A Survey of Industry Advisory Board Operation and Effectiveness in Engineering Education

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ABSTRACT

Voluntary boards composed primarily of industry practitioners who give aid and advice are almost universal in engineering education programs, though there has been little published research on this subject. Based on a survey of 90 engineering school directors and advisory board members, this research characterizes the operation, makeup, and effectiveness of advisory boards. The study shows that effective boards have a clear understanding of their role and limitations in influencing curriculum, encourage engagement with students, have formal procedures for involvement in ABET accreditation, and are well coordinated with the larger educational institution. Boards can be effective with or without involvement in fundraising, but it is essential that fundraising expectations be clearly understood and agreed upon by the school and the board. Boards composed largely of members with close ties to the institution, generally alumni, will be more engaged as advocates of the program and will contribute more financially.

Keywords: advisory board, engineering program, organizational effectiveness

I. INTRODUCTION

The use of voluntary advisory boards to give aid and advice to educational programs is common across most engineering academic divisions, regardless of their field of study. The vast majority of universities offering accredited degree programs in engineering have established some form of advisory structure composed of practicing or retired professionals who are called upon to help support the educational program in various ways. This structure is referred to in a number of ways, including "board," "council", or "committee," and the members may be called "advisors," "visitors," or "associates". This report will use the general term "Industry Advisory Board" (IAB).

While the use of advisory boards to support engineering educational programs is common, there is relatively little written and no known comprehensive research on what it takes to establish and operate an effective advisory program. Rooney and Puerzer (2002) note, "There has yet to accrue any significant database of literature focusing on the type and level of interaction currently obtained between IABs and the programs they advise." The goals, operation, and composition of advisory boards have significant variations across programs. Some schools have established valued and effective advisory boards, with excellent working relationships within the program. Other boards could be described as perfunctory, non-functional, or dysfunctional. Yet other programs may find that some aspects of the advisory board relationship are working well while other aspects are ineffective.

In the published literature on organizational effectiveness in general, and engineering advisory boards in particular, the factors and relationships that shape the operation and effectiveness of these boards are ill defined and not well understood. As a review of the literature on the subject of organization effectiveness concludes, effectiveness is not a concept but a construct (a high level abstraction composed of concepts at lower levels of abstraction) (Campbell, 1977; Quinn and Rohrbaugh, 1983) which will vary depending on organizational structure, goals, and culture. This study evaluates effectiveness in the context of IABs. Surveys were administered to advisory board members and directors of engineering academic programs in order to determine their perceptions of IAB effectiveness, as defined by the individual participant in the context of their specific institution.

II. A SURVEY OF ADVISORY BOARD OPERATION

A. Survey Overview

To help understand the composition and operation of typical advisory boards in engineering education, an on-line survey was created and distributed to engineering school directors and board members in April and May of 2007. The survey was emailed to 208 engineering school directors from 38 large research engineering institutions (according to the Carnegie classification (Reis, 1997)) located across the United States. School directors were asked to forward the survey to members of their advisory boards for their perspectives.

This study had its genesis in the primary researcher's experiences as an advisory board member at his undergraduate alma mater. In addition, the study was informed from observations of a number of IAB meetings with two different engineering programs at the University of Oklahoma and from a series of interviews with program directors and board members. This experience was quite instructive and published as a case study (Genheimer and Shehab, 2007),

along with a model of IAB organizational effectiveness developed by the authors based on the organizational effectiveness work of Quinn and Rohrbaugh (1983). From this background and experience, and guided and structured by the IAB effectiveness model, key operating variables and issues of interest in IAB operation were identified which were explored in the large scale survey.

The survey consisted of 116 questions divided into eight major sections. A common core of questions was asked of every participant, but the role of the participant (department director or board member) determined which of the remaining questions were asked. Specifically, board members were asked to provide demographic information as well as information on board operation. Directors were asked for information and opinions on board operation and structure. The survey used multiple question formats as appropriate to the type of response requested.

Space does not allow for a discussion of all of the results of the survey, so only key findings regarding board effectiveness, objectives, and makeup are discussed in this report. The entire study is available from the authors (Genheimer, 2007).

B. Survey Response and Analysis

Of the 208 directors contacted, 43 directors from 42 different engineering academic programs at 25 different institutions completed the survey, for a response rate of 21 percent. The response rate of advisory board members is unknown as the distribution of surveys was at the discretion of program directors that chose to participate. Table 1 provides details of who responded to the survey.

The number and breadth of responses from engineering school directors is sufficient to draw meaningful inferences regarding advisory board effectiveness. However, caution should be exercised in interpreting survey responses as the sample size is small enough that the 95 percent confidence interval on responses is $+/-15$ percent. Forty-seven responses were received from advisory board members but only nine different engineering programs were represented in that sample. Note that there was only minimal participation from Computer Science programs and no participating board members. The relatively small number of programs represented in board member responses means that caution must be exercised in generalizing board member responses as representing all engineering programs. In addition, the self-selective nature of participation by both directors and board members means that the survey sample is not broadly representative of engineering programs and introduces a self-selection bias which could be assumed to be more favorable towards board engagement and effectiveness. Finally, the survey data do not meet the strict requirements of data type and normality so the statistical significance (p-value) of the parametric analysis performed should be viewed with care.

With these cautions in mind, this study is best considered to be a qualitative view of advisory board operation and effectiveness to illuminate patterns and trends, rather than a strict quantitative analysis from which definitive models and analysis can be derived. Within these limitations, the study does offer insights into elements and dimensions of operation and effectiveness that should be informative to individual IAB programs.

III. ADVISORY BOARD SURVEY RESULTS AND ANALYSIS

The analysis of the advisory board survey results examined the perception of overall effectiveness as evaluated by board members and directors. Further analysis examined specific advisory board objectives and how these objectives factored in to the evaluation of

Role	Discipline	Institutions	Participants
Director	Chemical Engineering	6	6
	Civil Engineering	7	7
	Computer Science	3	3
	Electrical / Computer Engineering	8	9
	Industrial Engineering	11	11
	Mechanical Engineering	7	7
	Total	42	43
Board Member	Chemical Engineering		
	Civil Engineering	1	6
	Computer Science		
	Electrical / Computer Engineering	3	12
	Industrial Engineering	4	19
	Mechanical Engineering	1	9
	Unspecified		1
	Total	9	47

Table 1. Summary of survey participant disciplines and roles.

overall effectiveness. Finally, the impact of board composition on effectiveness in accomplishing board objectives was examined.

