

## **Diversity of Personality Types for Engineering in the New Millennium.**

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### Abstract

A ten-year study at the University of Western Ontario (UWO) has related the personality type (MBTI) of a large group (n=1865) of Canadian engineering students to the progress of those students through the engineering program to graduation. It has been found that the entry class, in comparison with general first-year students, contains a large proportion of I\_TJ (introverted, thinking, judging) types and an even larger proportion of these same I\_TJ types graduate in engineering. On the other hand the 'opposite' E\_FP (extraverted, feeling, perceptive) types form a much smaller proportion of the entry class and furthermore feature significantly in the group of students who withdraw after or during first year and also in the group who transfer out of engineering and graduate in non-engineering disciplines. Can the engineering profession afford to be under-represented in E\_FP types who by nature adapt well to change, enjoy variety and action, are interested in people and are good communicators?

As a follow-up to the main UWO study, it was decided to survey a subset of engineering graduate alumni (from the original MBTI cohort) asking about their current job description and job satisfaction. There were 45 responses from graduates with a preference for FP and 35 responses from graduates with a preference for TJ. This paper presents the results from this alumni survey and compares the responses and comments from the engineers with the minority FP (feeling, perceptive) preference with those from the engineers with the majority TJ (thinking, judging) preference.

### Introduction

National engineering groups both in Canada<sup>1</sup> and in the United States<sup>2</sup> remind us that engineering is changing faster than ever before. Accelerating programs in R&D together with the information technology explosion are leading to a "fusion of technologies" and the "merging of once disparate fields". This is leading to an engineering employment shift from manufacturing to service industries and from large co Bob Sternmpanies to smaller engineering enterprises. Such changes place added demands on engineers. Not only must they preserve a broad technical base with the ability to develop and transfer their expertise to other areas but they must also be able to cope with technical and societal change involving a variety of social, political and environmental factors. What are the personality characteristics in tomorrow's engineers that would naturally equip them to deal with such novel technical demands and interpersonal challenges?

A continuing study at the University of Western Ontario has tracked the progress of engineering students throughout their undergraduate programs in terms of their personality type as recorded by the Myers-Briggs Type Indicator. The results<sup>3</sup> show that although all types enter the engineering program and all types graduate, there is an emphasis towards Introverted, Thinking and Judging ( I\_TJ) types, both at entry and at graduation . Conversely, Extraverted, Feeling and Perceptive (E\_FP) types form a significantly smaller proportion of the entry group. Also a lower percentage of (E\_FP) types graduate so they form an even smaller proportion of the graduation class.

As part of the larger UWO study a survey was sent to a subset of engineering alumni from the MBTI cohort asking them about their work area, job function and job satisfaction. In particular this survey was intended to compare the responses from the more common TJ types with those from the less common FP types. This paper presents and comments on the survey responses from these two groups of engineering alumni.

### Personality Type from the Myers-Briggs Type Indicator

The MBTI is a self-reporting questionnaire based on Jungian theory concerning the way that people perceive information and make judgements. It identifies the respondents personality preferences on four bi-polar scales: extraversion / introversion (E/I), sensing / intuition (S/N), thinking / feeling (T/F) and judging / perceptive (J/P). The extraverted person has an attitude which is more oriented to the outer world of people and things whereas the introvert is more inwardly focused on concepts and ideas. The sensing person perceives directly and thoroughly through the five senses whereas the intuitive person is quick to tack on ideas and associations to these perceptions. The thinking person judges objectively and logically whereas the person with a feeling preference evaluates against a more personal value system, which is more likely to include human factors and societal values. The judging person deals with the environment in a planned and orderly way, taking in just enough information to make a decision whereas the person with a perception preference is more flexible and adaptable, takes longer to fully understand a situation and does not rush to make a decision. These four MBTI scales identify the respondent's personality type as one of sixteen possible four-letter arrangements such as INTJ or ENFP. All types are good, all types are normal and all types are found, although in different proportions, amongst the entry and graduation classes of engineering students. While the preferences of one type may match the demands of a given environment or situation better than the preferences of other types, no organization can afford to have 'blind spots', i.e. the lack of entire classes of personality types. Such a lack, Kroeger<sup>4</sup> suggests, may have disastrous consequences for the organization.

