

# Distributions of Myers-Briggs Type Indicator for IT Students Enrolled in a First Year Unit

Glenn Stewart

School of Information Systems  
Faculty of Information Technology  
Queensland University of Technology  
e-mail: g.stewart@qut.edu.au

## Abstract

*This paper reports the distribution of Myer-Briggs Types for a large (565) sample of students enrolled in a first year subject in an information technology course at a large Australian University. These distributions are analysed with respect to gender, age and societal affinity. The purpose of this analysis is to detect any patterns of type distribution, which may inform teaching and learning strategies for these students. Findings include a predominance of Sensory and Perceptive types, who prefer hands-on and concrete learning experiences. Implications for teaching with these type sets and across types are discussed.*

## Key Words

Learning Styles, Teaching Styles, IS Education, IT Curriculum Development

## INTRODUCTION

This paper reports on data obtained from a research project which studies the relationship of the Myer-Briggs Type Indicator ® (MBTI) (Myers et al 1999) to the IT students' selection of major, success and persistence to graduation as a function of MBTI personality type. The paper presents the descriptive statistics of the distribution of type as a function of gender, age and societal cultural affinity. This study is partially supported by the MBTI copyright holders (Consulting Psychology Press) and funded through a Faculty Teaching and Learning Grant.

This study was prompted by reports in the literature that students of various personality types have different experiences at University, with some personality types thriving and others aborting their studies. These observations, coupled with teaching objectives within the Faculty of Information Technology, Queensland University of Technology, led to the study reported in this paper. Our objectives were to improve the teaching in first year, to reduce the attrition rate of first year students and to discover how to better frame the students' learning experiences, particularly in programming. In addition, we perceived an emerging need to develop team work and creativity from first year, and the literature review undertaken suggested that the data obtained from the application of the MBTI might be of use in this process.

The data collection for this project commenced in 2002 which yielded a data sample of 565 students and 38 staff. We have confirmed our hypothesis that the majority of first year IT students are neither NT nor NF; that the modal student type would be SP and that the modal lecturer type would be NT. These results have been reported elsewhere (Stewart 2002, Stewart and Stark 2002).

The next section describes the background to the MBTI ®. This is followed by a section discussing the application of the MBTI® in revealing learning styles. We then present the results in terms of gender, age and societal affinity, and close with a discussion of results and their applicability in developing appropriate learning experiences for students in first year IT courses.

## BACKGROUND OF THE MYERS-BRIGGS TYPE INDICATOR (MBTI®)

The Myers-Briggs Type Indicator (or MBTI ®) is a personality type indicator developed from the theories of personality proposed by C.G. Jung in 1920. The constructs of personality were seen by Jung to consist of preferences along three dichotomous scales: Extraversion – Introversion, Sensing- Intuition, and Thinking-Feeling. The latter two scales were proposed by Jung in the 1930s. The first scale (E-I) deals with how the person gains energy from the environment. For extraverts, the source of energy is from people, activities or external objects. For introverts, the source of energy is ideas formed within. The second scale (S-N) deals with how a person gathers information. A Sensing person gathers information methodically through the physical senses, while the Intuitive person gathers information holistically. The third scale (T-F) deals with how a person

makes a decision, based on the information gathered. A Thinking person uses deductive logic based on objective and non-personified information. A Feeling person uses logic to make a decision, but factors into the decision cycle consideration for others values and beliefs. The final dichotomy (Judgemental or Perceptive) identifies the orientation of the person in terms of a preference towards decision making or a preference towards information gathering.

Thus, a personality type can be expressed as a combination of the preference clarity for behaviours along each of the 4 dichotomous scales: E-I, S-N, T-F, and J-P. This yields 16 different personality types. Implications for types in terms of learning styles are discussed in the next section

## LEARNING STYLES

There are distinct patterns of class involvement and theory engagement which are a function of the type dichotomies.

Examining the Extraversion-Introversion dichotomy, we see that extraverts require action and engagement with people. They may need long periods of activity throughout the learning period. For extraverts, lengthy lectures are a chore and tutorials that emphasise individual effort difficult to endure. Conversely, introverts will not perform well 'on-the-spot' and need time for reflection and mastery. Thus, class questions and group work are difficult for these students. In addition, introverts need time for reflection before forming an opinion.

