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Are software engineers really engineers?

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ABSTRACT: The purpose of this investigation is to compare the personality profile of a sample of software engineering students to engineering students in general at the University of Western Ontario, London, Canada. The result of this investigation can be used to determine the personality differences between software engineers and all other engineers, according to the Myers-Briggs Type Indicator (MBTI). Based on this investigation, it is clear that introverts are more common among software engineering students. The software engineers are split on the sensing-intuition scale, as well as all other engineers. In general, engineers lean towards thinking types, as opposed to feeling. A key item in this work is expected to be in the perception/judging area, since this dimension refers to a need to impose order (judging) as opposed to a more open and adaptable attitude (perceiving); as a whole, engineers skewed fairly in favour of judging. The results show that only a few minor differences were found, particularly in the percentage distribution of two types.

INTRODUCTION

It is generally accepted that individuals with similar interests tend to gravitate towards certain professions. Obviously, this may be the result of many factors. These factors may include, but are not limited to, such things as:

- Similar interests leading to similar choices of major.
- High school counsellors' advising students to go into engineering only if they are considered to be of an *engineering type.*
- A relationship between interests and performance such that students choose engineering because they perform well in certain subjects like mathematics in high school.

THE MYERS-BRIGGS TYPE INDICATOR

Jung's theory of psychological types assumes that a great deal of apparently random behaviour is actually quite orderly and consistent. These consistencies result from differences in the ways persons take in information and make decisions.

The Myers-Briggs Type Indicator (MBTI) has been used for more than three decades to determine personality types [1]. The MBTI describes preferences as summarised below; it does not measure skills or abilities. Rather, it stresses that all preferences are equally important.

This provides a scheme that is easy enough to handle, yet sufficiently complex to perform non-trivial characterisations. Although neither this scheme nor any other yet developed is considered by all psychologists to be universally accepted, many educators and institutions are employing the MBTI inventory for a variety of purposes, including vocational counselling and career development.

SCALES OF THE MBTI

Extraversion and Introversion (E and I)

Some people are oriented to a breadth-of-knowledge approach with quick action, while others are oriented to a depth-of-knowledge approach reflecting on concepts and ideas. Jung calls these orientations extraversion and introversion.

Sensing and Intuition (S and N)

Some people are attuned to the practical, hands-on, common-sense view of events, while other are more attuned to the complex interactions, theoretical implications or new possibilities of events. These two styles of information gathering, or perception, are known as sensing and intuition, respectively.

Thinking and Feeling (T and F)

Some people typically draw conclusions or make judgements objectively, dispassionately and analytically; on the other hand, others weigh the human factors or societal import and make judgements with personal conviction as to their value. These two styles of decision-making, or judgement, are called thinking or feeling, respectively.

Judgement and Perception (J and P)

Some people prefer to collect only enough data to make decisions before setting on a direct path to a goal and typically stay on that path. Others are finely attuned to changing situations, alert to new developments that may require a change of strategy, or even a change of goals. These two styles are called the preferences for judgement or perception, respectively.

Summary of the Scales

In summary, the MBTI sorts these four sets of preferences (one from each pair) to filter out a person's preferred type. Hence, there are 16 possible configurations, as presented in Table 1.

Table 1: The 16 MBTI types.

ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESFJ	ENFJ	ENTJ

If the MBTI results show that a person is ISTP, then the terminology is to suggest that the person *prefers* ISTP, not that the person *is* an ISTP. No type is better than any other; the various types are gift differing. Of course, people can and do use all eight preferences. However, in each of the four pairs, every person has one preference that is stronger than the other, one that works better for each person than its complement.

ENGINEERS

Many people outside the engineering area seem to have ideas and stereotypes about what engineers are like and what attracts them to the engineering field. Table 2 compares the percentage in each MBTI preference for a sample of engineering students who passed the first year of the engineering courses at the University of Western Ontario (UWO), London, Canada [2].

Table 2: Type distribution of engineering students at the UWO (N=1,252).

ISTJ N=244 19.5%	ISFJ N=41 3.3%	INFJ N=38 3.0%	INTJ N=126 10.1%
ISTP N=102 8.2%	ISFP N=36 2.9%	INFP N=54 4.3%	INTP N=124 9.9%
ESTP N=68 5.4%	ESFP N=30 2.4%	ENFP N=45 3.6%	ENTP N=85 6.8%
ESTJ N=136 10.9%	ESFJ N=31 2.5%	ENFJ N=29 2.3%	ENTJ N=63 5.0%

That particular study showed that ISTJ, ESTJ, INTJ and INTP compose over 50% of the sample and were therefore significantly over-represented, whereas ESFP, ISFP, ESFJ and ENFJ are all particularly underrepresented in that group. It is worth noticing that there are by far more ISTJ (19%) than any other type.

That research found more introverts (I=61%) than extroverts (E=39%) types; slightly more sensing (S=55%) than intuitive (N=45%); much more thinking (T=76%) than feeling (F=24%); and less perceiving (P=43%) compared to judgement (J=57%) type. It can also be noted that STs comprise almost 44% of the sample, and so do NTs (32%). On the other hand, SFs constitute only 11% of the subjects, and NFs only 13%. TJs are abundant among engineering students, whereas FJs and FPs are scarce.

That sample is extremely similar to the sample found for engineering majors at other universities in the USA [3][4]. It was already known that engineering attracts thinking and judging types (TJs). It was also known that all 16 types enter engineering. Therefore, it was assumed that somewhere in the complex activities of engineering, members of each type are able to find a niche for the best use of their gifts.