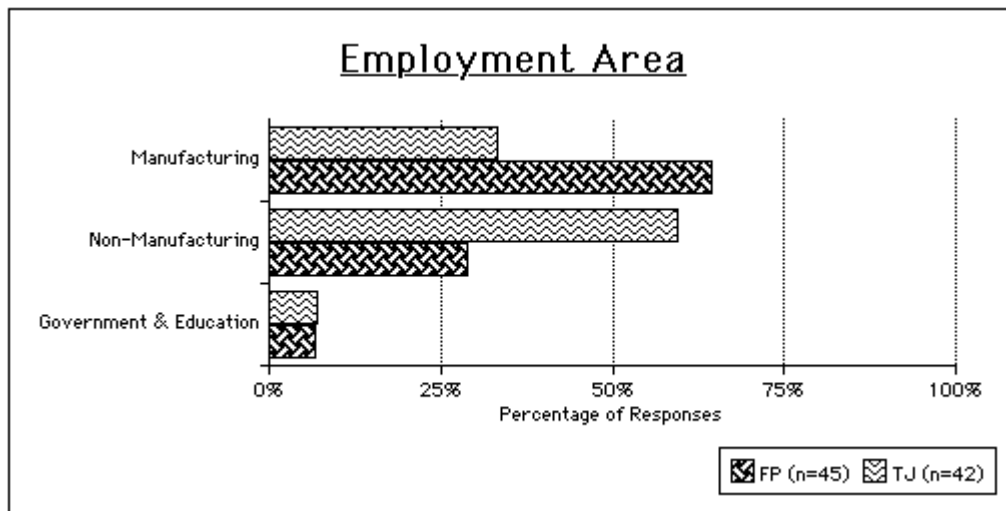
An MBTI study of a large group (n = 1865 ) of engineering students at the University of Western Ontario showed that the engineering entry were ISTJ in comparison with other first-year students and also that the engineering graduates were more I\_TJ than the engineering entry class. On the other hand, the total group of students withdrawing from the engineering program were \_SFP in comparison with the entry class. In fact 42.0 % of the entry group and 45.8 % of the engineering graduates were TJs whereas only 14.6 % of the entry class and 13.2 % of the engineering graduates were FP's. The TJ types are over-represented in the program and among the group of engineering graduates, while the FP types are under-represented.

Engineering presents a natural appeal to logical and objective T types and to well-organized and decisive J types. It has been said<sup>5</sup> that “TJ types tend to choose careers of power and authority and FP types tend to avoid them” and professional type distributions from the MBTI Atlas<sup>6</sup> confirm that engineers are 43 % TJ and 19 % FP and that professional managers are 49 % TJ and 17 % FP. However the needs and demands of the engineering profession are changing. The F types are naturally attuned to “people skills”, are good in teamwork and in the skills of understanding and motivating colleagues. Additionally, the P types are open-minded, curious and flexible and alert to unusual approaches. Also P types, especially in combination with N, tend to be more creative. Perhaps the engineering profession needs FP types more than it currently acknowledges!

In order to track and compare the professional paths, employment areas and job satisfaction of UWO engineering alumni a survey was sent to two separate groups; a TJ group of more typical engineering alumni and an FP group of less typical engineering alumni. The main results derived from the responses of these two groups of engineering alumni of different personality type are described and discussed below.