Sensing types approach learning through fact retention and methodical study evolved as a serial experience (Beyler and Schmeck 1992 quoted in Myers et al (1999 pp 263). Intuitive types 'value abstraction and conceptualising' (Myers and McCauley quoted in Myers et al 1999 pp 263). Thus, Sensing IT students will have difficulty with a top-down, theory driven approach, whereas Intuitive types will have difficulty with a bottom-up, and fact oriented approach. The debate is on delivery; does one commence with concrete facts and examples as desired by Sensing types, or commence with the concepts and then presenting concrete facts and examples derived by the theory, as preferred by Intuitive types. Only through knowing type, will the lecturer have a means of determining the best approach for that group.

Students with a preference for the Thinking type of decision making also prefer a fact-based, serialized learning approach, whereas Feeling types prefer a holistic approach (Myers et al 1999 pp 263). In addition, there are gender differences for this dichotomy, with a majority of males reporting a preference for Thinking and a majority of females in the USA reporting a preference for Feeling. Myers et al (1999 pp 264) suggest that Thinking types work best if approached from a systemic perspective and have a preference for independence in learning. Feeling types are more motivated if supported by caring learning facilitators.

Finally, in examining the Judging-Perceptive dichotomy, Myers et al (1999 pp 264) state that Judging types prefer learning settings with clear structure, motivation, drill and teaching games. Perceiving types like a holistic approach (Beyler and Schmeck 1992 quoted in Myers et al 1999 pp 264), tactile learning and collaborative work with dependency on others and the learning facilitator' (Elliott and Sapp 1988 quoted in Myers et al 1999 pp 264).

Schroeder (1993) reports on an eight year study which tracked 4,000 entering college students which examined how student characteristics including MBTI related to choice of major, academic "aptitude", academic performance in specific curricular areas, and attrition. The research revealed fascinating differences in first-year academic performance between four learning patterns: IN, IS, EN, and ES.

*"As a group, students preferring the abstract reflective (IN) pattern make the highest grades while those preferring the concrete active (ES) pattern receive the lowest grades. The results are not surprising since on most campuses students take general education courses during their first year. For the concrete active learner, many of these courses are viewed as obstacles because they have little practical utility. These students are eager to move beyond these required courses and focus their interest on their major. Core curriculum courses can be tremendously challenging to these students if they do not understand their "practical" value or see relationships between these courses and their majors."*

We also note "often the types of students who are in the minority (of preference types) or whose preference diverge from the focus of the curriculum, tend to drop out" (Myers et al 1999 pp 277). As examples, Myers et al report the following studies: F, NF and NP types dropped out most frequently at the US Naval Academy (Roush 1989), which has a majority of students being IST; NF types dropped out most frequently in engineering (McCauley 1990), where ITJ students dominate; and T types were most effected in nursing (Kalsbeck 1987), where F students dominate. Conversely, Myers et al (1999 pp 276-279) reported that, where alignment occurred, success was higher. For example: ITJ in engineering (Rosati 1997); TJ in law (Gilchrist 1991); S,F, and J in family medicine and S in obstetrics (Friedman and Slatt 1988); J in dentistry (Erskine, Westermann and Grandy 1986); and SJ in nursing (Schurr, Hendriksen, Alcorn, and Dillard 1992).

These results linking MBTI type to learning style preferences need confirming in the Australian context, but more particularly, in the IT domain, as there are few such studies focused on IT students. Of particular interest is how are MBTI types distributed in our various societal segments found in our multi-cultural environments? Are there patterns found in these distributions related to societal affinity, and if so, what does this mean in terms of framing effective learning experiences for students – particularly for first year students who are not as sophisticated in coping with material presented in ways not congruent with their preferred learning style? In this study, we posed specific questions: What is the modal type in IT? Which types are in the minority in IT studies? Are these modal and minority types different for each societal affinity group, or are there consistent patterns?

The purpose of this paper is to report on the findings to these questions and discuss their implication in framing curriculum experiences for students of IT. The next section describes the method after which comes sections on the results and their discussion. The paper concludes with discussing implications for teaching and further research.

