

Abstract

Personality has been described as being an individual's characteristic patterns of thinking, feeling and acting across a wide range of situations – the consistent features of the way they behave. It affects how we make decisions, solve problems, handle conflicts, deal with politics and cope with stress. Personality theory helps us understand how others are different from us, despite similar experiences and situations. The Myers-Briggs Type Indicator is currently the most widely used inventory of psychological types in the world. It provides a matrix of 16 personality types. This enables us to expect specific personality differences in particular people and to cope with their differences in a constructive way. SAS programmers are a group that has not been profiled. This paper looks at some introductory research conducted to provide an up-to-date personality profile of SAS programmers according to the Myers-Briggs Type Indicator. It also looks at how knowing and understanding your personality type can help you become a better programmer.

Introduction

I am a SAS programmer and have no formal training in the study of personality types but the subject fascinated me so I conducted a small survey to look at the personality types of SAS programmers for my dissertation as a part of my MSc in Business Intelligence.

Numerous researchers have looked at the relationship between computer programming and personality however most of their work has focused on the relationship between personality and success or achievement in programming. Little work has been done that looks at personality types of programmers for the sole purpose of trying to understand them as a group. I decided to focus on the personality types of SAS programmers.

This paper is based on my dissertation. It delves into the theory behind personality types and focuses on the Myers Briggs type indicator as a tool for determining type. The Myers-Briggs type indicator categorises psychological types by means of a questionnaire.

The paper looks at the results of the survey of the MBTI preferences in a small sample of SAS programmers and then discusses how understanding your own personality type can help you become a more effective SAS programmer.

Personality Theory

"The theory of character and personality types can illuminate both aspects of our humanity – our differences and our similarity. It can bind the two together into a paradoxical unity, where difference becomes similarity and similarity becomes difference. At its best, perhaps, it can offer a model for seeing how individual differences are an ordered set of ways in which we express our underlying similarity; and equally, how we are all similar in the very fact of our individuality. More specifically, it can provide...tools for understanding and acceptance". Totton & Jacobs (2001).

It is difficult to define personality, Lewis and Crozier (2002), describe it as being an individual's characteristic patterns of thinking, feeling and acting across a wide range of situations – the consistent features of the way they behave. Research into the nature of personality mainly focuses on 'personality traits' and 'typologies'.

Psychometric Testing

“One can never give a description of a type, no matter how complete, that would apply to more than one individual ... Classification does not explain the individual psyche. Nevertheless, an understanding of psychological types opens the way to better understanding of human psychology in general.” (Jung [1921] 1971).

Psychometric tests are tools that enable us to discover a person's trait or type. They have proved useful in assessing people in terms of strengths, weakness and developmental needs.

Parkinson (2000) explains that psychometric tests are standard ways of measuring an aspect of mental performance. He states that they can also be used to look at personal attributes like personality or temperament, careers or employment interests, values, attitudes and motivation. They are standard tests because everyone is presented with the same questions and instructions for completing them. Personality questionnaires differ from ability tests in that there are no 'right' or 'wrong' answers just as there are no 'good' or 'bad' personalities but rather a variety of personal characteristics, which may be more or less useful depending on what you are trying to achieve. However, personality questionnaires still contain questions that everyone has to answer and they are administered, scored and interpreted in a standard way.

A professional should always administer the tests– see appendix A for more information.

Myers-Briggs Type Indicator

The theory of psychological types was developed by Swiss psychiatrist Carl Jung (1875-1961). He suggested that human behaviour was not random but was in fact predictable and, therefore, classifiable. Jung was the first to suggest that differences in behaviour are as a result of preferences related to the basic functions our personalities perform throughout life. Emerging early in life, these preferences form the foundation of our personalities.

According to Hall and Lindzey (1978) Jung described the total personality as consisting of a number of differentiated but interacting systems. As well as these interdependent systems there are the attitudes of introversion and extraversion, and the *functions* of thinking, feeling, sensing and intuiting. Finally, there is the *self*, which is the centre of the whole personality. The MTI is an extension on the theory on attitudes of introversion and extraversion and the four functions.

The attitudes

Jung refers to a psychic energy that powers mental activity. The outward turning of this energy toward the external world is known as extraversion, while the inward flow towards the psyche is referred to as introversion. Traits typical of extraversion include habitual outgoingness, venturing forth with careless confidence into the unknown, adapting easily to a given situation, and being particularly influenced by objects and events in the external world. The traits of introversion are reflected in a keen interest in the subjective psyche, shyness, inscrutability, and self-concern (Ewen, 1980).

The functions

Ewen (1980) describes Jung's four functions as follows:

Sensation – merely establishing the fact of what is there

Thinking – interpreting and understanding the meaning of what is perceived

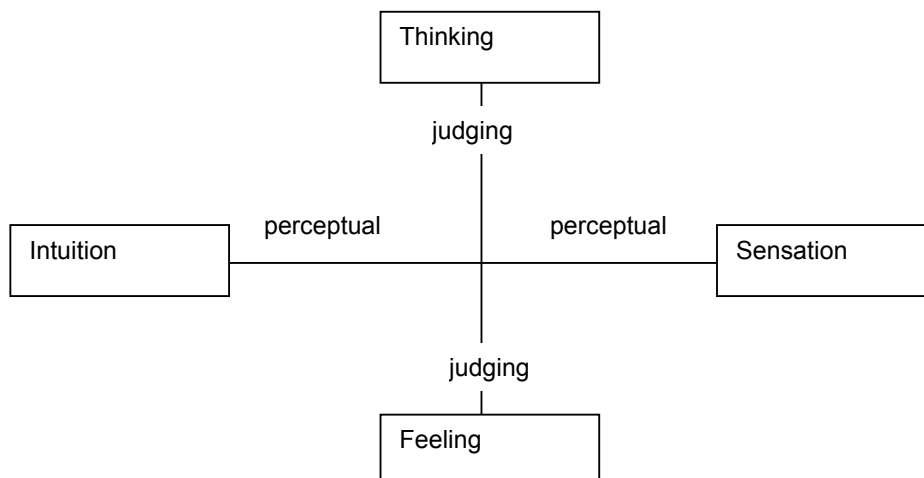
Feeling – evaluating the desirability or pleasantness of what is perceived

Intuition – forming apparently inexplicable hunches or conclusions without using any of the other functions

“Sensation tells you that something exists; thinking tells you what it is; feeling tells you whether it is agreeable or not; and intuition tells you whence it comes and where it is going” (Jung [1964] 1968).