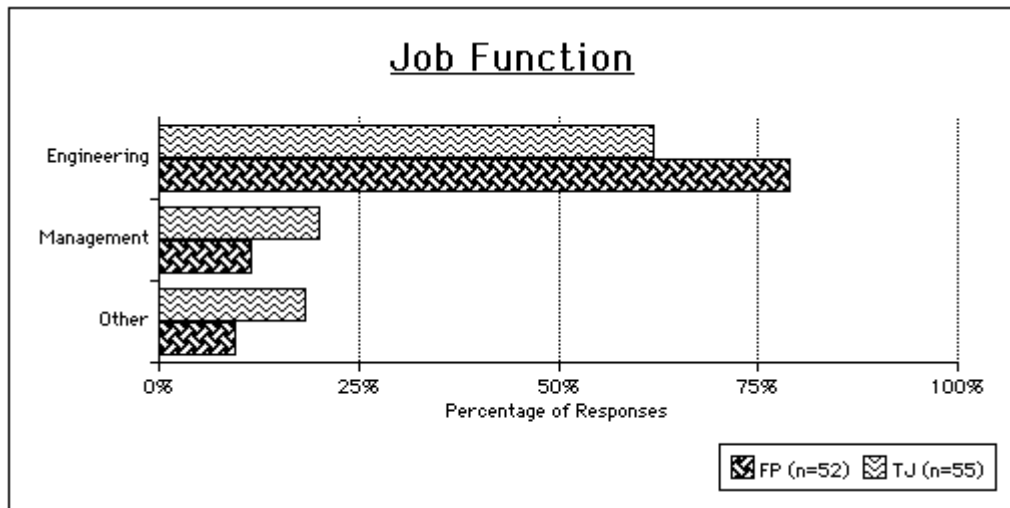
### Results and Discussion

The survey shown as Appendix A was mailed to two groups, one TJ group and the other FP, of alumni from the original (n = 1865 ) cohort. All these alumni were within their first six years of graduation. There were originally one hundred randomly selected names in each of the two groups. However current addresses were not obtainable for some of the alumni so eventual mailings were to 88 FPs which yielded 45 responses (9 from females), and to 79 TJs which yielded 35 responses (4 from females). Some of the respondents had held more than one job since graduation and answered some survey questions with respect to each job, so it is possible that the number of responses for some graphs is greater than the number of respondents.

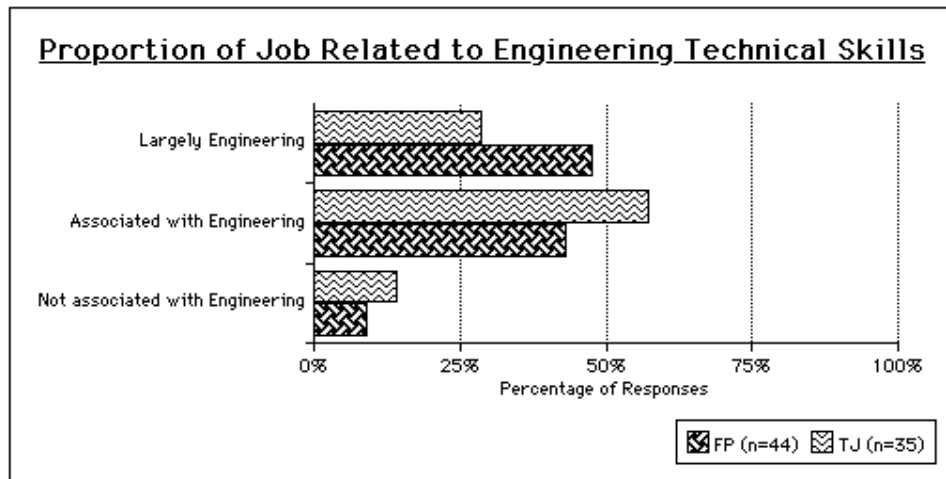


**FIGURE 1 : EMPLOYMENT AREA**

About 90 % of the respondents were in full-time employment and Figure 1 shows that significantly more ( $p < 0.01$ ) of the FPs were employed in manufacturing areas whereas significantly more of the TJs were employed in non-manufacturing areas. As the manufacturing companies tend also to be the larger companies, this suggests that more of the FPs were employed in the larger companies and more of the TJs were employed in the smaller non-manufacturing companies.