## MEHTOD

During 2002, we collected MBTI survey data over two semesters from students enrolled in a first year unit in a Bachelor of Information Technology. Though most students were first year students, some advanced students and post-graduate students, as well as secondary students were enrolled in this unit. The unit was an introductory unit on Information Systems. Students were invited to participate in a longitudinal study of the relationship of type to persistence to graduation and selection of major in Information Technology. Participation in the research was voluntary. There was a curriculum objective of using the knowledge of type to link with preferred learning styles and also to better understand diversity through revealing equally valid ways that individuals undertook decision making and working with others.

Students were issued with a surrogate identifier which was a combination of a colour and object: e.g. Red Cloud. Each practical session had a separate colour in order to be able to provide reports back to the students. Through these means, student identity was protected. A secure index file was kept, linking the surrogate name to a surrogate number. A separate secure index was kept of surrogate number to student number. Results of grades and major selection are tracked with student number and then mapped to the surrogate number independently of the analysis of the correlation of units and majors.

The data was collected using the online web survey from Consulting Psychology Press (CPP), who own the distribution rights of the MBTI. The data was collected during scheduled practical sessions. After the data was collected, CPP collated the data, and produced individual reports for each student. These reports were labeled with the surrogate name. These reports were then sorted by colour, and distributed to the students by their tutors. Students had to identify their report as the tutor did not have any file linking student to surrogate.

Students first undertook a self-validation exercise where they were given a profile of all 16 types and asked to identify their characteristics. Students then compared the report to their observations of self. From this, exercise, student were asked to identify characteristics of the opposite type and determine how they would work with people of this type. The purpose of this validation exercise was to get the students to confirm the report, seek clarification and explanation, and to study the type of others.

We gave students an information package including an information letter, a consent form and the demographic form one week before data collection. These forms were issued again during the data collection sessions, with students again reminded that full participation was voluntary. The demographics collected included gender, age, country of birth and societal affinity. This latter element was seeking to identify the dominant cultural influence in their life through reporting on their adoption and use of that culture. These cultural types were derived from studies on societal culture and include sixteen different societal groups. The demographic data collected is shown in table 1.

Item	Reason for Inclusion
Gender	To study variance in type distribution as a function of gender and understand its implication in learning activities.
Age	To study the distribution of preference as a function of age.
Country of Origin	To link learning style with early education.
Societal Affinity	To link learning style with cultural practices and thus appreciate diversity.

*Table 1: Demographic data collected in study*

## RESULTS TO DATE

Our study in 2002 has found that the majority of the sampled IT students at the university are not NT (23.8%) nor NF (16.5%), but rather SP (34.7%) or SJ (25%). Our staff profile is the reverse of this profile with the majority of staff being NT (37%) or NF (31%) with 21% being SJ and only 16% being SP.

The overall type distribution is shown in Table 2.<sup>1</sup> Overall, 65% of students report a preference for T, 66.7% of students report a preference for P, 60.9% of students report a preference for I and 60.2% of students report a preference for S.

This leads to a composite type (the combination from the most common components) being ISTP, and in some sense, sets the character of the class; namely a preference for logical reasoning (T) coupled with a preference for dealing with facts (S), rather than theory. In addition, the P types have a preference for gathering information, rather than making decisions, with a consequential characteristic of procrastination. Finally, from the preference for introversion, we see a preference for reflective activities with a small number of people rather than working in groups.

The type with the largest distribution is ISTP with 14.7% of students in this class, followed by 13.1% of students in the ISTJ class, totaling 27.8% of the course. The least occurring types are ENFJ (1.2%) and ENTJ (1.4%). Other combinations that may have significance in teaching, is the dominance of SP students (35.7%). These students have been found to be the least likely to persist to graduation and have the lowest grades (Myers et al 1996). Results per the learning patterns quadrants are: IS = 38.1%, IN = 22.8%, ES= 22.1% and EN= 16.9%.

