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RECRUITING CONSTRUCTION LEADERS AND MANAGERS FOR THE FUTURE

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Abstract. The US construction industry has difficulty in attracting and recruiting personnel. Many who enter the industry are lacking management and leadership skills critical to success. Missouri University of Science and Technology conducted a study to determine what factors influence the decision of a college student to enter the construction industry. Experienced professionals were surveyed to determine factors that keep them in the industry and what the differences were between their expectations and reality. Potential construction professionals in college were surveyed about what attracts them to construction and what they anticipate in their careers. Extensive statistical analysis of the surveys is completed. Results show that students look for a career with challenges and a positive work environment. Frequent relocation and job related stress are factors that inhibit students choosing construction.

Keywords: recruiting, US construction industry, careers.

Introduction

The purpose of the research conducted at Missouri University of Science and Technology (Missouri S&T) and reported here is to discover what factors influence graduating US civil engineering students to choose, or not choose, a career in the construction industry. Eventually we hope to provide knowledge and identify factors that will help to increase the number of available, qualified professionals for the construction industry.

The construction industry over the last decade has had difficulty in attracting and retaining engineering and construction professionals. Many of those that enter the industry are deficient in project management, leadership, and constructability skills. Gathering the right kind of personnel to be responsible for a multi-million or billion dollar construction project is necessary for the growth of the industry. Why is it that highly educated, top quality, young engineers choose not to pursue careers in construction?

Background

During the spring of 2001 the Construction Industry Institute (CII), a US –based consortium of leading owners and contractors who have joined together to find better ways of planning and executing capital construction programs, (CII 2002) published its annual slate of proposed topics to investigate (Prudhomme 2001). Among the topics listed was, “Attract, Recruit, and Retain Top Quality Construction Leaders / Managers.” Specifically, the topic asks, “How do we attract and retain the necessary talent to insure technically correct, cost effective designs in the future and the leadership to effectively execute them?” Through this question, CII indicates that there is, or will be, a shortfall of professionals entering the construction industry.

One compelling paper pointed to “Construction Education” as being a key-contributing factor to resolving this professional manpower shortage (Mayo 1999). Mayo strongly suggested changing construction education curricula so that students are better prepared for the realities of the construction industry as compared with other possible career options (e.g. design/consulting). Many of the findings of this article concurred with the findings of Williamson and Gankowski at Illinois State University, who directly attributed the relationship between student empowerment, attitude, and motivation toward construction course work to that of professional construction management itself.

Practical experience (e.g. internships, co-op programs, etc.) is a key factor, as well as the student’s attitude towards his studies (Williamson 1997). In an article in the “Practice Periodical on Structural Design and Construction,” detail is given to the kinds of skills industry leaders need to be able to perform their important tasks (Badger 1999). Skills such as communication, construction materials and methods, cost controls, budgeting, scheduling, and project administration are essential.

Badger's article also expressed how a study in 1998 showed that construction education programs were producing 2,350 graduates per year, while the industry demanded approximately 4,400 graduates annually. This shortfall of over 2,000 graduates per annum is significant.

Research Method

This study was conducted in two phases. The first phase consisted of interviews of selected individuals for the purpose of formulating a series of questions to be included in a survey that would be conducted during the following phase. The second phase was the execution of a survey among professionals and students.

Starting with a listing of 3464 graduates of the civil engineering department at Missouri S&T, 986 alumni were chosen at random to survey. Included in the survey packet was a self-addressed postage paid envelope, a letter of introduction from the investigators, and the survey instrument. Surveys were mailed out in mid-November 2002 and were received from late November through December 2002. The student survey was conducted among the students enrolled in the senior capstone design course at S&T in the Fall of 2002 and Spring of 2003.

Of the 986 surveys sent out to professionals, 201 were received, for a return rate of approximately 20%. Table 1 provides the results obtained. Of the surveys completed and mailed back, 172 indicated that they were male, while 29 stated they were female. The youngest respondent was 23 years of age, while the oldest was 80 years of age; with three respondents declining to answer the question pertaining to age.