Sensation and intuition can be seen as being opposite to or opposing one another. They are known as the perceptual functions as they involve purposive acts of cognition. Similarly thinking and feeling also oppose each other, however, they are the judging functions.

The four functions can be seen as being in pairs, on two axes as shown below (Totton & Jacobs, 2001).



Although everyone has the capacity to use all four functions, one tends to become more highly differentiated than the others and is known as the dominant or superior function. It serves not only as a mode of experiencing, but as a major basis for organising one's personality. In Jung's typology people reflect the given characteristics to varying degrees. The unconscious compensates for the superior function and attitude by stressing the opposite tendencies; and the remaining two functions alter between consciousness and unconsciousness and act as possible back ups to the dominant function (Ewen, 1980).

Jung's ideas were later expanded by Katherine Cook Briggs and her daughter, Isabel Briggs Myers, and used to develop the Myers Brigg Type Indicator instrument. According to Hirsh and Kummerow (1989) the MBTI is currently the most widely used inventory of psychological types in the world.

Myers and Briggs developed Jung's theory by introducing the idea that as well as a dominant process, there is also an auxiliary, developed well enough to provide a balance between judgements and perception and between extraversion and introversion. The MBTI theory relates to the everyday aspects seen in well-balanced people. Jung does not describe the normal, balanced types as having an auxiliary process at their disposal but rather he describes the rare, theoretically 'pure' types who have little or no development of the auxiliary.

By taking the auxiliary process into consideration, Myers and Briggs split Jung's types into two. An introverted thinker could either be an introverted thinker with sensing or the introverted thinker with intuition. They suggested sixteen types in place of Jung's eight (Briggs Myers & Myers, 1993). The following table shows the sixteen types

		SENSING TYPES		INTUITIVE TYPES	
		With thinking	With Feeling	With thinking	With Feeling
INTROVERTS	Judging	ISTJ Introverted Sensing with thinking	ISFJ Introverted Sensing with feeling	INTJ Introverted Intuition with feeling	INTJ Introverted Intuition with thinking
	Perceptive	ISTP Introverted Thinking with sensing	ISFP Introverted Feeling with sensing	INTP Introverted Feeling with intuition	INTP Introverted Thinking with intuition
EXTROVERTS	Perceptive	ESTP Extraverted Sensing with thinking	ESFP Extraverted Sensing with feeling	ENTP Extraverted Intuition with feeling	ENTP Extraverted Intuition with thinking
	Judging	ESTJ Extraverted Thinking with sensing	ESFJ Extraverted Feeling with sensing	ENTJ Extraverted Feeling with intuition	ENTJ Extraverted Thinking with intuition

For a full description of each of the sixteen types see Appendix B.

A summary of the four dimensions is as follows (Durling, Cross & Johnson, 1996):

Inner and Outer world

- *Extraverts* prefer the outer world of people and things. They tend to do their best work externally, in action, and are most comfortable interacting with other people and in group working.
- *Introverts* prefer the inner world of ideas and concepts. They are most comfortable when working quietly alone, and do their best work reflectively, in their heads.

Information gathering

- *Sensing* addresses reality directly through the senses. The focus is on directly observable phenomena, on facts and practicality. Sensing learners prefer to begin with the details and facts, and then move towards concepts: there is also more liking for step-by-step exposition.
- *Intuition* uses internal sensing with imagination. It focuses on ideas and associations, together with possibilities and what might be. Intuition learners prefer to begin with the big picture, and then move towards details and facts. (Note that intuition is denoted by the letter 'N').

Decision Making

- *Thinking* prefers analytical, logical, evaluative and objective modes of thought. It is an impersonal and detached basis for choice. Thinking types prefer exemplars that are based around things or products.
- *Feeling* acts by appreciation and utilises more personal, subjective values. Feeling types prefer to make choices based on personal values. They prefer exemplars that are based around people.

Relating to the outer world

- *Judgment* emphasises thought which is decisive, planned and orderly. It is associated with a need for closure and the settling of things. Judgment types prefer more structure in lessons.
- *Perception* is a preference for keeping all options open. It is associated with a more flexible, spontaneous and adaptable approach. Perception types are more likely to prefer an exploratory learning environment that offers choice.

Briggs Myers & Myers (1993), states that the usefulness of the MBTI is that it enables us to expect specific personality differences in particular people and to cope with people and the differences in a constructive way. She states that differences in human behaviour are a result of observable differences in mental functioning. The basic differences concern the way people prefer to use their minds, specifically the way they perceive (the process of becoming aware of things, people, occurrences and ideas) and the way they make judgements (coming to conclusions about what has been perceived). Perception determines how we see a situation and judgement determines what we do about it. Therefore differences in perception or judgement result in differences in behaviour.

After looking at the abundance of literature evaluating the reliability, validity, and usefulness of the MBTI, Bishop-Clark and Wheeler (1994), point out that for the most part, researchers and reviewers conclude that the MBTI is a reasonably valid and reliable instrument that is potentially useful for a variety of purposes. They acknowledge that it is not without its critics but it is one of the best researched and widely accepted of the instruments measuring cognitive style and personality instruments. Bringhurst (2001) points out that the MBTI has an extensive database covering many languages and cultures and that it is used worldwide by multinational corporations, out-placement firms and individual therapists, as well as many professionals in financial planning. Keen and Bronsema (1981) suggest that the MBTI should be the basis for cognitive research in the area of information systems.

Applications

SAS Programmers and Programming

SAS programmers are often involved in various different jobs which range from data management to analysis to development. When discussing the personal qualities of good SAS programmers, Nelson & Nelson (1999), include the following attributes:

Adaptability – the ability to be flexible in the way that one perceives stimuli, creates, develops and executes ideas.

Problem solving/self-educating – the ability to investigate and understand myriad facets of a work problem or issue.

Communication – the ability to articulate what problems exist, proposed courses of action, persuasive skills to internal and external stakeholders

Learning individuals – the ability to integrate knowledge into a second hand nature of learning. To be able to recycle knowledge and complete patterns of what was learned before, presently and how these can be applied to future problems and issues.