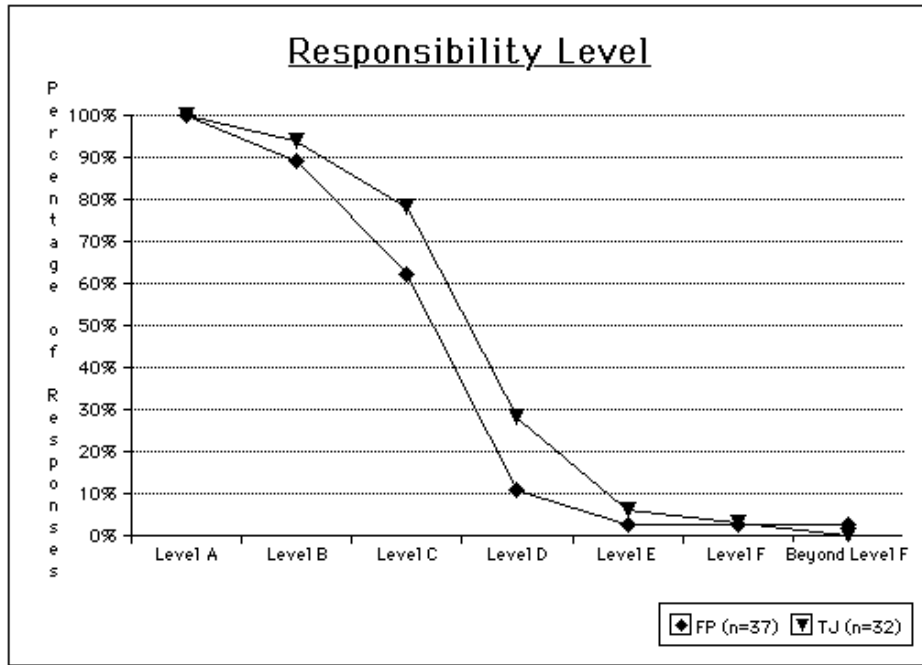


**FIGURE 2 : JOB FUNCTION**

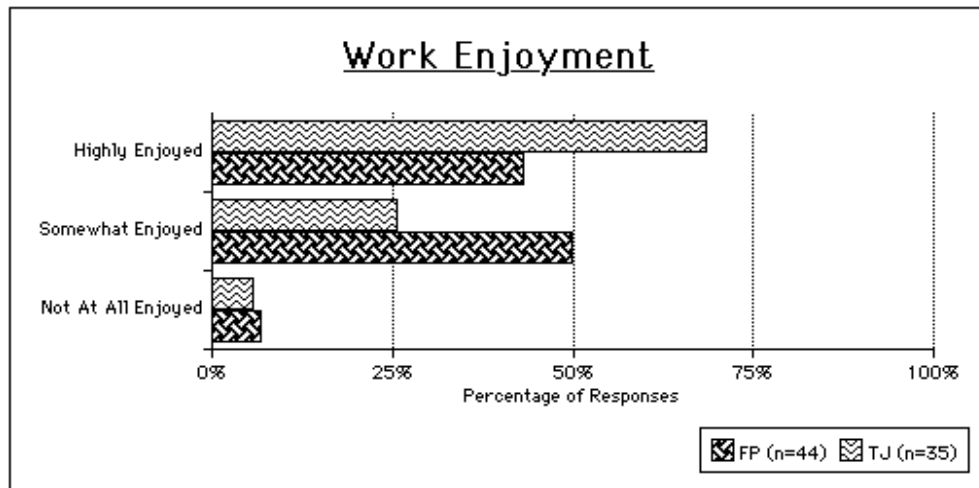


**FIGURE 3 : PROPORTION OF JOB RELATED TO ENGINEERING**

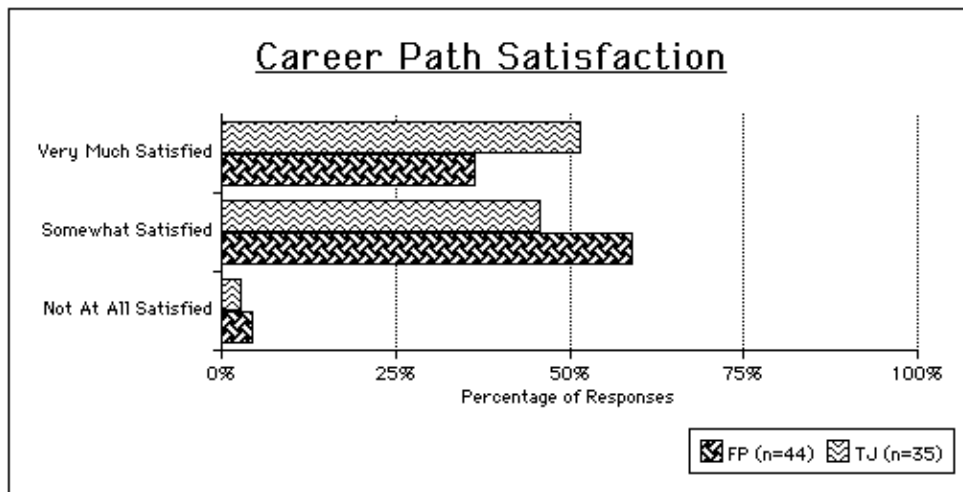
Figure 2 and Figure 3 express the alumni's job function and the proportion of engineering in their current jobs. Most of both groups of alumni were still working at mainly technical jobs but the engineering content was larger for the FP group and there was more of the TJ group who had already moved into management. Figure 4 shows that more of the TJs attained higher responsibility levels and this is consistent with more of them working in management.