**T=65, F=35**

J=33.3 P=66.7	<b>ISTJ</b> <b>13.1%</b>	ISFJ 4.1%	INFJ 1.8%	INTJ 4.4%	<b>I=60.9</b> E=39.1
	<b>ISTP</b> <b>14.7%</b>	ISFP 6.2%	INFP 6.7%	INTP 9.9%	
	ESTP 8.7%	ESFP 6.2%	ENFP 6.7%	ENTP 7.6%	
	ESTJ 5.1%	ESFJ 2.1%	ENFJ 1.2%	ENTJ 1.4%	

**S=60.2, N= 39.8**

Table 2: Overall Type Distribution IT students enrolled in the unit in 2002 (N=565)

### Gender distributions

In this section we report on the gender distribution. Of the 565 students, 453 were male (80.2%) with 97 female (17.2%) and 15 not reporting their gender. Table 3 gives the detailed distribution for males, and Table 4 gives the detailed distribution for females. We observe that the most preferred type for males is either ISTP or ISTJ, whereas for females the most preferred type was ENFP (13%) or ESFP (11%), with ISTJ preference reporting for 9% of females and only 5% reporting a preference for ISTP. In particular, we see 31.1% of males are IST, and 35.8% of males being SP. Other patterns of note are found in the lower right-hand quadrant, with only 2.6% being EN\_J. Results per the learning patterns quadrants are: IS = 39.9%, IN = 23.9%, ES= 20.4% and EN= 15.8%.

This distribution is in sharp contrast with those of the few females (n=97) enrolled in the unit, as shown in table 4. The composite type for females is ESFP, with the largest preference group being ENFP (13%). This contrasts directly with the composite type for males as ISTP and a smaller preference group for ENFP (5.5%). We note higher preference for F, which is consistently reported for females, where up to 60% of females in the USA report a preference for F behaviours (Myers et al 1996). We also note the moderately high preference for E (52%) and for N (43%) which is in contrast to males of E (39.7%) and N (36.2%). Results per the learning patterns quadrants are: IS = 28.0%, IN = 20.0%, ES= 29.0% and EN= 23.0%, but these results are qualified by the small number of participants (n=97).

**T=69.8, F= 30.2**

<sup>1</sup> The most common type is shown in bold, the next most common type in bold italics and the third most common type in italics (if over 10%).

J=33.3 P=66.7	<b>ISTJ</b> <b>14.1%</b>	ISFJ 3.5%	INFJ 1.8%	INTJ 4.4%	<b>I=63.8</b> E=36.2
	<b>ISTP</b> <b>17%</b>	ISFP 5.3%	INFP 6.2%	<b>INTP</b> <b>11.5%</b>	
	ESTP 8.4%	ESFP 5.1%	ENFP 5.5%	ENTP 7.7%	
	ESTJ 5.3%	ESFJ 1.6%	ENFJ 1.3%	ENTJ 1.3%	

**S=60.3**, N= 39.7

*Table 3 Distribution of Type for males enrolled in first year unit 2002 (N=453)*

T=45, F=55

J=34 P=66	ISTJ 9%	ISFJ 6%	INFJ 2%	INTJ 5%	I=48 <b>E=52</b>
	ISTP 5%	ISFP 8%	INFP 9%	INTP 4%	
	ESTP 9%	<b>ESFP</b> <b>11%</b>	<b>ENFP</b> <b>13%</b>	ENTP 7%	
	ESTJ 4%	ESFJ 5%	ENFJ 1%	ENTJ 2%	

**S=57** , N= 43

*Table 4 Distribution of Type for females enrolled in first year unit in 2002 (N=97)*

### Cultural Affinity

Though sixteen cultural groups are used in the study, we have only sufficient data for Anglo, Confucian Asian and Southern Asian to draw some observations. Anglo cultural affinities are those cultures that adopt the practices found in the dominant cultural groups in the United Kingdom, USA, Canada and Australia. Confucian Asian cultural affinity is identified as those cultural aspects as practiced in China, Vietnam, Laos and Cambodia. Southern Asian cultural affinity is those cultural aspects as practiced in Indonesia and Malaysia. Sub-continent cultures were identified as belonging to India, Sri Lanka and Pakistan.