Nancy Patton, considered according to Nelson & Nelson (1999) to be a leader in the SAS community, was quoted in their article as saying:

“I think that as time passes and the employer has higher expectations of the SAS Programmer, personality becomes an important part of the job – almost the most important part. After all, how important is the work really if there is poor communication and little respect.”

In a survey that looked at the assessment criteria used when hiring SAS programmers, Howard (2000) reported that not all programmers were computer science majors and commented on the varied backgrounds that programmers come from including music, social and physical sciences. According to Howard, companies look for professionalism tinged with a sense of humour, curiosity, self-motivation, flexibility and creativity. It is important for a SAS programmer to be able to work in a team environment effectively, handle work pressure, work against deadlines, and communicate effectively with clients.

Howard (2000) gives an amusing description of a programmer:

“Programmers are human cats: night creatures, independent, they prefer to be left alone except when they want attention, they’re elegant (with code) and managing programmers has been likened to herding cats.”

Loren (2000), a career SAS programmer, discusses the importance of MBTI in the SAS workplace. She suggests that the more you understand about how people differ, the more productive you will be in your job as you are able to work more effectively with others. The MBTI can be used to improve effectiveness by generalising in order to understand. Loren states that certain personality styles migrate to specific careers and that introverted thinkers tend to be drawn to computer work. According to her they are the ISTP and INTP types. The ISTP type enjoys setting up, maintaining and fixing systems and attending to the accurate operation of existing systems. The INTPS would rather design. They see patterns and relationships, like to learn new technologies or apply existing skills in a new way. For an intuitive, once its planned it is finished and they have lost interest. It takes a sensing type to implement the great ideas of an intuitive type and to keep the “intuitive” realistic while developing.

All psychological types would be expected in a sample however certain traits are expected to be more clearly represented than others in particular fields. Holland (1997) suggests that people gravitate towards occupations and work environments that fit in with their personal orientations. A person’s choice of occupation can be construed as an attempt to fill a desired way of life through their work. Career choices reflect a person’s self perception regarding their abilities, values and personality along with assessments of how these individual aspects fit with particular occupations.

When looking at several studies on the personality types of software engineers and programmers, Capretz (2002), noted that ISTJ was always the most common personality type and that the common thread in all the studies was the prevalence of introverts, thinking, judging, and almost as many sensing as intuitives among the groups. ISTJ was the largest single type amongst Capretz’s sample of software engineers and from his results he suggested that software engineers are most likely to be sensing thinkers, or thinking judges or intuitive thinkers.

After looking at various studies, Hansberger, Henley and McCarley (1996) concluded that compared to the general population, computer programmers report more introverted, intuitive, and thinking preferences. They reported on a study done by Lyons (1985) that found that three types accounted for over 50 % of the

computer population: ISTJ (23 %), INTJ (16 %), and INTP (12 %). Six percent of the general population falls into the ISTJ category while INTJ and INTP comprise 1 % of the general population.

The literature seems to suggest that the stereotypical computer programmer is the ISTJ type and this personality fits with the idea of computer programming being a technical occupation which involves thinking, logic and accuracy. In a sample of SAS programmers we would expect to find a high percentage of ISTJ types. However as the job of a SAS programmer is so diverse we would also expect to find a mixture of other personality types.

Research

My research involved sending a questionnaire to SAS programmers.

The first section of the form elicited general demographic details – age, sex and race.

The second section involved the user accessing the Internet and completing a personality test. The test, the Hale Online personality test, is an online adaptation of the Myers-Briggs Type Indicator® (MBTI®) personality test. Due to copyright reasons the test could not be reproduced on the form so participants had to access it online. The third section looked at job specifics. It questioned the industry in which the participant worked and the percentage of an average day that they would spend programming in SAS. It also asked whether programming in SAS gave the programmer job satisfaction and finally it asked the participant what motivated their career choice.

The questionnaire was e-mailed to eighteen SAS programmers who were then asked to forward it on to other SAS programmers. This non-probability method of sampling a population is called snowball sampling (Denscombe, 1998). The sample emerges through a process of reference from one person to the next. Each person who receives the questionnaire forwards it on to others who they know would be relevant for the purposes of the research. The sample 'snowballs' as each of the nominees, nominates further persons to be included in the sample. The advantages of this method are that the accumulation of numbers is quite quick and people are not approached cold as the questionnaire comes from someone they are acquainted with (Denscombe, 1998) so the response is relatively good. The disadvantage is that, as the goal is to try and get a representative of the whole collection of SAS programmers, then the sample may become biased, as people tend to send to others they know who are likely to be of the same age and in the same industry.

A total of 57 persons returned the questionnaire. One of the forms was spoilt (it was returned empty). The breakdown of all responses is given in Table 1.

Table 1 Breakdown of responses for 56 questionnaires

Sex	
Male	59 %
Female	41 %
Race	
Caucasian	79 %
Asian	11%
Black	4%
Oriental	4%
Other	2 %
Industry	
Pharmaceutics	73 %
Finance	16 %
Marketing	2 %
Other	9 %
Time spent programming in SAS	
75-100 %	39 %
50-74 %	21 %
25-49 %	11 %
<25 %	29 %
Does programming in SAS give you job satisfaction?	
Yes	57 %
No	23 %
It used to	20 %
Motivation	
Money	29 %
Security	20 %
Autonomy	5 %
Recognition	4 %
Power	0 %
Other	42 %

There is not an even distribution across all 16 MBTI types. In the population as a whole the majority types are Sensing and Extraversion. The distribution of types in the general population is shown in Table 4.

Table 4 The MBTI types and their distribution among the general population (Kirby, 1988).

ISTJ 6 %	ISFJ 6 %	INFJ 1 %	INTJ 1 %
ISTP 6 %	ISFP 6 %	INFP 1 %	INTP 1 %
ESTP 13 %	ESFP 13 %	ENFP 5 %	ENTP 5 %
ESTJ 13 %	ESFJ 13 %	ENFJ 5 %	ENTJ 5 %

The descriptive Statistics used by Chandler, Carter & Benest (2003), Capretz (2003) and Hackston (2001) involved comparing their sample to the population at large. Capretz calculates an R ratio. The ratio is the percentage of the observed frequency (sample) to the expected frequency (general population). If the ratio is greater than 1.00, it means that there are more people in that group than expected from the numbers in a general population. If the ratio is less than 1.00, there are fewer people in that group than expected in a general population.