One hundred and five (105) held a bachelor's degree only, while 95 participants had completed some education since their undergraduate work, with 3 of those completing a PhD. One respondent did not indicate education level. One hundred and twenty five respondents indicated that they were registered or professional engineers in their areas, with the remaining, just over 1/3 of those returning surveys, indicating they did not hold a license to practice engineering. Lastly, when asked in question number 6 whether or not they were "in the construction industry," 94, or approximately 46%, answered in the affirmative, while the remaining stated they were not in the industry.

Student surveys were administered in the Fall of 2002 and the Spring of 2003, where 37 and 41 surveys were collected, respectively, for a total of seventy eight (Table 2). Sixty one of those surveyed were male, while the remaining 17 were female. All but two students were within one semester of graduation at the time of the survey. Given this, it is somewhat interesting to note that 31, approximately 40 %, had selected post graduation employment, while the remainder had not. The youngest student surveyed was 20 years of age while the oldest was 31, with an average age being 23. Seventy one students felt that they would pursue licensure as a professional or registered engineer with all but one of the rest indicating to the negative. Two out of every three students indicated that they were not going to enter the construction industry, while only 25 indicated that they would, or would consider, entering the construction industry.

At this point, the key data that was at the heart of this study was analyzed. A series of three responsive statements, followed by numerous sub responses (given a Likert-type scale), produced the data necessary to determine each respondent's key personality/individual skill sets, reasons for entering the industry, and the motivation for them to remain in the industry.

Table 1. "Occupation" of Professionals Surveyed

Structural Design	31
Environmental Engineering	22
Water Resource Engineering	13
Construction Eng./Project Management	84
Traffic/Transportation Analysis and Design	16
Materials Engineering	1
Code/Specification Enforcement	7
being an Expert Witness or Legal Services	1
Geotechnical Engineering	2
Other	19
Unknown	5
Total	201

Table 2. Planned "Occupation" of Students Surveyed

Structural Design	26
Environmental Engineering	7
Water Resource Engineering	11
Construction Eng./Project Management	23
Traffic/Transportation Analysis and Design	3
Materials Engineering	2
Code/Specification Enforcement	0
being an Expert Witness or Legal Services	0
Geotechnical Engineering	5
Other	1
Unknown	0
Total	78

Using standard statistical methods described in Backus (2004), a series of comparisons was made within each respective group (the students or the professionals) and then pairing the professionals as a whole group with the students as a whole group. These comparisons focused on how those in construction (or those entering) perceived these factors differently from those who were not in (or were not planning to enter) the construction industry. Likewise, an analysis was done to compare those with the "occupation" of "Construction/Project Management" to those that did not express this as being their occupation. There were some limitations to this analysis, which are noted in the next section.

Professional Survey Data Analysis Results

As a first step, an analysis of the professionals in this study was executed to ascertain certain traits or percep-

tions that will influence a graduating civil engineering student to enter construction when compared with any other civil engineering field. Thus, when looking at professionals, it is a clear requirement to ascertain the "actual" differences between those in construction and those not in construction, or at least ascertain their mutual perceptions. And for this part of the analysis, these differences only pertain to the sample of professionals that returned surveys and not comparing that to the students surveyed.

The results of the analysis demonstrate several significant differences, when analyzing the data based upon the difference between those stating that they are professionals in the construction industry and those that are not (see Table 3). When looking at values that would make an individual successful, 5 factors stand out as being viewed differently between professionals in constructions and those in other endeavors. On average, the value of "be comfortable with the routine" scored higher for those not in construction (mean value of 3.943) than those that were in construction (mean value of 3.473), indicating that those in construction believe that being comfortable with the status quo was not as valuable as compared to their non-construction counterparts.