A. Overall Effectiveness

The primary effectiveness assessment measure used in this study was a question in the survey that asked, "*Overall, how effective has the advisory board been in accomplishing its objectives?*" Responses were solicited using a 1 to 5 interval scale, with a 1 being "completely ineffective" and a 5 being "extremely effective." No definition of effectiveness was given, so that participants were responding in accordance with their own mental construct and assessment of effectiveness as applied in their specific organizational context. Effectiveness, as evaluated in this study, should be considered an assessment of the participants' overall level of satisfaction with the advisory board process. Figure 1 summarizes the response to this question, separated by school directors and board members.

As shown in Figure 1, school directors and board members in aggregate feel that their advisory board programs are quite effective. While directors give a somewhat higher effectiveness evaluation than do board members, this difference is not statistically significant.

Comments from directors on their advisory board experience were generally positive, with some cautions. "The board works very effectively in recommending items for consideration, and slightly less effectively in delivering or implementing items." "The advisory board has been effective, though they do have full-time jobs and can let items … slip through the cracks." Some board members were very positive: "To this day, I am amazed at the impact our Advisory Board has on the department." "We like to think that we are extremely effective." One contrary view from a department director, whose program does not use an advisory board, seems to be a distinct outlier: "In my experience, advisory boards, both at the college and department level, are mostly social exercises…. I have yet to see an example of a successful industry advisory board."

B. Board Objectives

From the literature on engineering advisory boards and interviews with advisory board directors and members, eight distinct objectives were identified as primary purposes of advisory boards (Genheimer and Shehab, 2007) and are listed in Table 2. Participants were asked to evaluate the importance of each objective and the corresponding effectiveness of the board in accomplishing these objectives. As shown in Figure 2, curriculum input and ABET accreditation were identified as the most important of the objectives, with health and development and program advocacy also evaluated by both groups as very important. Director's have a higher opinion of board effectiveness regarding curriculum input and ABET support, while board members have a slightly higher rating of their effectiveness in support of program health and development and program advocacy. Fundraising objectives were considered of very low importance by board members, though directors viewed them as more important than did board members. Both groups, however, thought boards were somewhat ineffective in this area.

The correlation between overall effectiveness and the accomplishment of specific board objectives helps provide a better understanding of how these objectives affect the perception of effectiveness. Table 3 summarizes effectiveness for each specific objective in relation to the overall effectiveness rating. Correlations with moderate to strong significance ($r > 0.35$ and $p < 0.05$) are highlighted. Note that for directors, just three objectives (curriculum, ABET accreditation, and health and development) emerged as significantly correlated to overall effectiveness, indicating that directors have a more focused view of the role of an effective advisory board. Board member responses showed most of the objectives as significantly correlated to overall effectiveness, suggesting that perhaps they view their advisory board more broadly than do directors.

Curriculum input is the most often mentioned board objective in the literature and is generally considered the archetypical role of advisory boards (Genheimer and Shehab, 2007). This survey confirms its importance with the strongest correlation to overall effectiveness of any of the objectives analyzed from both directors

Figure 1. Response distribution of ratings of overall board effectiveness.
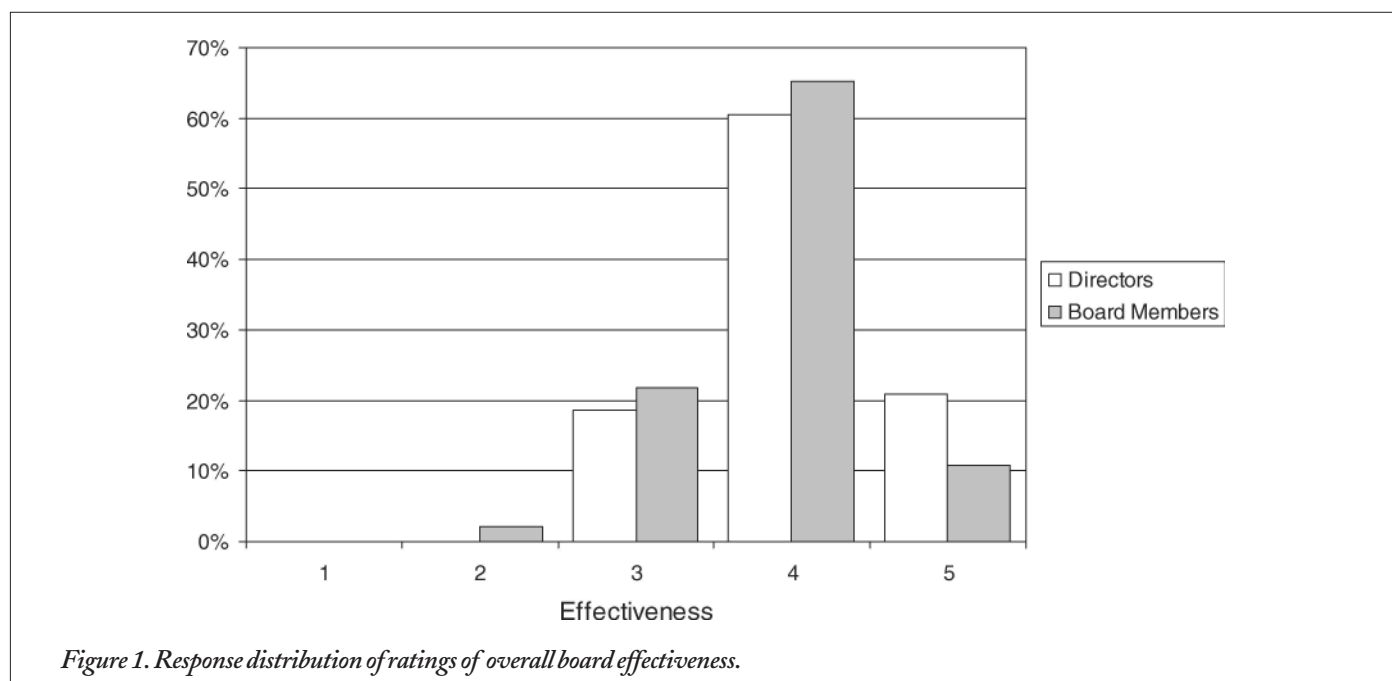
Survey Question	Board Objective
Advise program on curriculum content to meet industry needs	Curriculum input
Provide input and feedback to help meet ABET accreditation criteria	ABET accreditation
Provide input on program health and development opportunities	Health and development
Serve as an advocate for the program with administration, community, industry, alumni, etc.	Advocacy
Assist with seminars, design projects, graduate placement, mentoring, etc.	Program assistance
Help promote and coordinate research opportunities with industry	Research
Raise funds for school use from board member personal resources	Internal fundraising
Use board member contacts and influence to raise funds from other sources	External fundraising