The Anglo societal group is shown in table 5. Here we see a strong preference for T (72.1%), P (70.7 %), with I (63.4%) and S (55.4%). The composite type is ISTP, with the ISTP, ISTJ and INTP accounting for 54.6% of the population. Results per the learning patterns quadrants are: IS = 36.8%, IN = 28.5%, ES= 18.4% and EN= 18.2%.

Table 6 shows the distribution for those students indicating a Confucian Asia cultural preference. The composite type is ISTJ, with the strongest preferences for ISTJ (15.5%) and ISTP (12.7%). There is a marked stronger preference for J behaviours in this group than with the Anglo group (53.5% versus 29.3%), with a slightly higher preference for Introversion. There is a slightly lower preference for T behaviours (63.4% versus 72.2%). Results per the learning patterns quadrants are: IS = 39.5%, IN = 26.7%, ES= 16.8% and EN= 16.8%.

Table 7 shows the MBTI distribution for Southern Asian IT students. This societal affinity group has very high preference for S (76.2%) and consequential low preference for N (23.8%). The composite type is ISTP, but a large percentage of students is ISTJ (23.8%) showing a strong bias to the upper right hand quadrant. There were no reports of ENFJ or ENTJ in this sample. There is a strong preference for I (70%), T (61.9%) and P (64.3%). Results per the learning patterns quadrants are: IS = 56.4%, IN = 16.7%, ES= 23.7% and EN= 7.2%. This very large IS and very small IN segments have significant implications in teaching these students, however we note that the sample size is too small to make generalizations (N=42).

T=72.1, F=27.9					
J=29.3 P=70.7	<b>ISTJ</b> <b>13.2%</b>	ISFJ 3.1%	INFJ 0.4%	INTJ 4.5%	I=63.4  E=36.6
	<b>ISTP</b> <b>16.7%</b>	ISFP 3.8%	INFP 7%	<b>INTP</b> <b>14.6%</b>	
	ESTP 8.7%	ESFP 3.8%	ENFP 8.4%	ENTP 7.7%	
	ESTJ 5.2%	ESFJ 0.7%	ENFJ 0.7%	ENTJ 1.4%	
S=55.4, N= 44.6					

Table 5: MBTI Distributions of Anglo cultural affinity in students enrolled in first year IT unit 2002 (N=287)

T=63.4, F= 36.6					
J=53.5  P=46.5	ISTJ 15.5%	ISFJ 2.8%	INFJ 7%	INTJ 9.9%	I=66.2  E=33.8
	ISTP 12.7%	ISFP 8.5%	INFP 4.2%	INTP 5.6%	
	ESTP 4.2%	ESFP 2.8%	ENFP 2.8%	ENTP 5.6%	
	ESTJ 5.6%	ESFJ 4.2%	ENFJ 4.2%	ENTJ 4.2%	
S=56.3, N=43.7					

Table 6: MBTI Distributions of Confucian Asian cultural affinity in students enrolled in first year IT unit 2002 (N=71)

T=61.9, F=38.1					
J=35.7 P=64.3	ISTJ 23.8%	ISFJ 2.4%	INFJ 0%	INTJ 0%	I=70  E=31
	ISTP 14.3%	ISFP 11.9%	INFP 11.9%	INTP 4.8%	
	ESTP 7.1%	ESFP 7.1%	ENFP 2.4%	ENTP 4.8%	
	ESTJ 7.1%	ESFJ 2.4%	ENFJ 0%	ENTJ 0%	
S=76.2, N=23.8					

Table 7: MBTI Distributions of Southern Asian cultural affinity in students enrolled in first year IT unit 2002 (N=42)

### Age Distribution

Age was tracked as a demographic variable, with the groups reported being 16-20, 21-30 and 30-40. Space limitations prevent detailing the type tables. Following is a summary of results.

In the MBTI distribution for 16-20 year olds, we see a strong preference for P (68%), T (62.6%), with ambivalent preference for S (54.4%) and I (58.2%). Results for the learning pattern quadrants are: IS = 31.7%, IN = 26.5%, ES= 22.8% and EN= 18.8%.

The MBTI distribution for 21-30 year olds shows a moderately low preference for N (33.1%). The composite type is still ISTP, with high preference for ISTP (19.5%), ISTJ (15.6%) and ESTP (10.2%). Results for the learning pattern quadrants are: IS = 45.3%, IN = 17.6%, ES= 21.5% and EN= 15.7%.