Table 3. Key Results of Professional Data Analysis Pertaining to Personal Skills/Values

Judgments of agreement with the significance of a personal skill/value with respect to profession				
Value	Based on Question Six		Based on Occupation	
	In Construction	Not In Construction"	"Construction/PM"	Other Occupations
Be comfortable with the routine	3.473*	**3.943***	3.409	3.736
Utilize intuitive judgment	**5.892***	5.264*	5.909	5.546
Be very hands on	**5.304***	4.733*	5.318	4.990
Be an organizer/ planner	**6.283***	5.743*	6.190	5.995
Be an observer	**5.419***	4.934*	5.364	5.149

Note: Responses on a 7 point scale (1 = Strongly Disagree, 7 = Strongly Agree). The values above represent the mean value of the responses to that particular value.
* Means have a significant difference that exists between the two samples
Bold – Significant mean that is greater than the opposing group

Next, is the ability to "utilize intuitive judgment," where those in construction (mean of 5.892) deem this was much more important than did their counterparts (at a mean of 5.264). The following skills, "be very hands on," "be an organizer/planner," and "be an observer" all scored higher amongst those respondents indicating that they were in construction (with means of 5.304, 6.283, and 5.419 respectively) versus those who did not (with means of 4.733, 5.743, and 4.934). The differences, in these last four values, are such that the means are approximately half a category away from each other on the given Likert-type scale.

An analysis of these same values on a basis of "occupation" revealed that there are none that demonstrate a significant difference between those that indicate that have spent the majority of their career in the "occupation" of "Construction Engineering/Project Management" versus other specialties. However, the reason why there is no statistical significant difference is because of the conservative approach to the significance test used in this analysis. It is important to note that there is the possibility that there is significance between those indicating "Construction Engineering/Project Management" as their occupation and those that do not (as the data shows), but it is not significant on the aggregate.

There are three significant reasons why these professionals opted to enter construction in the first place: "the challenge of the work," "the work environment," and "work experience" (see Table 4).

Table 4. Key Results of Professional Data Analysis Pertaining to Entrance Rationale

Judgments of agreement with the significance of a value with respect to entrance rationale				
Value	Based upon Question Six		Based on "Occupation"	
	In Construction	Not In Construction	Construction /PM	Other Occupations
The challenge of the work	**5.871***	5.248*	6.182	5.549
The work environment	**4.849***	4.383*	4.591	4.631
Work experience	**5.129***	4.305*	5.136	4.715

Note: Respondents indicated their agreement on a 7 point scale (1 = Strongly Disagree, 7 = Strongly Agree). The values above represent the mean value of the responses to that particular value.
* Means have a significant difference that exists between the two samples
Bold – Significant mean that is greater than the opposing group

In each of these cases those in construction scored the importance of that rationale higher than their non-construction counterparts. Like with some of the values/skills above, the first two rationales, "the challenge of the work" and "the work environment," demonstrated significance with the scores differing by around half a

scale interval when those in construction are compared against those that are not, on the seven point Likert-type scale.

For "the challenge of the work," the means were 5.871 to 5.248 and for "the work environment," the means were 4.849 to 4.383. Most surprising is the difference in the values given for "work experience." For this rationale, those in construction scored this at a mean of 5.129, while the opposing sample indicated at a score of 4.305. This nearly one full point mean difference is not seen anywhere else in the responses amongst the professionals surveyed. Clearly this indicates that there is a strong perception that perhaps the work experienced gained by those in construction is not perceived to be as valuable amongst those outside of construction as those inside it.

The results of the analysis of the same rationale in a comparison of "occupation," were very similar to that of the previous discussion on the values/skills analysis, with significance seen between those in construction industry and those not in the construction industry, but not when those in construction are compared against the whole. Thus, any differences that existed in the scores did not meet the criteria for the purpose of significance.