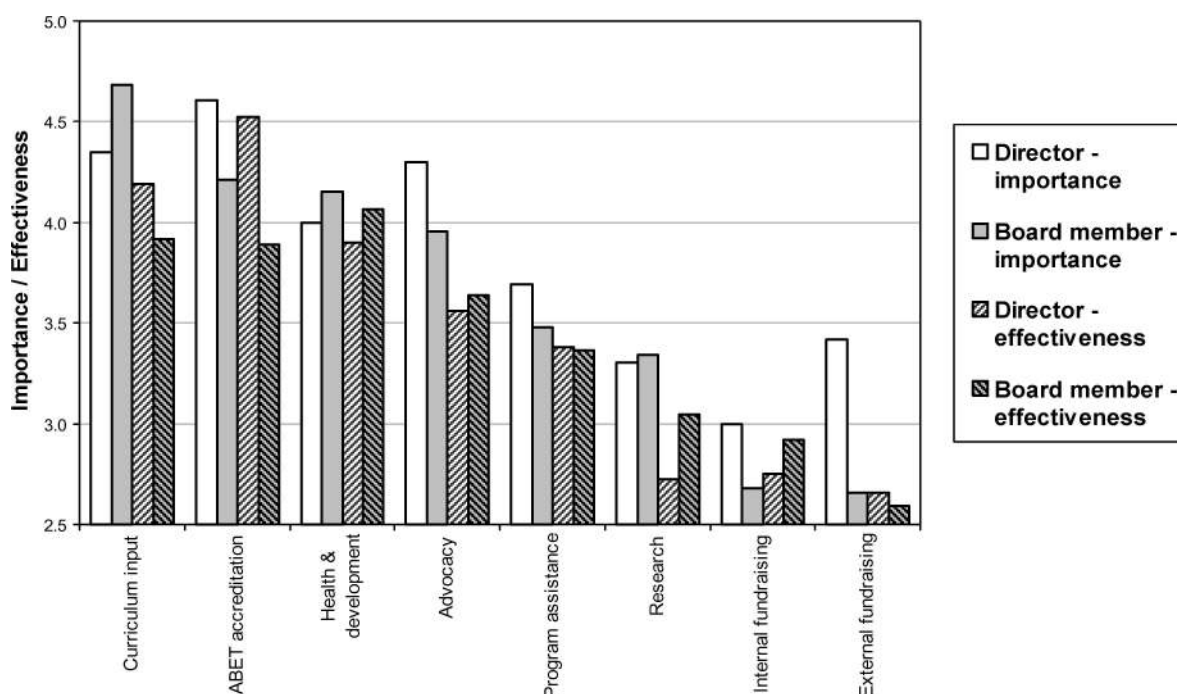*Table 2. Survey questions regarding board objectives.*

Figure 2. Mean importance and effectiveness ratings of board objectives.

($r = 0.59$) and board members ($r = 0.68$). Directors appear to be reasonably satisfied with the contribution of the board in this area as indicated by the small difference between importance and effectiveness ratings. Board members, on the other hand, are less satisfied with their ability to influence curriculum, with the largest gap between importance and effectiveness of any of the objectives. On the whole, board members feel that curriculum input is a vital role of advisory boards (importance = 4.68), and desire that the board have more input and influence with regard to curricular content (effectiveness = 3.91). This is one area where frustration showed up in survey comments by some board members. One member expressed disillusionment about the board's ability to influence curriculum with the comment, "I am considering withdrawing from this board since I feel ineffectual in it." Another expressed the concern, "Change is too slow to react to market needs." Directors

recognize the importance of this role, but are more cautious, believing that board members sometimes have too narrow a perspective on academic and curriculum issues and do not "fully understand academia". Industry representatives typically desire students to have up-to-date skills specific to their industry needs. Academic leaders stress the importance of engineering fundamentals, realizing that curriculum change can never respond quickly enough to market needs, and thus emphasize the ability and importance of life-long learning. Because of the high correlations to overall effectiveness, this is an area of board operation that needs clear communication and aligned expectations between administration and board members.

Department directors give the highest importance rating of any board objective to assisting with the ABET accreditation process (importance = 4.60) and show a strong correlation of this element

Board Objective	Director		Board Member	
	r	p	r	p
Curriculum input	0.59	< 0.001	0.68	< 0.001
ABET accreditation	0.39	0.012	0.30	0.047
Health and development	0.46	0.003	0.58	< 0.001
Advocacy	0.30	0.055	0.46	0.001
Program assistance	0.21	0.176	0.58	< 0.001
Research	0.21	0.193	0.57	< 0.001
Internal fundraising	0.04	0.804	0.35	0.030
External fundraising	0.26	0.107	0.24	0.163

Table 3. Board objective effectiveness correlations to overall effectiveness.

to overall effectiveness ($r = 0.39$). For directors, ABET accreditation is an essential element of their program and advisory board input has become a mandated part of this process. The IAB represents important constituencies of the engineering program and can thus be expected to participate in the development and review of Program Objectives, which are key elements of ABET Criterion 2 (ABET, 2006). One director commented, "I have been using the board primarily to help with the undergraduate accreditation processes." Fortunately, department directors also give very high marks to the effectiveness of the board in this area (effectiveness = 4.52), indicating that advisory boards in general are quite useful in accomplishing this objective. Both directors and board members were asked whether the board's input in the accreditation process was best characterized as formal, informal, none, or unknown. Although all respondents indicated that the board played some role in ABET accreditation, with 46 percent indicating formal involvement in the process, almost 30 percent of responding board members did not know how their input was used. An ANOVA looking at board involvement with the ABET accreditation process on the effectiveness of the ABET accreditation objective shows a significant effect ($F(2,76) = 21.63, p < 0.001$). Clearly the more formal-

ized the role of the board in ABET accreditation the higher the perception of effectiveness with regard to this objective (Figure 3).