The MBTI distribution for 31-40 year olds shows a moderately low preference for N (35.9%). The composite type is again ISTJ, with the highest preference type also being ISTJ. There are also high preferences for INTP (15.4%) and ISTP (12.8%). Results per the learning patterns quadrants are: IS = 41.1%, IN = 25.7%, ES= 23.0% and EN= 10.3%.

### Comparison between segments

For comparison sake, these distributions are compared with those of the IT lecturers (Stewart and Stark 2002) and a reference sample (Myers et al 1999 pp 157,158). Examining lecturers, we see similar strong preference for T (66%), I (66%) and P (58%), with a shift in preference to N (63%) rather than S (which was over 60% for students). The composite lecturer type is INTP, which indicates a preference for top-down, theory driven material, which is the opposite to the students. This desire for theory is echoed in the high preference for N. Results per the learning patterns quadrants for lecturers are: IS = 29.0%, IN = 36.9%, ES= 7.8% and EN= 26.1%. These results lead to the simple conclusion that type is a function of societal affinity, age, gender and status (IT lecturer, IT student or general population).

These results in terms of the learning pattern quadrants are summarised in Table 7.

Segment	Population	IS	IN	ES	EN
IT Students	Total Sample	38.1	22.8	22.1	16.9
IT Lecturers	Within faculty <sup>2</sup>	29.0	36.9	7.8	26.7
Gender	Male IT students	39.9	23.9	20.4	15.8
	Female IT students	28.0	20.0	29.0	23.0
	USA Male sample <sup>3</sup>	38.6	7.8	36.3	16.3
	USA Female Sample <sup>3</sup>	40.6	9.5	31.2	14.7
Societal Cluster	Anglo	36.8	28.5	18.4	18.2
	Confucian Asian	39.5	26.7	16.8	16.8
	Southern Asian	54.4	16.7	23.7	7.2
Age	16-20	31.7	26.5	22.8	18.8
	21-30	45.3	17.6	21.5	15.7
	31-40	41.1	25.7	23	10.3

*Table 11: MBTI Distributions for learning patterns quadrants for IT students, IT lecturers and representative samples*

## DISCUSSION

We have sought to profile the IT student population enrolled in a common and compulsory first year unit in order to understand their type distribution and determine its implication in developing more effective learning activities for this population. We first note that the MBTI type distribution for lecturers in the N component is the opposite to that of their students. The implication for this in teaching is that S students prefer a fact-based approach, with clear deliverables and less task uncertainty, whereas N students prefer a theory driven, holistic approach to education. Our proposition is that NT lecturers will tend to deliver top down, theory driven courses.

Of greater concern is the research reports that SP students have the lowest grades and are less likely to graduate than their NT counterparts. This is echoed through the reports that IN students have the highest grades and ES students have the lowest grades. These observations have yet to be tested with this population of students, with this analysis currently underway. But this identification of trends for the temperament and learning pattern correlation with persistence to graduation and grades drives the analysis of the data. This section discusses the data in terms of these patterns and links observations from the literature to draw our attention to potential issues for teaching these diverse groups of students. We first discuss the learning pattern quadrants and then discuss the temperaments.

<sup>2</sup> Reported in Stewart and Stark (2002)

<sup>3</sup> Myers-Briggs Personality Types and their Distribution in a National Representative Sample of 1,478 Males and 1,531 Females (From Myers, McCauley, Quen and Hammer 1999 pp 157,158).

## Learning Pattern Quadrants

The dominant quadrant for male students is found in the IS upper right hand area, with 39.9% of male students found in this area. Myers et al (1999: 55) label these people as Thoughtful Realists, and observe that these people (Introverts with Sensing)

*“Like to test ideas to see whether they are supported by facts. They like to deal with what is real and factual in a careful, unhurried way and can be irritable when they feel rushed and unable to devote adequate attention to the task at hand. They do not put themselves forward and prefer to stay in the background of projects and activities. .... they are likely to avoid leadership roles and may experience considerable discomfort when forced into such roles”*

These characteristics make it difficult for such students to readily work within a theory driven discipline and may also lead to difficulties in a team environment where someone has to take a leadership role.