Lastly, when discussing the analysis of the professional survey, the question was asked concerning what would cause then to remain in the construction industry. In both analyses, construction against non-construction and Construction/PM against other "occupations," there was no one significant factor. When comparing those in construction and those who stated they were not, there were several factors that registered confidence intervals that would imply significance; however the intervals do not meet the required significance test. Specifically these differences had intervals that were relatively close to zero, and thus are suspicious for the purposes of this analysis. As a point of side exploration, the professional survey data were also compared along age difference lines. The resulting score difference between the professionals of different ages, split between those above and below the median age of 39, did not demonstrate one single instance of significance in the results.

Student Survey Data Analysis Results

The student data were analyzed in the same manner as the data for the professionals. Regarding skills/values that were perceived to be important, the students did not cite any one particular skill as being more significant for those interested in construction than those that were not. When using the strict analysis rules for this study, the interesting result is that there is no significant factor in any of the comparisons made.

No one skill/value, reason for entering the industry, or reason for staying in the industry stood out when the data based on comparisons of construction vs. non-construction or Construction/PM vs. other "occupations" within the student data set were analyzed. Due to a small sample and the central limit theorem understanding of "significantly large," conclusions that could be made regarding these comparisons would be questionable. While there are some differences indicated between subsets of students, there are none that can be spoken about with confidence or that demonstrated the desired level of significance for this study.

Combined Analysis Results

Table 5. Professional Positive and Negative Aspects of Construction Responses

All Surveyed	201		
Positive Aspects	Number Scoring	Negative Aspects	Number Scoring
Challenge	46	Hours related	67
Variety	32	Travel/moving related	34
Salary/ Pay/ Money	21	Job Security/ Stab./Reloc.	23
Out-doors/Not Desk Job	17	Stress related	15
Sense of Accom-plishment	14	Pressure related	12
Non-Construction	107		
Positive Aspects	Number Scoring	Negative Aspects	Number Scoring
Variety	14	Hours related	35
Challenge	13	Travel/moving related	21
Salary	13	Job Security/ Stability	12
Sense of Accom-plishment	8	Stress related	9
Outdoors/ Not Desk Job	7	Pressure related	3
In Construction	94		
Positive Aspects	Number Scoring	Negative Aspects	Number Scoring
Challenge	33	Hours related	32
Variety	18	Travel/moving related	13
Out-doors/Not Desk Job	10	Job Security/ Stability.	11
Salary	8	Pressure related	9
Sense of Accom-plishment	6	Stress related	6

The data collected required various kinds of analysis to enable the drawing of any conclusions. When combining the students and professionals together, the first part of this analysis was to review the "free response" information offered from the response to the statement of "List the three most positive [or negative] aspects of the Construction Industry." Tables 5 and 6 illustrate the resultant

most popular positive and negative aspects given these responses.

Table 6. Student Positive and Negative Aspects of Construction Responses

All Surveyed	78		
Positive Aspects	Number Scoring	Negative Aspects	Number Scoring
Outdoors/Not Desk Job	32	Hours related	39
Salary	17	Travel/ moving related	18
Variety	11	Stress related	7
Hands On	6	Pressure related	1
Challenge	5	Job Security/ Stability	1
Non-Construction	54		
Positive Aspects	No. Scoring	Negative Aspects	No. Scoring
Outdoors/Not Desk Job	23	Hours related	27
Salary	10	Travel/ moving related	11
Variety	9	Stress related	5
Hands On	4	Pressure related	1
Challenge	2	Job Security/ Stability	1
Going into Construction	24		
Positive Aspects	No. Scoring	Negative Aspects	No. Scoring
Outdoors/Not Desk Job	9	Hours related	12
Salary	7	Travel/moving related	7
Challenge	3	Stress related	2
Variety	2	Pressure related	0
Hands On	2	Job Security/ Stability	0

Interestingly, regarding positives in the industry, results seem to indicate that "challenge" and "variety" are what professionals value most, while graduating civil engineering students seem to consider the positives as being "outdoors" or "not a desk job" and the "salary," "pay" or "money" as the two most important categories. This difference in priorities definitely indicates the possibility that students entering the construction industry have a different perception of what a career in construction will focus on compared with what those who have been in the industry value from that experience. When asked for their free answer on the question of negatives in the construction industry, professionals and students alike opine that hours are the number one negative factor. There is a clear consensus by all involved that the construction industry has a problem with "long," "excessive," "awful," or even "odd" working hours.