Program health and development is an activity in which the advisory board works with the program to evaluate and assist in its overall health and development. The survey did not clearly define the meaning of "health and development," but this could include activities such as strategic planning, competitive program analysis, review of financial health, and assistance in recruiting or interviewing new faculty. Program directors give this objective an importance of 4.00 and an effectiveness of 3.90, indicating that they are fairly satisfied overall with board performance in this area. Board members are equally satisfied with their role in program health and development, with an importance of 4.15 and effectiveness of 4.07. This objective shows one of the strongest correlations to overall effectiveness for both directors ($r = 0.46$) and board members ($r = 0.58$). The desire on the part of both board members and school leadership is that the board play an important role in the strategic life and health of the academic program.

Program advocacy with industry, community, university administration, and potential students is viewed by directors as an important responsibility of IABs (importance = 4.30). However, directors expressed some dissatisfaction with the effectiveness of the board in this area (effectiveness = 3.56). Clearly, directors would like advisory boards to be stronger advocates for their programs than they feel that they are. However, board members do not see this objective with the same importance (3.96) but do have a similar view of effectiveness (3.64). Board member effectiveness evaluation correlates strongly with overall effectiveness ($r = 0.46$). The correlation to overall effectiveness by directors is weaker ($r = 0.30$).

Program assistance refers to commitments of time and effort by individual board members and the board as a whole to assist students and the program by providing, for example, seminars, design projects, graduate placement, and mentoring. Board member ratings in this area correlate significantly with overall effectiveness ($r = 0.58$), but director ratings do not show nearly as strong a correlation ($r = 0.21$).

To further explore the topic of program assistance, respondents were asked to indicate how the board engaged with students, as seen
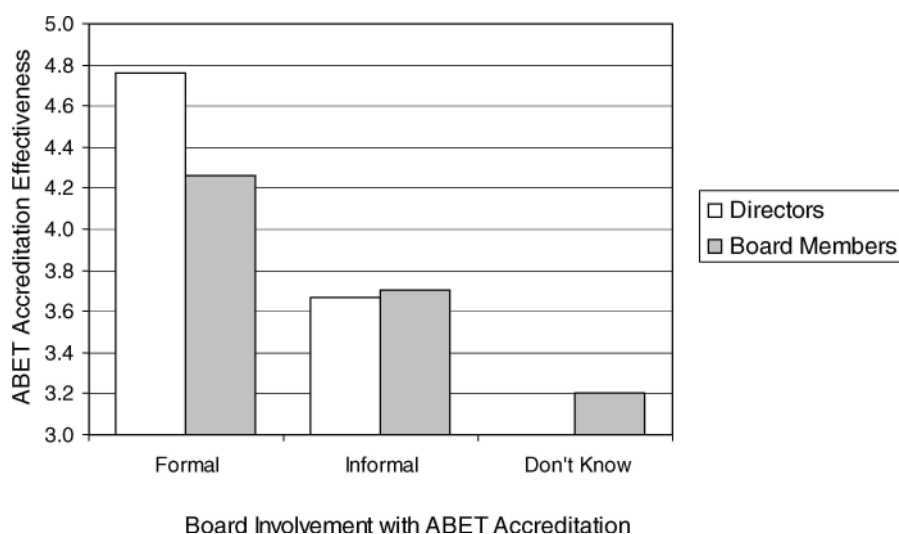

Figure 3. Mean ratings of ABET involvement on ABET accreditation effectiveness.
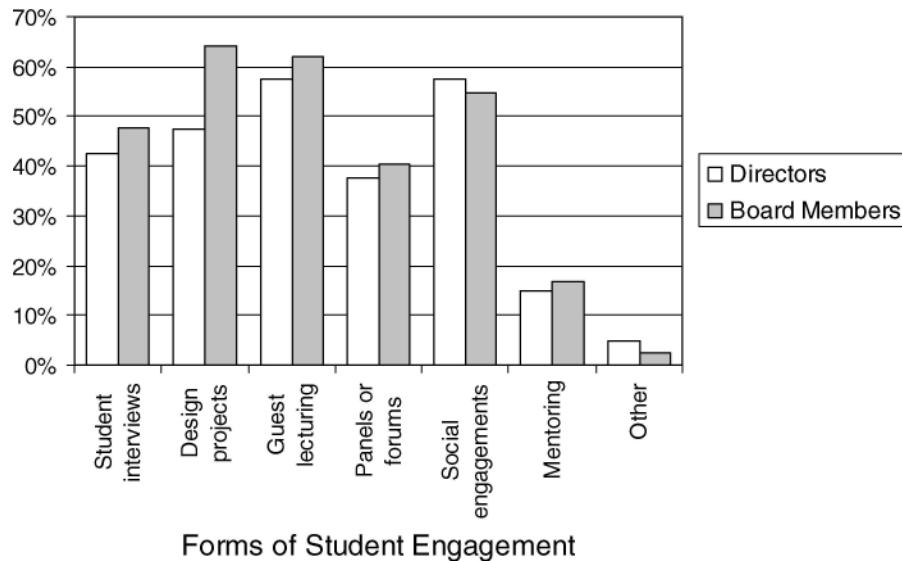
Figure 4. Response distribution of types of advisory board engagement with students.

in Figure 4. To assist with analysis, a student engagement index was created that simply counted the number of types of engagement listed for each respondent. A high student engagement index indicates that the board is engaged with students in many different ways. A correlation of the student engagement index against overall board effectiveness was run for both directors and members. It shows that from the board member perspective, programs that are more engaged with students are viewed as somewhat more effective overall ($r = 0.32$, $p = 0.037$). However, there is no similar correlation from the director perspective ($r = -0.26$, $p = 0.105$). It would appear that board members get a strong sense of accomplishment and satisfaction from feeling that they are able to contribute to the educational experiences of students, and the more they are engaging directly with students, the more effective they view the advisory board program. Directors, however, do not consistently have a strong assessment of the importance of board member involvement directly with students.

The objective of research support involves using the board to help identify or coordinate research opportunities for the academic program. As the objective and scale of research was not defined, there is the potential for differences of interpretation in this question, from involvement in a senior design project to helping support a full-scale research center. Though this is not a particularly high priority objective for directors (importance = 3.30), a significant gap shows up between the desires of program directors and their assessment of board performance (effectiveness = 2.73). Board members view research with similar importance as do directors (importance = 3.34) but have a more favorable view of their effectiveness (effectiveness = 3.04). Research shows a strong correlation to overall effectiveness by board members ($r = 0.57$) but not by directors ($r = 0.21$). It is possible that board members have a different definition of research than that of program directors in their response to this question. Consequently, board members felt that they were contributing at a more significant level in this respect than did program directors.

