuity is provided by following employment-related evaluation throughout the careers of the students from co-op experience to post-graduation employment. Potentially this method can assess “value added” in the academic and work experience of the student, and, of course, provide information to feed back into program/curriculum/co-op experience design and modification. Note the parallel tracks of assessment. On the top the employers evaluate the students or graduates, while on the bottom, the students/graduates evaluate their own experience. In this paper we emphasize the employer-evaluations track depicted at the top of Figure 1.

However, indicated in the figure, we have the possibility of coordination and comparison of data through a track as well as across tracks. Given the sorts of data that can be gathered, we also envision comparisons of employment-related evaluations with other sources of assessment, for example, exit interviews, portfolios, capstone course performances, etc. To begin to make proper comparisons however, one needs to have some putative common measures or items through and across tracks. But as we will indicate, regardless of how this is done, there are limitations in the overall process that would apply generally to any assessment program.

Each source of our evaluations, co-op employers, recruiters, and employers of alumni (ae), represents quite distinct aspects of employment-related assessment differing in context, contingencies (demands and constraints), biases, and interests. Any comparisons are thus affected by these characteristics. We now discuss each source in turn.

### Co-op Employers

Georgia Tech has one of the largest co-op programs in the United States with about 3000 students participating each year (some one-third of the undergraduate student body), so we potentially have a very large sample for study and

evaluation. All students are evaluated by their employer each work term. At Georgia Tech, co-op students are not a selected group academically (the GPA must be  $> 2.0/4.0$ ), though their actual overall GPA tends to be higher than average. Freshmen through senior students comprise this sample, so the possibility exists to evaluate value added as the student progresses through a curriculum. Indeed, we show that with respect to several key performance characteristics (e.g., ability to analyze and interpret data), clear improvements in employer ratings occur from freshman to senior status. It is possible to follow a student term-by-term to obtain “snapshots” of current skills. The students also evaluate their co-op experience and thus provide opportunities for correlating employer/employee results. Of particular value are comments by employers about specific behaviors, both desirable and undesirable, that provide much needed detail on criteria for effective versus ineffective job performances. More on this shortly.

There are a number of biases and other special interests that can affect interpretation of the results gathered from co-op employers. Here are just a few:

- a) Halo effects---employers generally show good results from Georgia Tech students---they are much in demand.
- b) Many employers of Georgia Tech students were once Georgia Tech students themselves.
- c) Employers may be *less stringent* in evaluation because students are at different stages of their academic careers (i.e., they are just students).
- d) Employers may be *more stringent* because the skills/knowledge requirements of the job to be accomplished are not in parallel with the student’s academic level.

### Recruiters

Recruiters represent the first interface with post-graduation employment. In comparison with the fairly inclusive co-op sample, recruitment is a significant filter in terms of who gets interviewed and the majors represented. We have analyzed some 326 recruiter surveys having item overlaps with both co-op employer surveys and permanent employer surveys. There are, again, special characteristics of this group affecting data interpretation, including the following:

- a) Recruiters have limited information on and contact with any particular student---a brief resume plus a half-hour interview.
- b) But, recruiters see many students from different sources and typically have a wider perspective than say, a typical co-op employer.
- c) As selectors, recruiters are likely to place different emphases on particular knowledge/skills than co-op employers.

- d) Recruiter evaluations are generic as opposed to individual, unlike co-op employers. Generic evaluations are generally less informative.

### Post-Graduation Employers

Post-graduation is a finer filter yet. Here one deals with the evaluation of particular individuals actually hired. Our present method consists of gaining these evaluations through alumni (ae) who agree to allow contact with their supervisor who then may respond to our survey. The alumnus (a) also provides a parallel self-assessment of their work experience.

Supervisors can potentially provide more detail on actual work performance and they should have a clearer, more long-term perspective on what skills and knowledge are important. Among the issues of concern with these data are:

- a) The employer has a greater investment in an employee and this may affect their evaluation.
- b) Halo effects (e.g., most Georgia Tech students do well, and the employer may be a Georgia Tech graduate, etc.).
- c) Probably most important in terms of our method, the sample of employers that gets evaluated is selected by the *employees* (another filter) who must give contact permission in their survey. This yields not only a circumscribed sample, but clearly a biased one. Only about 35% of the returned alumni (ae) surveys give permission to contact the supervisor.
- d) We could obtain generic evaluations, but, again, these are generally less informative.

Banta [4] also offers a critique of a method for surveying employers. A carefully constructed and validated employer survey instrument was used by a consortium of institutions in Kentucky, and was found to yield high overall ratings of graduates, regardless of the particular group of employers surveyed. Banta speculates that this constitutes a common halo effect in employer surveys, confounded by employers' willingness to provide feedback, gratitude for being asked, and constraints on giving negative feedback for fear of legal repercussions.

### Other Methodological Issues

As with many institutions, the primary method of obtaining information is generally through surveys. Despite the apparent efficiency and simplicity of surveys, they have many problems not always obvious to the inexperienced user. Here are but a few examples:

- a) Good item design is not trivial. Ratings can be profoundly affected by the exact wording of an item.
- b) Item scaling may be unclear---for example, what do the end-points of a five-point scale mean in terms of the performance being evaluated?