**FIGURE 4 : RESPONSIBILITY LEVEL**



**FIGURE 5 : WORK ENJOYMENT**



**FIGURE 6 : CAREER PATH SATISFACTION**

Figures 5 and 6 show that the TJs “highly enjoyed” their work significantly more than the FPs ( $p < 0.05$ ) and also were more satisfied with their career path to date. In summary of these comparative responses to the quantitative items on the survey, it seems that the TJ alumni had moved more into non-manufacturing areas, had progressed more into higher responsibility and management levels and seemed to enjoy their jobs more.

In response to the question of “where they would like to see themselves in the future” about three-quarters of the graduates responded. Again there was a difference in response emphasis; the TJ respondents mostly wanted their future to be in management with a minority wanting consulting or self-employment whereas these preference areas were reversed in the responses from the FP alumni.

About half the alumni took the opportunity to respond to an invitation on the survey to pass comments on their job, which might be helpful to current UWO students. There did seem to be common trends in the TJ comments, which were different from the FP comments. The TJ responses emphasized the importance of developing time-management, teamwork and communication skills. “The majority of time at work is spent interacting verbally or in writing. Communication and presentation skills are essential for success.” and “Make sure you can deal with the Union’s bull[....]” “They also stressed the engineer’s responsibility to “learn how to learn new stuff quickly” and to be committed to performing. “Engineering is more about dedication and commitment than it is about theory and formulae.....those are the easy parts!” On the other hand, the FP responses stressed the great variety of possible jobs, the necessity to be prepared to work on new problems and problems outside your field where you can “use skills of applying logic and rational thinking to any new problem”. Several FP responses emphasized the need to learn “more practical knowledge in the trades” and not “to be afraid to work with your hands”. It seems from these comments that TJs were happy “to get the job done”, which is one of their natural strengths, but acknowledged their need for better communication skills. The FPs, on

the other hand, feel a need “ for a better background in the trades” but nevertheless seem to be enjoying their natural preference for exploring and addressing new problems outside their field.

## Conclusion

The results from the survey of two alumni groups of different personality type, TJ and FP, suggest that the TJ types, who are more common and succeed in greater numbers in engineering school, also seem to be more satisfied with their progress in their early years in the engineering profession and to have advanced more into management. The FP personality types also enjoy their professional engineering work and are generally satisfied with their career progress, but less so than the TJs. It seems that the engineering profession, like the typical undergraduate engineering school program, remains more attractive to the thinking, judging personality type. While these TJ strengths are essential to the profession, it also needs to be more accepting and to make better use of other personality strengths such as those of FP types. Personality traits such as adaptability to a rapidly changing profession, developed people-management skills and sensitivity to environmental issues are more naturally associated with the FP type. Since the feeling/thinking (F/T) scale is the only MBTI scale that has, for the general population, a gender split, with females expressing a 60% preference for F in comparison with the males expressing a 60% preference for T, the retention of FP types in greater numbers might also lead to a better gender balance in the engineering profession.

## References

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Peter Rosati is a professor in the Department of Civil and Environmental Engineering at the University of Western Ontario. He has engineering degrees from Oxford and Western and an education degree from the University of West Virginia. His research in engineering education has focussed on personalizing the large enrolment courses, beginning with a Keller plan course in Dynamics. He is currently researching student learning styles and academic performance in relation to MBTI personality type.

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Judit Puskas is the Bayer/NSERC professor of Chemical and Biochemical Engineering at the University of Western Ontario. She has degrees from the Technical University of Budapest. She has twenty years of combined industrial and academic experience. She has used the MBTI in both the industrial and academic environments.