The topic of fundraising sparked the most comments and the widest variety of opinion among advisory board programs. Internal fundraising (contribution from board member personal resources) is given the lowest average importance rating of any of the objectives by both directors (importance = 3.0) and members (importance = 2.68). The standard deviation, however, is high (1.25 and 1.31, respectively) indicating that some programs put a high emphasis on internal fundraising, while others do not. For several programs, there is a deliberate decision to keep the advisory board out of the development or fundraising process. "We do not view our advisory committee as a fundraising tool. We have a different group that serves that purpose," notes one director. A board member from another institution says similarly, "Our advisory board is not involved in fundraising. Our alumni academy takes care of that function." Other programs are essentially at the same point without a formal policy. "We as a board avoid money raising, aka 'development'. Some of us are obviously donors but it never comes up in meetings or otherwise." In other cases, board members express frustration: "Education of students seems secondary to fundraising." Directors express frustration for the opposite reason. One director comments, "The board has not provided leadership on fundraising." On the other hand, several programs mentioned financial support and funding of scholarships as one of the strengths of the advisory board. Clearly, fundraising is a topic about which everyone has an opinion and there is much disagreement. Internal fundraising effectiveness showed essentially no correlation to overall effectiveness from department directors, and a weak correlation from board members.

Board members also show a wide range of responses to the question, "*The program is clear and up front regarding expectations about financial contribution from board members*" (Figure 5). However, correlation of the ratings on clarity of fundraising expectations with the measure of internal fundraising effectiveness shows a positive relationship ($r = 0.38$, $p = 0.041$). Having clear expectations and agreement between the school and the board on the place and priority of fundraising appears to be essential to effectiveness.

Board members were also asked to respond to the statement "*I am comfortable with the priority and attention given to fundraising by*
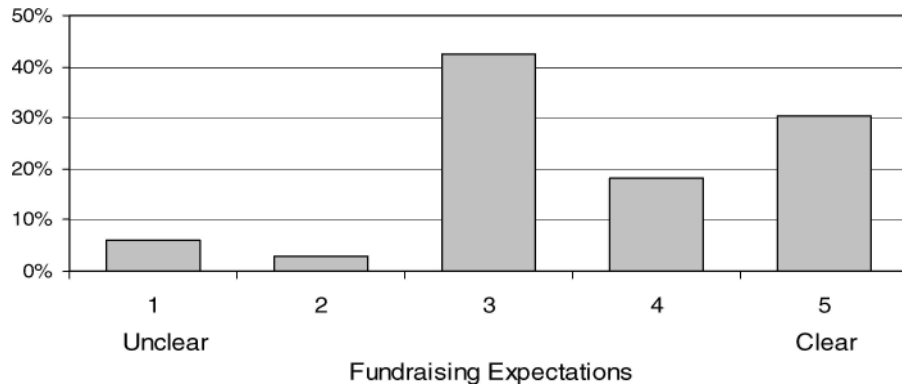
Figure 5. Response distribution of board member ratings of clarity of fundraising expectations.
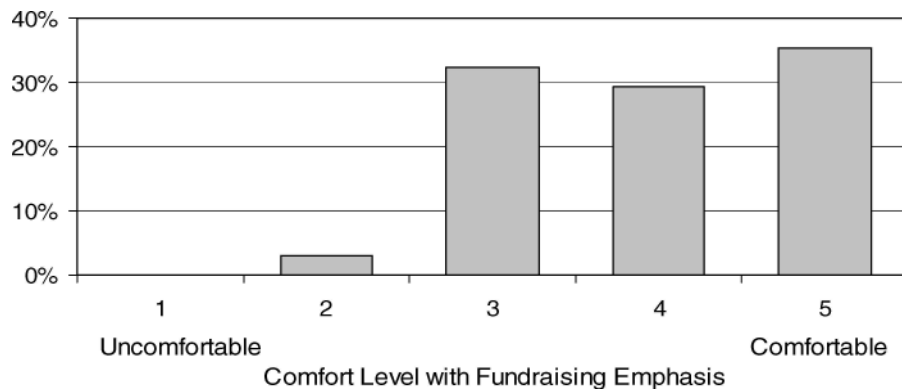

Figure 6. Response distribution of board member ratings of comfort with fundraising emphasis.
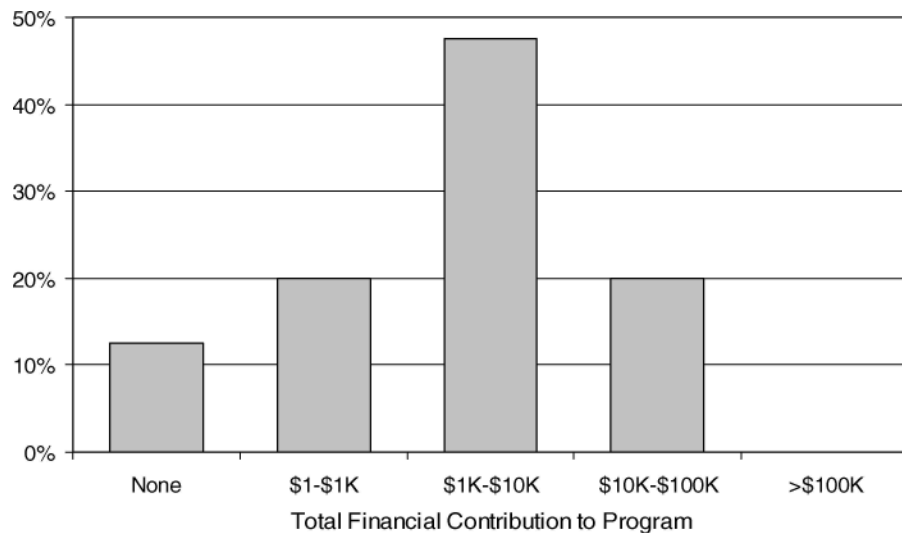

Figure 7. Response distribution of board member financial contribution to engineering academic program.

the board," and their responses are shown in Figure 6. This variable strongly correlates to overall board effectiveness ($r = 0.42$, $p = 0.017$), reinforcing how important it is that board members "buy in" and align with the fundraising strategy of the board, whatever that might be.