This is the most frequently occurring quadrant for all cultural groups, with South Asian students reporting a preference of over 54% for these characteristics. The minimum frequency was 28% (for females) with other segments having between 31.7 to 54.4% of the population reporting preferences in this quadrant.

The next most populated quadrant is the IN (upper left-hand area) 23.9% of the sample male population and 20% of the sample female population. Myers et al (1999 : 55) label these students as Thoughtful Innovators. These students are:

*“Interested in knowledge for its own sake, as well as ideas, theory, and depth of understanding. They are the least practical of all types, preferring the complexity of theory to the pragmatism of accomplishments in the real world.”*

These students were found to have the highest grades (DiTiberio 1996), and are seen as the ‘ideal’ student to who academics teach. This quadrant is under-represented in the Southern Asia sample with only 16.7% reporting IN preferences. Other segments with small representation include the age group 21-30 (17.6%) and females (20%).

The next most populated quadrant is the ES region (lower left-hand area) with 20.4% of the sample male population and 29% of females. Both Anglo and Confucian Asian IT students are under-represented here with 18.4% and 16.8% of their respective samples reporting preferences in these quadrants. Myers et al (1999: 56) label these students as Action-Oriented Realists, who are

*‘the most practical of all types. They learn best when useful applications are obvious. They enjoy the material world ..’*

The least populated quadrant is the EN region (lower right-hand area) with only 14.8% of the sample male population and 23% of the sample female population. These patterns are similar to those found for those students reporting Confucian and Southern Asian societal affinities. Practical, hands on work, that is pragmatic and has tangible outcomes may be preferred by these types of students. These students are labeled as the Action-Oriented Innovators who are change agents (Myers et al 1999 : 57). People in this quadrant are said to seek change, like to see new patterns and relationships.

When we analyse the distribution for females, we see a similar pattern emerging, with the ES quadrant being the most preferred modality (29%) followed by the IS quadrant (28%) Thus, we see most female students (57%) prefer practical material with tangible benefits. We see 23% of females preferring EN behaviours and 20% preferring IN behaviours. What is of most concern is the reported attrition of students from programs when their preferred type is in the minority. The EN type set is the least represented in the male IT student sample. Further work needs to be undertaken to determine if females with this type are more prone to change courses than others.

Finally, we note that the distribution for lecturers are not surprising, with 36.9% reporting preferences in the IN quadrant, 29% in the IS quadrant and only 7.8% in the ES quadrant. The IN characteristics previously described are typical of behaviours expected of scholars and researchers. What is of concern in teaching is that these behaviours are now seen as not typical of the IT student population, hence lecturers relating naturally to their unit may in fact not be reaching their students.

## Temperaments

Another common grouping to analyse MBTI data is to group according to the four temperaments: SJ, SP, NF and NT. The most common temperament found in the female IT student sample is SP with 33% representation, 25.1% of males and only 15.8% of lecturers. These students enjoy hands on learning that is applied and given at a fast pace (Myers et al 1999 : 60). Myers warns of these students *“our typical educational system is*



*particularly deficient in meeting the educational needs, interests and learning styles of the SP types*". They go on to state *"It would seem that the very things that are valued and used as criteria of educational success are quite opposite to the style and areas of competency of people with an SP temperament"* (Myers et al 1999 : 61). DiTiberio (1996) found that these students had lower GPA than students of the other three temperaments.

The most common temperament in the IT male sample is SJ with 39.9% of the total male sample, 24% of the total female sample and 21.1% of lecturers. Myers et al (1999 : 59 ) report these students as seeking group membership and responsibility. From an educational viewpoint, these students like material sequenced and structured, and prefer to focus on the practical applications of their learning tasks (Myers et al 1999 : 60). Myers goes on to warn *"most educational environments do not recognize the learning style and competencies of people with an SJ temperament"*. An IT degree that focuses on product development and product outcomes would be more attractive to these people than a theory driven degree.