Once the free response data were analyzed, the Likert-type data for students and professionals were combined for analysis of those responses. Initially, like with the two prior analysis modes, students as a whole group were compared with professionals as a whole group in an attempt to determine if there were differences in perceptions dealing with skills/values, entrance rationale, and/or reasons to remain within the industry.

Nearly every response was different between these two groups, based upon a statistical significance analysis. On two particular values, "be fiercely independent" and "be an observer" there was no significant difference between the two groups. "Be a good communicator," "be able to multi-task," "resist compromising," and "have strong computer skills" are somewhat suspicious differences as well. The only similarity for reasons to enter the profession of their choice, was in the area of "the available jobs." "Better jobs," "the variety of career opportunities," and "the job location" are all somewhat suspicious differences.

With regard to reasons to stay in the industry, with the exception of "satisfactory job security" which demonstrates statistical significant difference, yet is somewhat suspicious, all of the responses registered a difference between students and professionals with respect to perceived importance. On the remaining 50 Likert-type responses, statistically, there was a difference between the two groups, which indicates a possible perception divide between students and professionals about what a future as a civil engineer entails. Because of this, and with the goal of this study being to determine the key reasons for attracting/recruiting college civil engineering graduates into construction, an approach of comparing the relative ranking of the apparent importance of each response (using the mean for each scaling), was used.

The first consideration was the relative ranking of each of the responses to the three focus questions of this study. Table 7 is indicative of the rank ordering of the values listed by both the professionals and the students, in which several items of note leap off the page. While there are differences in importance on all but two of these skills/values between the two groups (students and professionals), the top four values are remarkably similar in position, and as a group are identical (note that for students there is a tie for the fourth ranked value).

This indicates that perhaps the perceived relative importance of these values is equally understood. However, the next 3 values are found in dramatically different spots on the other group's ranking. The number five value for professionals, "be an organizer/planner," is listed in position ten amongst students. Likewise, "be results oriented" is listed as number twelve amongst students, and "be respectful of subordinates" is elevated to a tie for fourth position amongst students. Number six on the student listing, "be willing to engage in earnest learning," is dropped to number eleven amongst professionals. The result is that from ranking five to approximately eleven there is a clear variation in relative importance of the skills/values between the two groups, indicating a difference in perceptions. When looking at the rankings

from eleven or twelve through twenty one, there again seems to be a strong similarity between the two groups. The two values that demonstrated no significant statistical difference fall into this latter group.

Table 7. Apparent Rank Ordering of Importance of Personal Skills/Values

All Students Ranking		All Professionals Ranking	
1	have people skills	1	be a good communicator
2	be a good communicator	2	have people skills
3	be a team player	3	be able to multi-task
4	be able to multi-task	4	be a team player
4	be respectful of subordinates	5	be an organizer/planner
6	be willing to engage in earnest learning	6	be results oriented
7	be able to delegate	7	be respectful of subordinates
8	be assertive	8	be able to delegate
9	utilize intuitive judgment	9	be assertive
10	be an organizer/planner	10	utilize intuitive judgment
11	have a strong analytical sense	11	be willing to engage in earnest learning
12	be results oriented	12	have a strong analytical sense
13	have strong computer skills	13	have strong computer skills
14	be very hands on	14	be an observer
15	be an observer	15	be very hands on
16	be appropriately humble	16	be appropriately humble
17	be slightly modest	17	be slightly modest
18	be a specialist	18	be comfortable with the routine
19	be comfortable with the routine	19	be a specialist
20	resist compromising	20	be fiercely independent
21	be fiercely independent	21	resist compromising