The total amount contributed to engineering programs by each advisory board member respondent is shown in Figure 7. The question specifically asked for the amount contributed to the engineering program with which they were involved, not the college or institution as a whole. The typical advisory board member in this sample
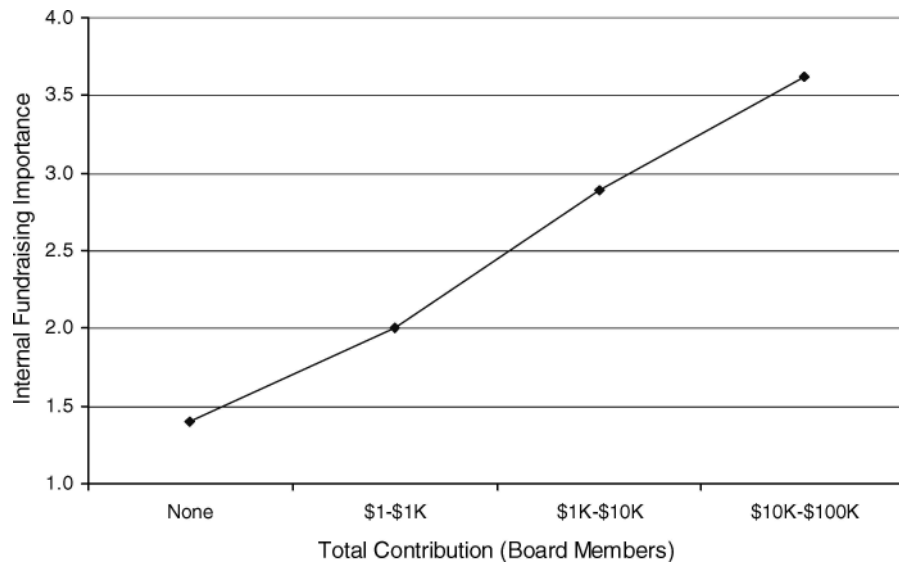
Figure 8. Internal fundraising importance versus individual board member contribution.
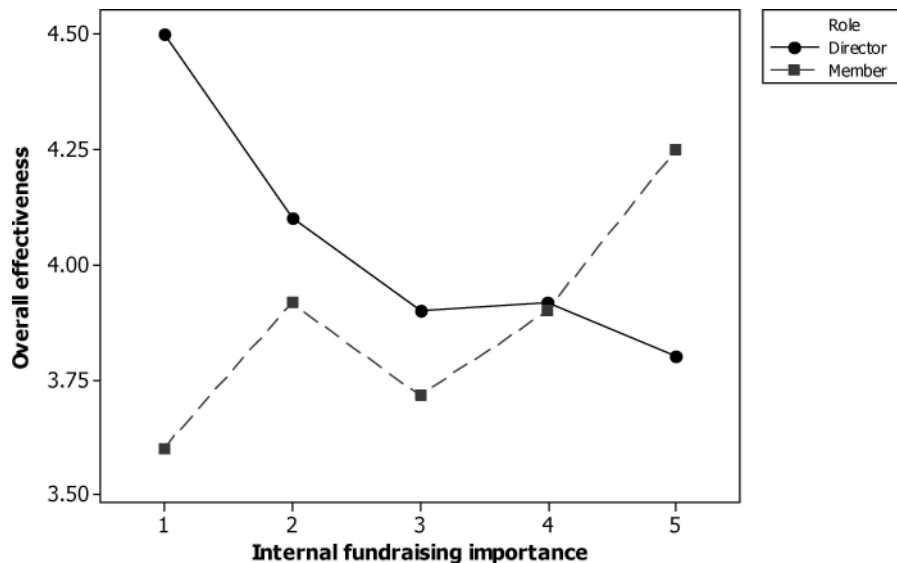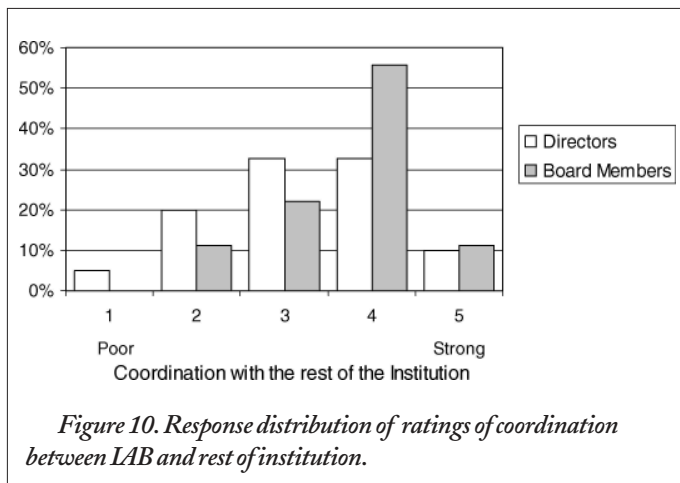

Figure 9. Overall board effectiveness as a function of internal fundraising importance.

has contributed between $1000 and $10,000 to the program. An ANOVA of the effect of individual contribution amount on the effectiveness of internal fundraising shows a trend toward statistical significance ($F(3,29) = 2.76, p = 0.060$), but there is a strong effect of individual financial contribution on the *importance* of internal fundraising ($F(2,35) = 5.09, p = 0.005$, Figure 8). Board members seem to be making a statement about their view of the importance of internal fundraising through their level of financial contribution. However, when considering internal fundraising effectiveness of the board as a whole, the individual level of financial contribution has a weaker effect, suggesting that board members do not always extrapolate their personal priorities as reflective of the priorities of the board as a whole.

Figure 9 shows an interesting pattern in the ratings of internal fundraising *importance* as compared to overall board effectiveness. While one cannot generalize too strongly from this data, it appears

that program directors that place a high emphasis on internal fundraising from their board are more likely to view the board as ineffective. On the other hand, board members who believe that internal fundraising is an important role for the board are more likely to view the board as effective. One interpretation could be that any fundraising emphasis should come internally from within the board rather than from department leadership or external pressure. Maximum effectiveness seems to be associated with department leadership taking a clear stand that internal fundraising is not the role of the board, or board members clearly identifying internal fundraising as a priority.

External fundraising, or using the influence of the board with individuals or organizations outside of the board to raise funds, has the same large variation in responses as did internal fundraising. Board members give this objective the lowest importance rating of any objective (2.66), but program directors give it a much higher

Figure 10. Response distribution of ratings of coordination between IAB and rest of institution.

importance (3.42). This is the largest disconnect of any objective between directors and board members and the difference is statistically significant ($t_{84} = 2.86$, $p = 0.005$). Directors also show the largest gap between importance (3.42) and effectiveness (2.64) in this objective. Clearly, many directors would like to see advisory boards do a more effective job using their influence toward external fundraising. Board members see almost no gap between importance (2.66) and effectiveness (2.59). The use of advisory boards for external fundraising may be overemphasized on the part of program directors, as there is only a weak correlation of this objective with overall effectiveness ($r = 0.26$).