Briggs-Myers & Myers (1993) explain that if a particular type is much more (or much less) frequent in a given sample than expected, the characteristics of the type may be responsible for this distribution. It was decided to follow this approach.

The type distribution of the SAS programmers is summarised in Tables 5 and 6. In these tables, the letter *R* refers to the ratio known as the self-selection index in the selection-rate-type table (SRTT) (Capretz, 2003).

Table 5 Dichotomous preferences and pairs temperament (n = 56)

Type	%	R
E	43	0.60
I	57	2.04
S	70	0.92
N	30	1.26
T	54	1.07
F	46	0.93
J	64	1.29
P	36	0.71
Pair	%	R
IJ	39	2.81

IP	18	1.28
EP	18	0.50
EJ	25	0.69
ST	34	0.89
SF	35	0.94
NF	11	0.90
NT	20	1.64
SJ	52	1.36
SP	18	0.47
NP	18	1.49
NJ	12	1.05
TJ	34	1.36
TP	20	0.79
FP	16	0.64
FJ	30	1.21
IN	12	3.00
EN	18	0.90
IS	45	1.87
ES	25	0.48
ET	23	0.64
EF	20	0.55
IF	27	1.91
IT	30	2.17

Table 6 Type distribution of SAS programmers and SRTT comparison with a general population sample (n = 56, R = selection ratio index)

ISTJ 18 % R = 2.98	ISFJ 14 % R = 2.38	INFJ 4 % R = 3.57	INTJ 4 % R = 3.57
ISTP 4 % R = 0.60	ISFP 9 % R = 1.49	INFP 0 % R = 0	INTP 5 % R = 5.36
ESTP 2 % R = 0.14	ESFP 4 % R = 0.27	ENFP 4 % R = 0.71	ENTP 9 % R = 1.79
ESTJ 11 % R = 0.82	ESFJ 9 % R = 0.69	ENFJ 4 % R = 0.71	ENTJ 2 % R = 0.36

With the respect to the dichotomous preferences (Table 5), this research found more introvert (I = 57 %) than extrovert (E = 43 %) types; More sensing (S = 70 %) than intuitive (N = 30 %) types; more thinking than (T = 54 %) than feeling (F = 46 %) types; and more judging (J = 64 %) than perceptive (P = 36 %) types.

When looking at SAS programmers in comparison to the general population (Table 5), the pairs with high R ratios (over-represented compared to the general population) were IN, IJ and IT. The pairs with low R ratios (under-represented compared to the general population) were SP, ES, EP and EF.

When looking at SAS programmers as a group (Table 5) they are more likely to be IJ (39 % of the sample). They show a stronger preference toward sensing and thinking or feeling (69 %) than toward intuition and thinking or feeling (31 %). Fifty two percent of the sample showed a preference for SJ. SAS programmers have a stronger preference for thinking or feeling and judging (64 %) compared to thinking or feeling and perception (36 %). They are more likely to be IS (45 % of the sample) and finally, they tend to prefer feeling and thinking with introversion (57 %) rather than feeling and thinking with extroversion (43 %).

Table 6 indicates that the single largest type among the sample of SAS programmers is ISTJ (18 %). MBTI data collected over the years shows that 6 % of the general population falls into this category (Kirby, 1988) as compared to 18 % in this study. The second most frequently reported type is ISFJ with 14 % of subjects fitting into this category as compared to 6 % of the general population. The third most frequently reported type is ESTJ (11 %) and can be compared to 13 % of the general population who fit into this category. ISFP and INTJ and INTP collectively make up 18 % of this sample compared to 8% of the general population.

ESFP, ESTP and ENTJ comprised 4 %, 2 % and 2 % respectively of the sample compared to 13 %, 13 % and 5 % in the general population

The descriptive statistics suggest that certain psychological types are related to SAS programmers. The research from the sample suggests that SAS programmers are most likely to be Introvert-Judging, Sensing-Judging or Introvert-Sensing with the most common types being ISTJ and ISFJ (32 %). SAS programmers tend to combine sensing rather than intuition with thinking and feeling. It appears that they prefer to combine judging rather than perception with thinking and feeling. The results also suggest that SAS programmers tend to combine introversion rather than extroversion with thinking and feeling. There doesn't appear to be a significant preference for either thinking or feeling. These results are consistent with the findings of Chandler, Carter & Benest (2003) where 50 % of computer students fell into either the ISTJ or ISFJ category. They are similar to Lyons (1985) results that found that ISTJ, INTJ and INTP accounted for over 50 % of the computer programmer community. He however reported that compared to the general population, computer programmers report more introverted, intuitive and thinking preferences. In this sample the preference was towards sensing rather than intuition and there was no preference over either thinking or feeling.

In accordance with the MBTI theory (Briggs Myers and Myers, 1993) the typical SAS programmer is an **introvert** who has a depth of concentration and tends to be more interested and effective when their work involves ideas and requires a good deal of their activity to take place quietly inside their heads. They tend to be careful with details and dislike sweeping statements. They also have the ability to work on one project for a long time. They may have some problems communicating. They are **sensors** and therefore like the established way of doing things and enjoy using skills already learnt more than learning new ones. They work steadily, with a realistic view of how long a project will take. They seldom make errors of fact and tend to be good at precise work. Being the **judging** type means that they work best when they can plan their work and follow the plan. They like to get things settled and finished but may decide things too quickly. They may dislike interrupting the project they are on for a more urgent one. Finally, they are satisfied once they have reached a judgement on a thing, situation or person. Sensing types combined with a judging attitude function well and contently in structured jobs with sharply defined procedures that must be followed. This study implies that SAS programmers do not have a preference for either thinking or feeling. The **thinking** programmers like analysis and putting things into logical order. They are able to get along without harmony and are more analytically oriented in that they respond more easily to people's thoughts. In comparison the **feeling** programmers like harmony and their efficiency may be badly disturbed by office feuds. They are more people-orientated and respond more easily to people's values.

ESTJ and ESFJ together made up 20 % of the sample. They have the same characteristics as above except that that they are **extroverted**. According to the MBTI theory (Briggs Myers and Myers, 1993) these SAS programmers like variety and action. They tend to be faster but dislike complicated procedures. They are

often impatient with long slow jobs. They tend to act quickly, sometimes without thinking. They like to have people around and communicate freely.