Now regarding the rationale for entrance into their chosen profession, again a relative ranking comparison can be made (see Tables 8 and 9). While the difference in the rankings in this area is not as dramatic as those concerning values/skills, there are some that are of interest. The most important reason for entering the chosen field for each group ranks as number three on the other group's apparent ranking (e.g. "the challenge of the work" and "work experience"). Likewise numbers two and four on the list are also switched. As mentioned before, statistically the rationale of "the available jobs" was not significantly different between the two groups, the placement of "job location" above "the available jobs" for students, and the placement of "job location" below "the available jobs" for professionals, indicates another interesting difference. The two groups are placing the value of "job location" above or below something they mutually agree to be of the same relative importance.

Table 8. Apparent Rank Ordering of Importance of Entrance Rationale

All Students Ranking		All Professionals Ranking	
1	work experience	1	the challenge of the work
2	the work environment	2	the variety of career opportunities
3	the challenge of the work	3	work experience
4	the variety of career opportunities	4	the work environment
5	the job location	5	the available jobs
6	the available jobs	6	higher pay
7	better benefits	7	the job location
8	higher pay	8	better benefits
9	the influence of a mentor	9	the influence of a mentor
10	the chance to travel	10	family influence (relative/ parent/ family friend in the industry)
11	family influence (relative/ parent/ family friend in the industry)	11	the chance to travel

Finally, the relative difference in the rankings of the reasons a person would be willing to stay in their chosen profession was analyzed. Here, the ranking of rationale one and two for one list are essentially swapped for rationale three and four on the other. From there-on in the ranking scale there is amazingly identical relative weight indicated by the responses given to each of the remaining reasons to remain in the industry.

This observation taken in light of the earlier discussion that statistical significance was discovered in every answer between the two sample groups is very interesting. Also of note in this general ranking analysis, is that when the two ranking schemas are compared against one another for significance (to determine if there is any significant differences between the apparent rankings by students and those of the professionals), a Wilcoxon sign-rank test bears out that there is no difference at all.

What might be best to discuss in this situation, then, is not so much what the question asked (e.g., "I will be more likely to remain in my chosen profession if I encounter …"), but, instead, its antithesis (e.g., "I will be less likely to remain in my chosen profession if I encounter …"). If this is considered, then a mutual listing of the top five reasons to "get out of your chosen profession" is listed in Table 10.

Table 9. Apparent Rank Ordering of Importance of Reasons to Remain in the Construction Industry

All Students Ranking		All Professionals Ranking	
1	fair promotions	1	satisfactory job security
2	a solid professional development program	2	flexible work schedule
3	flexible work schedule	3	Fair promotions
4	satisfactory job security	4	a solid professional development program
5	widely available education programs	5	widely available education programs
6	a mentor program	6	a mentor program
7	longer than expected hours	7	longer than expected hours
8	significant job stress	8	significant job stress
9	incidents of safety violations/ injuries on the job	9	incidents of safety violations/ injuries on the job
10	lower relative wages	10	lower relative wages
11	frequent travel/family moves	11	frequent travel/family moves

Table 10. Possible Ranking of Reasons to "Get Out"

Reasons to Leave Your Chosen Profession	
1	frequent travel/family moves
2	lower relative wages
3	incidents of safety violations/injuries on the job
4	significant job stress
5	longer than expected hours

Taking into account that each statistical comparison of these rationale demonstrated that students rated the importance of each of these reasons higher than their professional counterparts, it would seem that for these five possible rationale for departing, the justification/perception of these problems only seems to grow once a person transitions from a recruit to a functionary in their chosen profession.

As a final part of the combined analysis of these two groups, it is important to consider the mutual sub-groupings of those entering/in construction vs. those not entering/not in construction (or those desiring to be/are in "Construction Engineering/Project Management vs. other "occupations"). When reviewing the results of that kind of pairing, however, there was no great distinction in terms of ranking that differentiated either sub-grouping from the whole. In most cases the rank ordering of the various Likert-type scale mean scores was identical across construction/non-construction considerations for both students and professionals.