The survey also examined the level of coordination between advisory board activity and the larger institution in the response to the statement, "*Operation of this advisory board is well coordinated with the rest of the college or university.*" Figure 10 shows that board members perceive a higher degree of program coordination than do directors, with perhaps less awareness of internal institutional politics and conflict. A director noted that, "In the past, the development role had not been coordinated with the College of Engineering." A member expressed frustration that, "University rules … limit how many of the board's recommendations can be implemented." The rating of level of coordination shows positive correlations with overall effectiveness ($r = 0.33$, $p = 0.004$) and external fundraising effectiveness ($r = 0.34$, $p = 0.005$), and strong correlation with research coordination effectiveness ($r = 0.49$, $p < 0.001$). The implication is that the advisory board should not be allowed to be an isolated "island" (with visibility and communication only within the particular engineering academic program) and effort should be made to engage and coordinate the advisory board with the larger program of the college of engineering and university. This will pay off in increased effectiveness in several important areas, even if it does require more time and effort on the part of the program. Larger fund raising and research projects are typically beyond the scope and leadership of a single advisory board, though the board can play an important role in supporting these efforts for the college and the university given an appropriate level of coordination.

C. Board Makeup and Member Selection

Board members were asked a series of questions to provide demographic and participation information that would be helpful in understanding the composition of their advisory board. Questions were asked regarding age, gender, minority status, education, career,

net worth, giving, and relationship to the institution. The responses are summarized in Figure 11. The typical advisory board member in this sample is approximately 55 years old, a white male with significant education, a senior manager or executive in a manufacturing company, has a net worth of approximately $1 million, and is an alumnus of the program on whose advisory board he is serving.

The analysis examined board composition as it relates to effectiveness of accomplishment of board objectives. The makeup of the board in terms of strength of ties to the school and the percentage of alumni on the board, as well as the net worth of board members, are significant factors from the perspective of attendance, advocacy, and fundraising. None of the other elements of the makeup of the board were seen in this study as significantly affecting board objectives.

Survey responses were examined to determine which member selection criteria had the greatest effect on member attendance at meetings, as reported by board members. Not surprisingly, those board members who have the strongest ties to the school (Figure 11h) are the most likely to attend meetings consistently ($r = 0.36$, $p = 0.021$). There is a greater likelihood for alumni of the program to consistently attend meetings than for non alumni, but the effect is not statistically significant ($F(1,40) = 2.07$, $p = 0.158$). Surprisingly, there is essentially no effect on member attendance due to how far members have to travel to attend meetings, ($F(4,37) = 0.68$, $p = 0.610$). The interpretation is that members who are positively motivated and have strong ties to the school will consistently attend meetings regardless of how far they have to travel.

There is a positive correlation between board members' responses to the question regarding the strength of their ties to the school (Figure 11h) and the effectiveness of the board in program advocacy ($r = 0.47$, $p = 0.002$). This indicates that members who have close ties to the school are more likely to be active supporters of the program and use their influence to promote the school to future students, university administration, industry, etc.

Member characteristics have a pronounced effect on fundraising by the board. There is a strong relationship between the effectiveness of the board in terms of internal fundraising and the percentage of board members who are alumni ($r = 0.42$, $p = 0.009$). Boards with higher percentages of alumni typically perceive board internal fundraising as more effective (Figure 12).

There also is a positive correlation between the composition of the board in terms of net worth of members and the effectiveness of the board in internal fundraising ($r = 0.36$, $p = 0.006$). It is significant to note, however, that 13 percent of the directors and 38 percent of the board member participants indicated "don't know" in evaluating overall board composition with respect to net worth, a higher percentage than for any other question in the survey. It does appear that directors are more conscious than board members of the net worth of the board. When the actual contribution level of board members (Figure 7) is compared against their self-reported net worth (Figure 11f), a Spearman's Rho of 0.52 results, showing a strong positive correlation.

As was the case with internal fundraising, board member assessment of the net worth of the board is positively correlated with the effectiveness of external fundraising ($r = 0.42$, $p = 0.012$). While external fundraising is concerned with raising funds from outside the board rather than board members personally, it is a logical assumption that board members with greater net worth are more likely to have relationships and be in positions to
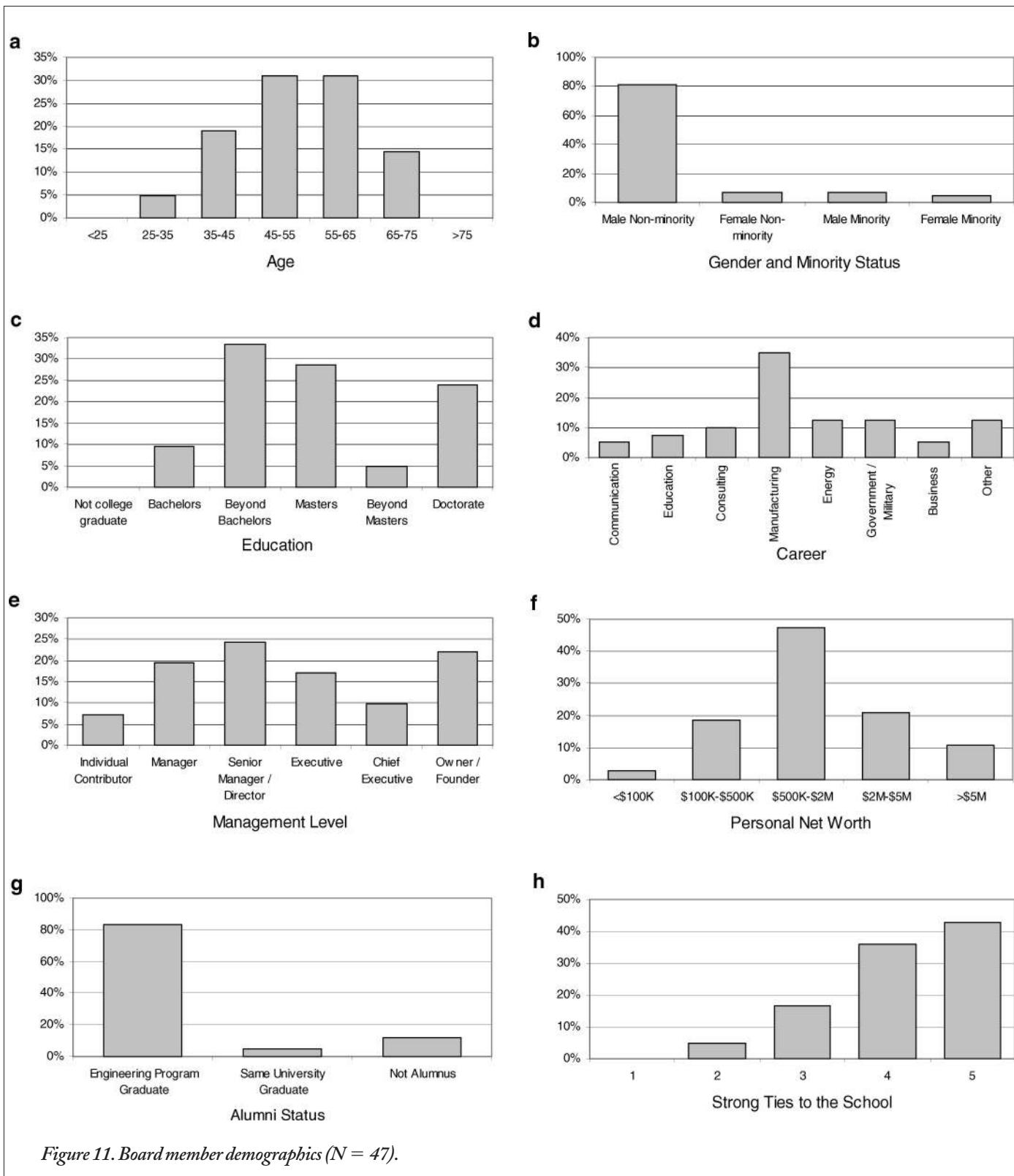
Figure 11. Board member demographics (N = 47).