Becoming a More Effective SAS programmer

These results may be important to employers looking for SAS programmers or students looking for careers. However, Briggs Myers and Myers (1993) warn that people **should not be discouraged** from choosing a career because it does not suite their personality type. The occupation should be thoroughly investigated and if they are willing to pursue it and make the effort to be understood by their colleagues, they could become valuable as **contributors of abilities that are rare** among that group. Generally colleagues make up a team that has a common purpose and they work together for the same general goal. Their differences in type can be an asset because they help people to do and to enjoy widely different kinds of work. One job may be boring or confusing to a certain type and therefore poorly executed, but it could be interesting and rewarding to another type and handled professionally. By considering the contributions of each member, the team or its leader is able to make more informed decisions than would otherwise be possible. Better results are achieved by the combined efforts of a variety of mental processes, outlooks and values (Capretz, 2003).

“...energy is created ... between opposite polarities. Here the energy may stimulate new ideas, new ways of looking at things, creative approaches and problem solving” (Bringhurst, 2001).

A healthy respect for each other's differences influences peaceful and effective coexistence. It also helps individuals to **recognize and cultivate their own less-developed processes** (Briggs Myers and Myers, 1993).

Finally, looking back at the qualities of good SAS programmers as described by Nelson & Nelson (1999), it can be seen how all the personality types found in this sample are important in achieving these qualities:

Adaptability – this is best achieved by the perceptive types who adapt well to changing situations compared to the judging types who prefer to work and follow set plans.

Problem solving/self-educating – this is preferred by the intuitive but can be done by the sensor if there are standard ways of solving the problem.

Communication – this comes more easily to the extrovert but can be developed in the introvert

Learning individuals – this comes more easily to the introvert but can be developed in the extrovert.

By considering your own job, breaking it down into processes and then deciding what traits are needed you can weigh up your own type. You will become aware of the strengths your traits bring to the job as well as the weaknesses. By knowing your weaknesses you will be aware of your own developmental needs and know better when to rely on the strengths of others in the group.

“We can all strive to be more outgoing or less impatient to reach conclusions, and better able to make decisions without resorting only to logic and rationality. Knowledge of who we are and how we can do better may facilitate a happier and more rewarding career” (Bringhurst, 2001).

From My Own Experience

In ethnographic studies the researcher has to be aware of the effects that they might have on their research – in this case however the research had an effect on the researcher. I was greatly influenced by the work of Bishop-Clark (1995) who presented a model (see Appendix C) that suggested that programming could be split into four stages and that different personality and cognitive factors affected each of the stages. She also suggested that not only does personality affect programming but programming might also change personality. This has influenced the way that I observe programmers and in the way that I program. She pointed out the importance of the reflective impulsive in the design and debugging stages. This quality is more observable in introverts and, although it does not come naturally to me, it can however, be developed. I have also become aware of other parts of my personality that are advantageous and disadvantageous to programming. Being an extrovert I am comfortable with communication however I do not have the depth of concentration that introverts tend to have. Both sensing and judging are traits that I have which are common to programmers

and give me a reliance on facts and the ability to organise. The combination of extrovert and feeling traits have not been advantageous to me as a programmer as I tend to be energetic and lively in work environments that often requires silence so that others can concentrate. Briggs Myers and Myers (1993) report that the standard temptation for ESFJs is talking too much. Bishop-Clark (1995) also points out that in the coding stage of programming, feeling type programmers may have more of a problem interpreting and giving meaning to variables than the detached, analytical, thinking type programmer. I was not aware that I was even doing this until I read Bishop-Clark's paper. I tend to automatically assume the meaning of variables based on their names instead of approaching the situation in an unbiased manner. As an inexperienced programmer I have also tended not to be too reflective of my work but this research has made me aware of that and it is something that is within my control to change. I had the opportunity of working with an experienced programmer and was impressed at his abilities in problem representation and design. However, as an introvert, he battles with communication and has a hatred of structures imposed by others. He is an excellent programmer but battles to fit into teams and organisational structures. This suggests that there is no one ideal personality type suited to SAS programming but many types are needed. Different personalities are suited to the different stages of programming and to the different job roles (data management, analysis, development or support) within the broad description of SAS programming.

"When people differ, a knowledge of type lessons friction and eases strain. In addition, it reveals the value of differences. No one has to be good at everything. By developing individual strengths, guarding against known weaknesses, and appreciating the strengths of the other types, life will be more amusing, more interesting, and more of a daily adventure than it could possibly be if everyone were alike" (Briggs Myers and Myers, 1993).

Conclusion

This paper has discussed how the SAS programmers sampled, tended to be more Introverted, Sensing and Judging without a preference towards being either Thinking or Judging. If you are a SAS programmer and you fit around this type then you have the strengths of concentration, logic and orderliness to offer to your job. You may not naturally find communication easy but it is something that can be developed. If you are as SAS programmer and you don't fit around the typical type then you have the opportunity of offering unique strengths to the group. For example if you are an extrovert amongst a group of introverts you may have the strength of communication needed for the group. You will also have developmental needs specific to your type.

Understanding your personality gives you a starting block to knowing your strengths and weaknesses as well as pointing to areas that may be developed.

Know yourself.