The NF temperament is found in 25% of the female sample, only 14.8% of the male sample and 26.4% of lecturers. The NF student prefers group interaction and learn best when they can relate to the group and the instructor (Myers et al 1999 : 61). They use their intuition and impressions to form ideas and then seek the logic and data to support their conclusions. They do not work top down or with concrete facts, but resonate with material. They do second best at tertiary studies in a variety of fields, preferably subjects with group work.

The NT temperament is found in 18% of the female sample, in 24.9% of the male sample and 36.8% of IT lecturers. These are the archetypal students, seeking *"mastery of concepts, knowledge and competence"* (Myers et al 1999 : 61). Students with this type:

*"... want to understand the operating principles of the universe or even develop theories for everything. They value expertise, logical consistency, concepts and ideas and they seek progress. [they] tend toward pragmatic, utilitarian actions with a technology focus. .... Their learning style is conceptual and ... [they] want to know the underlying principals that generate the details and facts rather than the details alone"* (Myers et al 1999 : 62)

## CONCLUSION

This brief analysis raises serious questions about how to frame a learning experience for this diversity of types, but more particularly, how to accommodate the pragmatic, detail oriented, fact based approach desired by nearly 75% of our actual student base. Many lectures are framed top-down, based on theory. Our students cannot easily resonate with this approach, and this may be particularly difficult with young and in-experienced first year students. If we are to teach to our client base, then this study has clearly shown that these clients prefer the opposite to that style traditionally experienced. There are implications in this study for effective design of practical activities and the need for more laboratories and product development opportunities for students. This is a significant resource implication for Universities seeking to make their curriculum more experiential.

Industry is also demanding more effective personal and interpersonal skill development in IS graduates (Snoke and Underwood (2001, 2002), Lidkte el al 1999, Gorgone et al 2002). The results from this study indicate that group work will be difficult for these students (high I preference), and completion of tasks on time will also be difficult (high P preference indicating delays in production of material due to information gathering orientation). The challenge here is not to deny these student preferences, nor to say that the students cannot be so educated and trained. Rather we have to ensure that the students have appropriate guidance and can develop skills in their non-preferred styles where these approaches are the best means to mastering material. This is the focus of current curriculum development in first year units at the author's university.

We have found that the modal student type is ISTP and modal learning pattern is found in the IS quadrant. The minority type is ENFJ or ENTJ and the minority learning pattern quadrant is EN. Females have a different type distribution to males and more females belong to the minority types. This is a concern, because other studies have shown higher attrition rates for students not belonging to the dominant course type. We have detected different distributions of type as a function of gender, age and societal affinity, but the number of students in each of these groups is too small to generalize from.

None-the-less, we see preference in IT students for logical, deductive preference for making decisions (T), a surprising large preference for information gathering rather than decision making (P), with the consequential elements of procrastination, a preference for a facts-based and hands-on approach to learning (S), with strong preference for individual work (I). This pattern emerges irrespective of culture, or age. A gender difference has been detected, with more females reporting preferences for extraversion and a split between preferences for S or N information gathering. We also see that the dominant learning style is IS, followed by ES. This means that the students prefer learning through doing and prefer a fact base approach. What is of concern is the large group of ES students, which other studies have shown tend to have the lowest grades compared to other quadrants. This aspect is now being researched in this population of IT Students.

The literature review indicates that type does influence approaches to learning, and approaches to teaching. In addition, there are correlations between unit success, major selection and persistence to graduation and MBTI type. There have only been limited studies relating to IT students and this study is one of the largest undertaken. Our research to date has shown that our student population has a MBTI distribution that is opposite to that of the academic staff and possibly opposite to the way in which they engage in the learning material. We are now correlating unit success with type and will report our findings soon. Further research is required to validate the observations in other disciplines and with that objective in mind, we are now undertaking a longitudinal study to determine if the same patterns of attrition and success found in other professions are indeed present within our own students. We also seek to detect patterns in major selection and unit success.

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<sup>4</sup> See this reference for the bibliographic details for Rosati 1997; Gilchrist 1991; Friedman and Slatt 1988; Erskine, Westermann and Grandy 1986; Schurr, Hendriksen, Alcorn, and Dillard 1992; Roush 1989; McCauley 1990; Kalsbeck 1987