influence the contributions of others. If fundraising is a program priority (both internal and external) and the desire is that board members support this priority, these data suggest that alumni with higher net worth should be sought as board members. As the accumulation of net worth is a function of time, it should come as no surprise that there is a strong correlation between the age and net worth of board members ($r = 0.63$, $p < 0.001$).

IV. CONCLUSIONS AND PRACTICAL IMPLICATIONS FOR BOARD EFFECTIVENESS

The overall effectiveness of an advisory board is dependent on a large number of factors, including the culture, value, and priorities of the institution. This research has shown differing views of advisory board effectiveness and priorities among different programs as well as between program directors and board members.
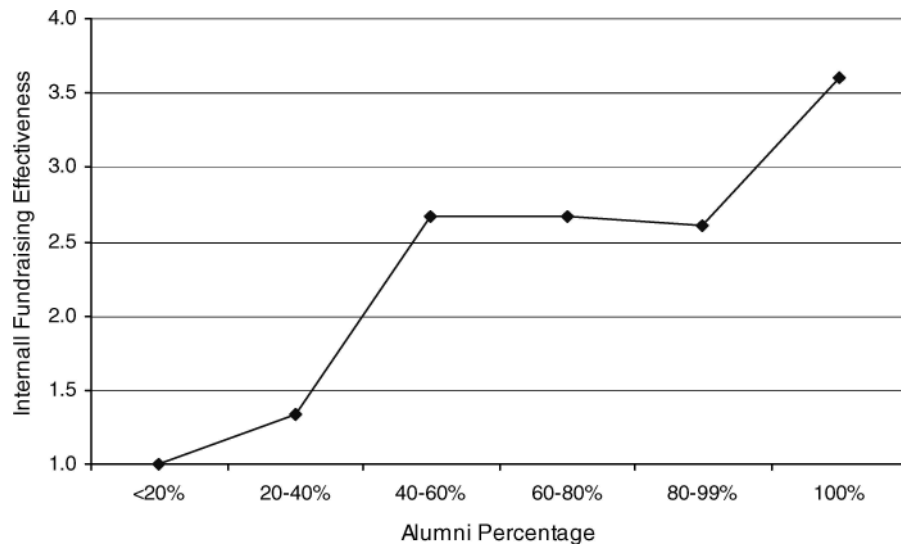
Figure 12. Internal fundraising effectiveness versus alumni percentage.

However, there are common themes that emerge among effective programs.

Nowhere is the variation between programs seen more clearly than in differing attitudes and approaches to fundraising. Some programs choose not to involve their advisory boards in fundraising while others have engaged their advisory boards very successfully in this area. For yet other programs, fundraising has become a source of frustration and contention. This research highlights the importance of clear communication and expectations in this area. If the program does choose to make fundraising a priority, board members must have "bought in" to this emphasis, and leadership on fundraising initiatives should come from the board rather than from the school. Programs can also be effective with a deliberate decision not to make fundraising one of the board objectives. Clarity and unity of purpose in this area are vital.

The following additional recommendations regarding advisory board operation can be made based on their correlations to board effectiveness:

- Ensure clear understanding by board members of the educational mission of the institution and aligned expectations of the advisory board role in regard to input on the curriculum.
- Have in place formal procedures for board involvement in the ABET accreditation process of which board members are aware.
- Promote engagement of board members with students in activities such as panels and forums, interviews, design projects, and social events.
- Coordinate advisory board activity and priorities with the rest of the college and university.

The makeup and selection of board members are significant to advisory board operation as they affect attendance, advocacy, and fundraising but do not affect other board objectives. Here are key considerations in board member selection:

- Board members with close ties to the school are more likely to attend meetings consistently and be advocates for the program.

- Board members with close ties will often be alumni of the program, and alumni are more likely to be financial contributors to the program. This research did not show any negative effects from having a high percentage of alumni on the board.
- If internal and external fundraising are priorities, individuals (particularly alumni) with higher net worth are more likely to be supportive of the fundraising process.

This research was somewhat limited by the relatively small number of responses, and in particular the small number of programs from which board member response was received. A larger and more representative response would have improved the reliability of the data and generalizability of the analysis. In particular, the minimal participation by Computer Science programs as well as the historic differences in alignment and accreditation between computer science and engineering curricula limit the ability to generalize the results of this study to include Computer Science programs. A greater response of board members across a larger number of programs would have allowed paired analysis within programs and helped clarify differences in priorities and perspective between directors and board members.

This study has shown that the majority of engineering program directors and board members view the advisory board as a significant asset to the engineering program, beyond just a tool for meeting ABET accreditation requirements, and view their own involvement positively. A number of factors in board operation and makeup were identified which were seen to correlate with board effectiveness, and these insights should be helpful to those involved in advisory board leadership.

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