References

- BISHOP-CLARK, C. (1995). Cognitive Style, Personality, and Computer Programming. *Computers in Human Behaviour*. **11**, 241-260
- BISHOP-CLARK, C. & WHEELER, D.D. (1994). The Myers Briggs Personality Type and its relationship to computer programming. *Journal of Research on Computing in Education*. **26**(3) 358-373
- BRIGGS MYERS, I. & MYERS, P.B. (1993). *Gifts Differing – Understanding Personality Type*. CPP Books, California.
- BRINGHURST, N.C. (2001). How assessing personality type can benefit you and your practice. *Journal of Financial Planning*. **14** (1), 104-111
- CAPRETZ, L.F. (2003). Personality types in Software Engineering. *International Journal of Human Computer Studies*. **58**, 207-214
- CHANDLER, J., CARTER, J. & BENEST, I. (2003). Extrovert or Introvert? The real personalities of computing students [online]. Last accessed 25/10/2003 at URL: http://www.ics.ltsn.ac.uk/pub/conf2003/janet_carter.htm
- DENSCOMBE, M. (1998). *The Good Research Guide*. Open University Press, Buckingham.
- DURLING, D., CROSS, N. & JOHNSON, J. (1996). Personality and learning preferences of students in design and design related disciplines [online]. Last accessed on 25/10/2003 at URL: <http://www.lboro.ac.uk/idater/downloads96/durling96.pdf>
- EWEN, R.B. (1980). *An Introduction to Theories of Personality*. New York: Academic Press
- HACKSTON, J. (2001). Newspaper readership and MBTI preferences [online]. Last accessed 21/11/2003 at URL: <http://community.opp.co.uk/>
- HALL, C.C & LINDZEY, G. (1978). *Theories of Personality* 3rd Edition. New York: John Wiley and Sons.
- HANSBERGER, J.T., HENLEY, T. & MCCARLEY, N. (1996). *Jungian Personality Factors in Human-Computer Interaction*. Poster session presented at the 1996 South Eastern Psychological Association Conference, Norfolk, VA.
- HIRSH, S. & KUMMEROW, J. (1989). *Life Types*. New York: Warner Communication.
- HOLLAND, J.L. (1997). *Making Vocational Choices: A theory of careers* 3rd Edition. Englewood Cliffs, NJ: Prentice Hall.
- HOWARD, N. (2000). The Ultimate Match Merge: Hiring the Best SAS Programmers. *SAS User Groups International Conference (SUGI)* 25 [online] Last accessed 1/11/2003 at URL: <http://www2.sas.com/proceedings/sugi25/25/ps/25p245.pdf>
- JUNG, C.G. ([1921] 1971). *Psychological Types*, Vol.6 of the *Collected Works of C.G Jung*. London: Routledge & Kegan Paul.
- JUNG, C.G. ([1964] 1968). *Man and his symbols*. New York: Dell.
- KEEN, P.G.W. & BRONSEMA, G.S. (1981). Cognitive style research: A perspective for integration. *Proceedings of the Second International Conference on Information Systems* 21 - 52
- KIRBY, W. (1988). Myers-Briggs personality type chart [online]. Last accessed 23/11/2003 at URL: <http://www.uwsp.edu/education/wkirby/ntrprsnl/types.htm>
- LEWIS, G. & CROZIER, G. (2002). *Understanding Psychometric Testing in a week*. London: Hodder and Stoughton
- LOREN, J.F. (2000). People Smarts for Career Growth. *SAS User Groups International Conference (SUGI)* 25 [online] Last accessed 1/11/2003 at URL: <http://www2.sas.com/proceedings/sugi25/25/ps/25p243.pdf>
- LYONS, M.L. (1985). The DP Psyche. *Datamation* August **15**, 103-110
- NELSON, G.S.B. & NELSON, J.B. (1999). SAS Skills for the Next Millennium. *SAS User Groups International Conference (SUGI)* 24 [online] Last accessed 1/11/2003 at URL: <http://www2.sas.com/proceedings/sugi24/Training/p309-24.pdf>
- PARKINSON, M (2000). *How to Master Psychometric Tests* 2nd Edition. UK: Kogan Page.
- TOTTON, N. & JACOBS, M. (2001). *Character and Personality Types*. Buckingham: Open University Press.

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Appendix A

Internet Resources

The official website of the Myers-Briggs Type Indicator Trust should answer most of your questions and provide you with further information.

<http://www.myersbriggs.org/>

If you would like to discover your type it is recommended that you *consult a professional* who is qualified to administer the test. The designation of a type has much deeper meaning than just a combination of four letters. The practitioner can show an individual this deeper view of type and how to use the knowledge productively.

OPP – Leaders in Applied Business Psychology are based in the UK and can administer the test.

<http://www.opp.co.uk/index.htm>

To purchase the test online visit

<http://www.knowyourtype.com/>

A short form version of a personality test can be found at

<http://keirsey.com/>

Appendix B

Description of the 16 types.

Martin (2003) specifically looks at type and career when giving the 16 type descriptions.

ISTJ are suited to careers that make use of their depth of concentration, their reliance on facts, their use of logic and analysis, and their ability to organise. They are often found in management careers and in technical and production-orientated careers. Their strengths lie in task orientation, realistic grounding, dependability and respect for facts and this leads them to careers that require an organised approach to data, people, or things. These strengths can also lead to their effectiveness as managers.

ISFJ are suited to careers that make use of their depth of concentration, their reliance on facts, their emphasis on interpersonal values and their ability to organise. Their sense of duty, personal commitment and practicality draws them to careers in which they can be of service to others.

INFJ are suited to careers that make use of their depth of concentration, their grasp of possibilities, their emphasis on interpersonal values and their ability to organise. They are found in careers where creativity and tending to human development are primary activities.

INTJ are suited to careers that make use of their depth of concentration, their grasp of possibilities, their use of logic and analysis, and their ability to organise. They are found in academic, scientific, theoretical, and technical positions that require prolonged periods of solitary concentration and tough-minded analysis. They communicate an impression of confidence, competence and drive. They are intensely individualistic and resist being bound by routine. They tend to choose careers in law, engineering, architecture, physical and life sciences, social science, computer science and consulting.

ISTP are suited to careers that make use of their depth of concentration, their reliance on facts, their use of logic and analysis and their adaptability. They are found in a variety of careers but commonly in careers that require tough-minded analytical and realistic approaches. Their quiet adaptability, realistic grounding, and their willingness to critically analyze the facts often draw them to careers where they can take a pragmatic approach to problem solving. They may also manifest a great curiosity about things, not so much in an abstract search for their meaning, but a curiosity about how and why they work and about their application. They choose careers in military or corrections work, farming, skilled trade and crafts work, mechanics, electrical/electronic engineering or technical work, computer programming, law, and accounting.

ISFP are most suited to careers that make use of their depth of concentration, their reliance on facts, their warmth and sympathy and their adaptability. They are found in careers that allow for practical care of people as in health care and service work. They are also found in skilled craft, trade and technical careers.

INFP are most suited to careers that make use of their depth of concentration, their grasp of possibilities, their warmth and sympathy and their adaptability. They are found in careers that give them opportunities to help others. They often have the ability to quickly establish rapport with others and develop excellent communication skills. They choose careers in the fine arts, journalism, psychology, education and entertainment.