- c) Ideally, one should attempt to anchor scale values with critical incidences or other reasonably objective methods. This, at the least, requires open-ended items where the evaluator can be specific about exemplars of effective and non-effective performances.
- d) Any given rating does not tell us on what basis the rating was made or how to respond to a particular value. In general, surveys, per se, are comparable to a physician merely taking one's temperature. If it's normal, what can one say? If not, what does this mean?
- e) Usually no considerations of reliability, much less validity, enter into the evaluations.
- f) While there should be common items on surveys using different classes of evaluators, the "same" item may not be the same to a different set of evaluators operating in a different context with different needs and interests, as indicated above.
- g) Opportunities to assess skills/knowledge may differ and should be specified by a rater.
- h) The *importance* of the particular skill/knowledge evaluated should also be specified.
- i) Raters should be carefully instructed to think always in terms of *specific* behaviors when attempting to rate a performance.
- j) One should be interested in both the central tendency and the *variation* of ratings.
- k) Adequate sampling, as indicated earlier, is not always easy either in terms of the evaluators or those evaluated. Obtaining multiple measures from multiple sources should provide a more consistent picture.
- l) This idea is sometime expressed as "triangulation".

### "Triangulation"

Different *sources* of evaluation of the same general area (e.g., work-related performance) would not be expected to meet at a common point, that is, agree. The actual situation is considerably fuzzier because, as already indicated, the different sets of evaluators are also not *aiming* at a common point. Thus, at best and regardless of methods, one can delineate only a vague region defining and evaluating performance criteria for use in curriculum renewal. Nevertheless, given methodological limitations and other constraints, "more is better."

### More Limitations

While the researchers in this project have taken many steps to ensure the accuracy of the data generated, there are numerous limitations to the project and threats to the analysis that should be noted. Among those limitations and threats are:

- a) The student body may have altered through changing times and culture, presenting employers with students who, while they are still highly qualified, have a different skill set than their predecessors.
- b) A systematic difference may exist between the student body and those students participating in the co-op program.
- c) Systematic differences may exist between those students rated by recruiters and the overall student body—because recruiters rate students as a group, all data is restricted to grade point average comparisons, rather than specific students and/or majors.
- d) Systematic differences may exist between the co-op students and those students rated by recruiters; because recruiters rate students as a group, this cannot be compared except by grade point averages.
- e) Systematic differences may exist between those employers who evaluated co-op students and those recruiters who rated interviewees.
- f) Insertion of items related to *Criteria 2000* may prove misleading—*Criteria 2000* outcomes are stated as a set as goals rather than as aspects of analytical instrumentation. Employers of co-op students and recruiters may interpret the items differently, since no behavioral anchors are provided.
- g) Lack of demographic and position-related information, apart from student class level, does not allow for optimally in-depth analysis of findings. Ideally, we would like to analyze findings by grade point average, gender, wage, position, and job responsibility data for those students evaluated by their employers, as well as comprehensive data on the recruiters and employers.

Hoey and Gardner [5] compared alumni and employer (supervisor) ratings across a series of identical items in an assessment of North Carolina State University graduates, and found little agreement between alumni and supervisor ratings. Almost without exception, alumni rated themselves lower than did their supervisors. The authors note the possibility of systematic bias in the employer ratings since alumni had to provide consent and supply the contact information before employers could be surveyed.

### SOME FINDINGS

*Co-op Program:* We now have 5 terms' worth of co-op supervisor evaluations. The ratings show some variability, especially in Spring 2001. All mean ratings were moderately high or better (>4/5). Among the areas rated, lifelong learning and technical skills have been rated highest, while written and oral communication skills were rated lowest.

A more useful way to look at these data is to disaggregate the findings to the level of the academic

department, and to stratify the results by student class level. Such disaggregations would then permit a clear demonstration of student knowledge and skill gains through the undergraduate experience. One such instance is co-op supervisor data from Mechanical Engineering at Georgia Tech disaggregated by class level. The results demonstrate how, for example, co-op supervisor ratings of students' oral communication skills increases over the course of their undergraduate careers.

*Recruiters:* Recruiters are asked to indicate how important a particular *Criteria 2000* outcome is, and then to rate the preparation they encountered among the Georgia Tech students they interviewed. This gives us three measurement possibilities: importance of a skill or ability, preparation with respect to that skill or ability, and importance relative to preparation. We now have three terms' worth of ratings from recruiters analyzed. In terms of importance, recruiters have consistently rated teamwork, problem solving, ability to apply knowledge of mathematics, science, and engineering, and above all, communication as the most important areas. In terms of preparation, the highest mean ratings have been on using necessary techniques and skills for practice, problem solving, and (apart from Spring 2001) the ability to apply knowledge of mathematics, science, and engineering. In terms of importance relative to preparation, the strongest areas of agreement are problem solving and ability to apply knowledge of mathematics, science and engineering. The largest performance gaps or differences in ratings of importance relative to preparation are in teamwork and communication skills.

### DISCUSSION

We have described an elaborate system for gathering and assessment of employment-related skills of engineering students and graduates that can be of some value in curriculum design and modification. We also pointed out the many sources of bias and other limitations of the system that must be taken into account in interpreting and applying the findings. We believe that these kinds of concerns will apply to virtually all practical systems of educational assessment. Nevertheless, careful and systematic methods of obtaining assessment data from multiple sources can enhance trust in the findings and lead to more effective curriculum revisions. For example, a primary area of agreement on ratings between co-op employers and recruiters was in communication skills. With uniform consistency, oral and written communication skills have been rated lowest by co-op supervisors among all the skill areas. Recruiter ratings also reflect a sizeable performance gap between the very high importance of communication skills noted by recruiters and the lower rating of the seniors they have interviewed over the time period covered by this analysis.

Written and oral communication skills very clearly constitute an area that bridges the goals of academic programs and the requirements of the workplace. Thus, this one area has been identified as the most actionable in terms of curriculum planning across engineering schools at Georgia Tech. The result has been the initiation of a number of technical writing and writing-across-the-curriculum initiatives within the College of Engineering.

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