Conclusions

Having executed a thorough analysis of the data collected, several conclusions can be drawn. As a way of reminder, the purpose of this research is to discover what factors influence graduating civil engineering students to choose, or not choose, to enter the construction industry. Also, the overall goal of these efforts was to provide knowledge and identify factors that will help to "expand the pool" of available qualified professionals for the construction industry.

Conclusions must then be clearly identifiable "factors" that are making an influence on a graduating civil engineering student. Based upon the analysis of the data, it would seem that the key factors for a civil engineering student choosing his or her field of choice, as they graduate, is whether or not that career choice will provide a positive work experience, a positive work environment, and provide challenge and/or variety. The validity of the importance of these entrance factors is buoyed by the fact that professionals cite these same reasons as being foremost in their memories of why they entered their chosen profession. Among construction professionals, however, it is clear that these factors resonate even more strongly. In the case of work experience, this one factor may mark the key selling point for those professionals that have entered the construction industry.

Ultimately, however, a student may choose not to enter a particular career field, and construction especially, when they consider any career choice that involves frequent travel/family moves, lower wages, safety violations/injuries on the job, significant job stress, and longer than expected work hours. With the exception of safety, these negatives seem so strong that they resonate when students are asked to freely respond without prompting; not simply when asked about them individually. Again, these negative statements mirror reality when professionals, who have had these experiences, discuss or indicate why they would choose to leave the industry. This also holds true when professionals freely express what they think about the problems they face in the industry. The pure volume of references in free responses, and significance of the relative responses on the provided Likert-type scale, indicates that these "negative factors" could definitely outweigh any positive factors, and may prevent a civil engineering graduate from choosing the construction industry as a future career.

Lastly, there are definitely certain skill sets possessed by the individual student, which will influence and/or suggest that he or she will have a successful venture into the construction industry. Professionals clearly indicate that the ability to "utilize intuitive judgment," to "be very hands on," to "be an organizer/planner," to "be an observer" are more important amongst those making a home in the construction industry, compared to other professional civil engineering career choices. Likewise, being able to "be comfortable with the routine" seems to be a skill that is not fitting for a person pursing a construction career. While students cannot really determine for themselves if they possess the skills that are important or should be developed to be successful in the construc-

tion industry, faculty and other mentors in college civil engineering programs should encourage those students that possess the right kind of skills, to pursue a future career in construction.

If these factors are considered, and in the case of the more negative factors, mitigated, and students are identified, it is hoped that the industry will be able to generally "expand the pool" of potential civil engineering students who will choose a career in construction upon graduation.

Areas of Future Research

This study clearly did not conclusively resolve the issue of recruiting and attracting individuals to the construction industry nor did it identify each and every factor that could help solve this problem. Some factors were identified and others were discounted. Further analysis of this data set using other statistical methods could yield useful results. There is the potential, however, to continue similar research by looking into other kinds and more expansive factors that effect career choices made by those considering a profession in the construction industry.

Clearly more research can be done in the area of gender related questions pertaining to job selection factors. The conduct of more research from other institutions, other regions of the country, or even other program types (e.g. Construction Science, Architecture, etc.) should be considered. A more expansive look at student perceptions between those thinking of entering the construction industry and those that are not, should be examined to determine more concrete perceptions. Considerations of how perceptions change amongst professionals as they age, and a comparison between those perceptions and the rationales of those individuals leaving from the construction industry later in their career, might be helpful.

It is important to pursue research in the area of what more can be done to retain people in the construction industry, and even to develop personnel further into leadership roles. Development of leadership was not considered in this study. Lastly, an analysis of trends over time, pertaining to these and similar factors, could lead to a more in depth analysis of the way in which the construction industry can resolve professional personnel shortages in the future.

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