INTP are most suited to careers that make use of their depth of concentration, their grasp of possibilities, their use of logic and analysis, and their adaptability. They are often found in academic, theoretical and technical positions, some which may require prolonged periods of solitary concentration and tough-minded analysis. Their careers include physical and life sciences, computer science, social science, architecture, law, journalism, engineering and medicine.

ESTP are most suited to careers that make use of their breadth of interests, their reliance on facts, their use of logic and analysis, and their adaptability. They are found in a variety of careers but are most often found in those that require an active realistic and hands on approach. They often choose marketing and sales, police or corrections work, skilled trades, banking, farming, management, journalism and personal services.

ESFP are most suited to careers that make use of their breadth of interests, their reliance on facts, their

warmth and sympathy, and their adaptability. They are found in careers that include active health and human services, such as nursing, teaching and childcare. Examples of careers chosen by ESFPs include teaching, coaching, childcare, office work, food service, nursing and personal services.

ENFP are most suited to careers that make use of their breadth of interests, their grasp of possibilities, their warmth and sympathy, and their adaptability. They are most often found in careers that are characterised by interests and abilities in working with people and fostering their growth, or that require skills in communication and expression. Examples of careers include counselling, teaching, psychology, journalism, social science, acting and entertainment, music and public relations.

ENTP are most suited to careers that make use of their breadth of interests, their grasp of possibilities, their use of logic and analysis, and their adaptability. They are found in careers that reflect their diversity of interests and that allow them to engage their inventive and analytical minds. Their creativity, comfort with the abstract, and problem solving abilities often attract them to careers in the fields of science, communications and technology. Examples of careers include photography, marketing, public relations, journalism, engineering, computer sciences, life and physical sciences, consulting and law.

ESTJ are most suited to careers that make use of their breadth of interests, their reliance on facts, their use of logic and analysis, and their ability to organise. They are found in careers that require the use of tough-minded, fact-orientated, and goal directed analysis to provide leadership and direction, and are often found in management and administrative positions. Examples of careers include management careers, teaching, military, police and corrections, social and public services, accounting and construction.

ESFJ are most suited to careers that make use of their breadth of interests, their reliance on facts, their warmth and sympathy, and their ability to organise. They are found in careers that are characterised by a great deal of communication, nurturance and people orientated work, including teaching and spiritually orientated positions. Examples of careers include teaching, religious work, health care, personal service work, childcare, household and domestic services and office and clerical work.

ENFJ are most suited to careers that make use of their breadth of interests, their grasp of possibilities, their warmth and sympathy, and their ability to organise. They are found in careers that require organisation, expressiveness, and an interest in people's emotional intellectual and spiritual development. Examples of careers include religious professions, teaching, counselling and psychology, acting, music, writing and journalism.

ENTJ are most suited to careers that make use of their breadth of interests, their grasp of possibilities, their use of logic and analysis, and their ability to organise. They are found in careers that require drive, leadership, innovation, and tough-minded analysis; hence, they are often found in management and leadership positions. They are often very aware of power and status issues. Examples of careers include a variety of management and administrative positions, business and finance, marketing, psychology and social sciences, law, physical and life sciences, consulting, human resources, acting and computer sciences.

MARTIN, C. (2003). Looking at type and Careers. CAPT (Centre for the Applications of Psychological Type) [online] Last accessed 22/11/2003 at URL: http://www.capt.org/using_type/Workplace.cfm

Appendix C

The Bishop-Clark Model

In a review on the empirical studies of the relation between cognitive style, personality traits and computer programming Bishop-Clark (1995) reported that in the majority of studies, computer programming has been measured as a single activity. Computer programming has however been described as an activity having separate and distinct phases: problem representation, program design, coding and debugging. Bishop-Clark suggests that certain cognitive styles and personality dimensions may affect some phases but not others. In her review, she discovered that the three main factors that were studied with some regulatory with regard to cognition and personality were:

- 1 locus of control,
- 2 introversion/extroversion and,
- 3 dimensions of the MBTI.

Also studied to a lesser degree is field dependence/independence.

Many other personality variables have been studied but not with the same frequency as those previously mentioned and therefore Bishop-Clark suggests that they yield no conclusive findings applicable to a general understanding of programming achievement.

Locus of control can be either internal or external. People with a strong internal locus of control feel that they have the ability to influence the world around them and that their performance is a consequence of their own actions. In contrast, those with a strong external locus of control consider their performance as being due to factors outside their control. Internal locus of control can be discovered using the Rotter Locus of Control Scale (Rotter, 1966). Bishop-Clark reports that the varying results and large differences in sample size found in different studies, prevents one from making any reasonable conclusions regarding the relationship between locus of control and computer programming.

Introversion/Extroversion can be measured by the Eysenck Personality Inventory (Eysenck, 1958) or the MBTI. Of four empirical studies that investigated whether introversion contributed to programming achievement, Bishop Clark reported that three did not find introversion related to computer programming. She did however find the studies to have several methodological weaknesses. She suggested that more research is needed before conclusions could be made.

Bishop-Clark (1995) reported on six empirical studies to investigate the relationship between *MBTI* and computer programming. Five of the six studies used the scores on the four dimensions of the MBTI as well as a variety of demographic and aptitude measures as independent measures in linear regression models to predict programming success. Three of the studies found no significant differences between the score on each of the preference indices and the computer aptitude scale, while two of the studies found a number of the MBTI dimensions to be significant. The results indicated that thinkers and judges achieve higher programming success. Bishop-Clark suggests that intuitively this makes sense as programming is an activity that demands logical impersonal analysis (thinking) which typically involves a quite structured methodology (judging). She also commented on the attempt of several researchers to profile the typical computer programmer using MBTI. These studies indicate that a high percentage of computer programmers and systems analysts are introverted, sensing, thinking and judging.

Bishop-Clark describes *field dependence/independence* as representing two opposite ends of a continuum. Field independence is the ability to provide structure to a situation that is relatively unstructured. When perceiving information, a field independent person is likely to overcome the organisation of the field and restructure it. Field dependence can be described as an orientation toward the environment. The surrounding field has a strong impact on a field dependent person's perception of an item in the field. It has been shown numerous times that field independence is related to achievement in computer programming.