THE SOFTWARE ENGINEERS

Software engineers have been highly stereotyped; the following diverse characteristics are accepted as part of the somewhat *unique* profile of software professionals:

- Low need for social interaction.
- High need for challenge and achievement.
- Low motivation towards management responsibilities.
- Low identification with authority.
- Low tolerance for interpersonal conflicts.
- Loyalty to the profession rather than the employer.
- Optimism regarding time estimates.
- Systematic-methodical approach to problem-solving.
- Interest in stable and secure work.

The problem with the above personality traits is that they have typically been applied to programmers, without regard for the particular orientation of their software engineering endeavours, such as system analysis, design or maintenance.

The natural audience is a group of software engineering students. Sixty-eight software engineers students were invited to participate in the study and were administered the MBTI (Form G) to determine their personality types. This investigation considers students in upper level university classes. The type distribution of the software engineering students is summarised in Table 3. This group of students is not included in the sample shown in Table 2.

Table 3: Type distribution of software engineers (N=68).

ISTJ N=13 19.1% *I*=0.98	ISFJ N=2 2.9% *I*=0.90	INFJ N=1 1.5% *I*=0.48	INTJ N=5 7.4% I=0.73
ISTP N=3 4.4% *I*=0.54	ISFP N=3 4.4% *I*=1.53	INFP N=2 2.9% *I*=0.68	INTP N=9 13.2% *I*=1.34
ESTP N=8 11.8% *I*=2.17	ESFP N=1 1.5% *I*=0.61	ENFP N=2 2.9% *I*=0.82	ENTP N=5 7.4% *I*=1.08
ESTJ N=8 11.8% *I*=1.08	ESFJ N=2 2.9% *I*=1.19	ENFJ N=1 1.5% *I*=0.63	ENTJ N=3 4.4% *I*=0.88

This study has shown that ISTJ, ESTP, ESTJ and INTP comprise almost 55% of the sample and are therefore significantly over-represented, whereas ESFP, INFJ and ENFJ are all particularly underrepresented in this sample. It is also worth noticing that there are more ISTJ (19%) than any other type. This research also found more introverts (I=54%) than extroverts (E=46%); fairly more sensing (S=57%) than intuitive

(N=43%); significantly more thinking (T=81%) than feeling (F=19%); and slightly more judging (J=54%) compared to perception (P=36%) type.

It can also be noted that TJs comprise 46% of the sample, ITs comprise 43%, STs compose 46% and NTs make up to 36% of the subjects. On the other hand, SFs add up to 11% only, and NFs a mere 8% of the subjects. TJs, STs and NTs are abundant among software students. On the other hand, SFs and NFs are scarce. A cluster of sensing, thinking and judges (STJs) was also found. This is generally in line with type theory.

In Table 3, the letter *I* refers to the ratio known as the self-selection index in the Selection Rate Type Table (SRTT). In essence, the purpose of the SRTT is to determine if the distribution of types in a sample (eg software engineers) is different from a general population (all other engineers). This index indicates whether the number of types in a sample is greater (eg $I > 1.0$) or less (eg $I < 1.0$) than would be expected by chance.

A quick inspection of the 16 types shows that the value of *I* for almost all types, except for ESTP and INFJ, is smaller than 2.00 and greater than 0.50, which means that the type distribution of software engineering students is similar to the type distribution of a sample of other engineering students.

DISCUSSION

As predicted, the software engineers' results, though not completely, met the expectations of those in previous engineering studies. Both samples have approximately equal distribution of extraverts and introverts. All engineering students also have about even numbers of sensing and intuitive types.

In general engineering programmes attract significantly more thinking than feeling types. Thinking types in theory are motivated to work with concepts and materials that follow the rules of logic and cause-effect; thus, the weight of thinking types in both tables was predictable. Engineering students have more judging types than perceptive types. It may be inferred that J students who are goal-oriented and who value systems and order may have an easier time in engineering than P students who value a more adaptive or spontaneous approach.

Overall, other-engineering as well as software engineering share the fact that the programmes attract large numbers of hands-on practitioners (STs) and theoretical visionaries (NTs). Thus, it is essential for every engineer to develop mutual respect and communication so that the skills of both sides (N and S) – who see their world so differently – can be used constructively, as practice without theory is only a joke, but theory without practice is mere speculation.

Nevertheless, there are some minor differences between the profile of all-engineering students and the software engineering students. The biggest discrepancies can be noticed in the distributions of ESTPs ($I = 2.17$) and INFJs ($I = 0.48$). This means that the software engineering sample contains more than double the number of ESTPs, but less than half of INFJs, compared to the all-engineering sample.

Finally, this investigation confirms that, in theory, occupations should attract particular types, and similar occupations (all-engineering programmes and software engineering programmes) should have similar type distributions. The reader is invited to compare the percentages of each type presented in Tables 2 and 3. From the theoretical standpoint, these results concerning attraction to engineering are noteworthy.

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Conference Proceedings of the *4th UICEE Annual Conference on Engineering Education* under the theme: *Innovation in Engineering Education*

edited by Zenon J. Pudlowski

Published by the UNESCO International Centre for Engineering Education (UICEE), this volume of Proceedings comprises papers delivered at the *4th UICEE Annual Conference on Engineering Education* in Bangkok, Thailand. These Conference Proceedings include papers that present a multitude of innovative approaches to engineering education and specific activities, which are demonstrated in the four opening addresses, 12 keynote addresses, 16 lead papers, and over 60 regular papers. It also illustrates the international nature of UICEE meetings and will provide readers with valuable insights and experience in engineering education contributed by academics from almost 30 countries from around the world in the global community.

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