Bishop-Clark concludes that the work relating to cognitive styles and personality traits to computer programming has been scattered and difficult to interpret. She suggests that it may be that it is too complex to investigate at a high level. She presents a framework that suggests that different cognitive styles and

personality traits have different impacts on each of the four stages of programming. The framework, which is based on theory and not empirical work, is explained in the following diagram below:

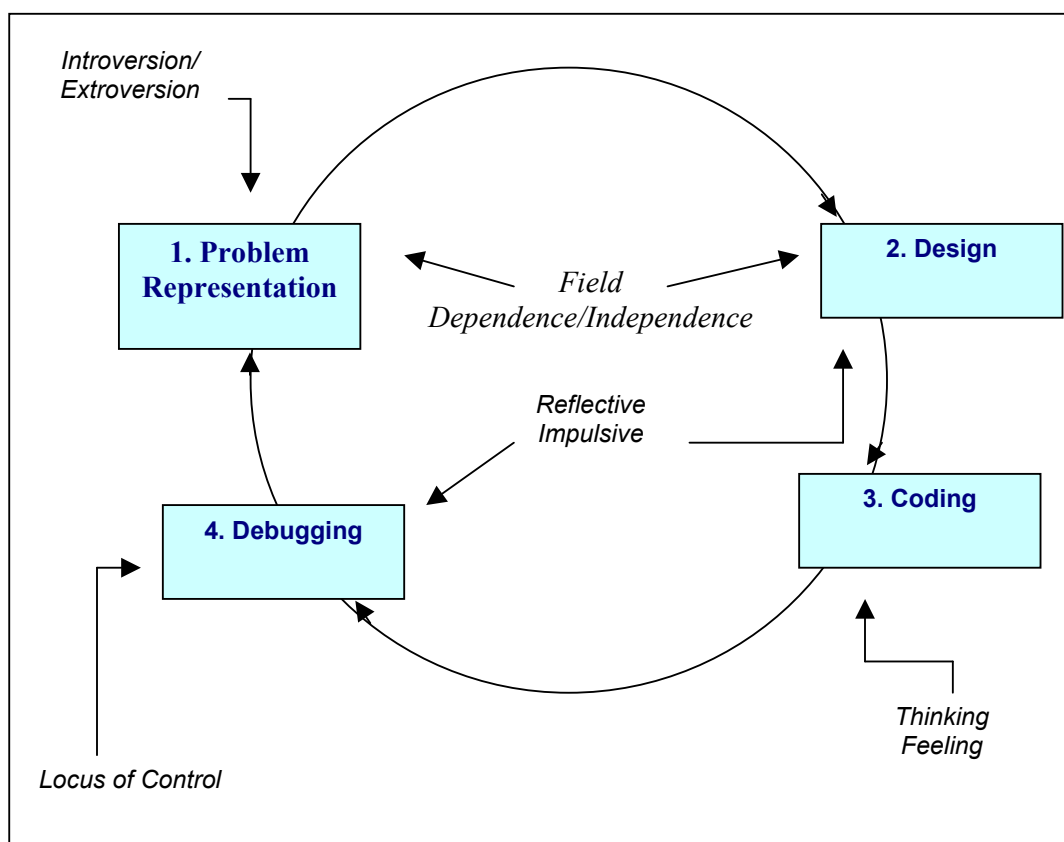


Figure 1: Styles and personalities related to the stages of computer programming. Taken from Bishop-Clark (1995).

Problem Representation requires the programmer to interact with others in order to understand the problem and the requirements of a particular program or system. The dimensions most relevant to this phase are introversion/extroversion and field dependence/independence. This phase requires more human interaction with users and clients. Programming problems are typically ill-defined and the programmer often has to make their own specifications. Introverts are more likely to attempt to understand the condition with books and internal thoughts rather than discussing the problem with clients or peers. Bishop-Clark suggests that introverts might have a difficult time achieving a problem representation consistent with the clients due to their internal orientation. When perceiving information, a field independent person is better at identifying and isolating relevant information from a complex situation.

Design involves combining the planning and design strategies with programming knowledge in order to transform a mental representation into a logical solution. Structured programming is a technique of writing programs that encourages organisation, modularity, documentation, and structure. The design phase makes use of semantic knowledge, which has to do with the general concepts important to programming but are independent of any specific programming language. Designing a computer program requires the use of “restructuring skills” like those described in field independence. The degree of reflectiveness in a person’s cognitive style may also be strongly related to the design phase. Programmers with a reflective orientation are more likely to consider the effects of a particular design before jumping into coding.

Coding a program involves translating a refined version of the program design into programming code. It requires a detailed understanding of the syntax of a language and requires an attention to the specifics of the language such as spacing. Coding uses syntactic knowledge, which is precise, detailed, and arbitrary knowledge about how the constructs in a particular language must be implemented. One of the problems that face novice programmers is that they sometimes give meaning to data or variable names that should be approached as meaningless. The thinking/feeling dimension of the MBTI describes the way in which decisions are made. The problem of interpreting and giving meaning to variables may be more of a problem for feeling types rather than detached, analytical, thinking types. Bishop-Clark suggests that the coding stage is more problematic with feeling types.

Debugging involves understanding code and finding and correcting errors (syntactic and semantic) in existing programs. It requires persistence and an incredible attention to detail. According to Bishop-Clark, a student’s tendency toward a reflective style and an internal locus of control may have the largest impact at the debugging stage of developing software. A reflective programmer is more likely to consider the effects of a change before actually making the change. The debugging phase is often the most frustrating and requires a large amount of persistence. Programmers with an internal locus of control are willing to persist at a task and are more willing to delay immediate rewards. Internals have persistence, and according to Bishop-Clark they believe that the proper working of a program is a function of their own activity. Externals on the other hand, may have more of a sense that the program is not working because of a faulty machine rather than their own actions.

BISHOP-CLARK, C. (1995). Cognitive Style, Personality, and Computer Programming. *Computers in Human Behaviour*. **11**, 241-260

EYSENCK, H. (1958). A short questionnaire for the measurement of two dimensions of personality. *Applied Journal of Psychology*. **42**. 14-17

ROTTER, J.B. (1966). Generalised expectancies for intended versus external control of reinforcement. *Psychological Monographs: General and Applied*. **80** (1)1-28