

Bipolar Factor and Systems Analysis skills of Student Computing Professionals at University of Botswana, Gaborone.

Ezekiel U. Okike

Department of Computer Science
University of Botswana
Gaborone, Botswana

Abstract—Temperamental suitability (personality traits) could be a factor to consider in career placement and professional development. It could also be an indicator of professional success or failure in any profession such as Systems Analysis and Design (SAD). However, there is not sufficient empirical evidence in support of the personality traits to which systems analysts and designers may be categorized. The objective of this study is to empirically investigate the main personality traits to which systems analysts and designers may belong, then propose a new approach to composing a personality matrix based on sound computational model. The study employed a quantitative research approach to measure the personality traits of 60 student systems analysts and designers using a human metric tool such as the Myers Briggs Type Indicator (MBTI) and some pre designed additional questionnaires. A mathematical model of the form $\alpha_{ij} = \beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + \beta_3 x_{3j} + \beta_4 x_{4j} + \dots + \beta_n x_{nj}$ was employed in order to measure achievement in systems analysis and design examination. The Statistical Package for the Social Sciences (SPSS) was used to analyse the data. Using linear regression, the model was not significant, implying that achievement in SAD examination does not depend only on personality traits, motivation variables and study habit variables which were the independent variables. However, the R squared value indicated that these variables account for 52% variation in the dependent variable SAD score (achievement). The best achievers in the personality traits are ENFJ, ENTJ, ISFJ and INFJ all scoring 70% each. Therefore, the best achievers possess the personality traits of extroversion (E), iNtuition (N), Feeling (F), Judging (J), Thinking (T), Introversion (I), Sensing (S). Overall, the highest passes are students of the traits INFJ (11), INTJ (11 passes), ENTJ (10 passes), ENFJ (10 passes), ESFP (3passes), ISFJ (3passes), ISTJ (3 passes), ESFP (2 passes), ENFP (1), ISTP (1), and ISFP (1).

Keywords—personality trait; systems analysts; academic achievement; bipolar matrix

I. INTRODUCTION

The term computing professionals encompasses professionals in Computer Science (CS), Computer Engineering (CE), Software Engineering (SE), Information Technology (IT), and Information Systems (IS). Systems Analysis and Design (SAD) is the professional practice of trained systems analysts whose main duty is to seek to understand what humans need to analyse data input or data flow systematically, to process or to transform data, and to

store data and output information in the context of a particular business [10]. This professional skill could be the specialization of any computing professional depending on interest. Like any other professional practice, the systems analyst must possess certain qualities and skills which can only be acquired by appropriate formal education and training. Students enrolled in the Systems Analysis and Design (SAD) course offered at the undergraduate level at the University of Botswana, Gaborone are the focus of this study. The University of Botswana, Computer Science Department has different cluster groups identified by the following programmes: Bachelor of Computer Science (BSC 280), Bachelor of Information Technology (BSC 204), and Bachelor of Information Systems (BIS 210), and Bachelor of Computing with finance (BSC 205). All clusters take SAD as a core course at 300 levels. The main objectives of the SAD course among others are to teach students to:

- Identify systems, roles, elements and the need for Systems Analysts
- be able to investigate systems
- be able to manage Information system projects
- be able to use appropriate methodologies, techniques and technologies in analysing designing, implementing and maintaining usable software systems

Temperamental suitability is one of the factors usually considered in career placement and professional development [4]. It can also be an indicator of professional success or failure in such profession as systems analysis and design [1, 2,3]. Using an automated human metric tool based on Myers Brigg's Type indicator (MBTI), the personality traits of individuals may be analysed.

The tool classifies individual personality traits using 16 categories namely Introversion Sensing Thinking Judging (ISTJ), Introversion Sensing Feeling Judging (ISFJ), Introversion Sensing Thinking Perceiving (ISTP), Introversion Sensing Feeling Perceiving (ISFP); Introversion iNtuition Feeling Judging (INFJ), Introversion iNtuition Thinking Judging (INTJ), Introversion iNtuition Feeling Perceiving (INFP), Introversion iNtuition Thinking Perceiving (INTP); Extraversion Sensing Thinking Perceiving (ESTP), Extraversion Sensing Feeling Perceiving (ESFP), Extraversion Sensing Thinking Judging (ESTJ), Extraversion Sensing

Feeling Judging (ESFJ); Extraversion iNtuitioN Feeling Perceiving (ENFP), Extraversion iNtuitioN Thinking Perceiving (ENTP), Extraversion iNtuitioN Feeling Judging (ENFJ), and Extraversion iNtuitioN Thinking Judging (ENTJ).

The bipolar factor or dimension was introduced in Jung's Theory of Psychological Types and identified as Jung's dichotomies or poles representing opposite preferences [6,8,12]. The combined Jung and Myers Briggs parameters representing the bipolar dimensions in human personality are:

- 1) *Extroversion (E) and Introversion (I)*
- 2) *Sensing (S) and iNtuitioN (N)*
- 3) *Thinking (T) and Feeling (F)*
- 4) *Judging (J) and Perceiving (P)*

Using the four personality trait pairs above, and performing all possible permutations on the traits yield the 16 different personality types ESTJ, ESTP, ESFJ, ESFP, ISTJ, ISTP, ISFJ, ISFP, ENTJ, ENTP, ENFJ, ENFP, INTJ, INTP, INFJ, INFP as defined above.

B. Problem Statement

Personality trait is a critical factor in determining career success as certain personality trait have been known to enhance job performance [1,2,4]. In the field of systems analysis and design however, there is not sufficient empirical evidence as to which personality traits successful and skilled systems analysts are categorized. This study is an attempt to contribute empirical solution to the problem of paucity of empirical evidence in support of personality trait categorization of systems analysts and designers.

C. Study Objectives

The main objective of this study is to empirically investigate the main personality indicators of good systems analysts and designers using trainee student analysts and designers. The study is also used to propose and demonstrate a new approach to compose personality matrix based on sound and convincing computational model.

D. Research Questions

The following research questions are investigated in this study.

- What are the personality traits of systems analysts and designers?
- Is personality a factor to be considered in the choice of systems analysis and design as a career?
- Do computing professionals such as systems analysts and designers (and programmers) have distinctive personalities?

E. Research Hypotheses

The following hypotheses are tested in this study:

H0: Introverts will have higher achievement in Systems analysis and design than extroverts

H1: Introverts will not have higher achievements than extroverts in systems analysis and design

H0: Sensors will have higher achievement in Systems analysis and design than intuitives

H1: Sensors will not have higher achievements than intuitives in systems analysis and design

H0: Thinkers will have higher achievement in Systems analysis and design than feelers

H1: Thinkers will not have higher achievements than feelers in systems analysis and design

H0: Judges will have higher achievement in Systems analysis and design than Perceivers

H1: Judges will not have higher achievements than perceivers in systems analysis and design

H0: There is significant correlation between personality traits and achievement in systems analysis and Design examination

H1: There is no correlation between personality traits and achievement in systems analysis and design examinations

The rest of this paper is divided into 6 sections. Section 2 is a review of relevant literature. Section 3 explains the research methodology. Section 4 presents the result of this study with appropriate discussion. Section 5 is the conclusion while section 6 is the list of references

II. LITERATURE REVIEW

Previous studies have looked at personality as indicators of success or failure in the fields of computer programming and software engineering [1, 2, 3]. Bentley [4] reviewed personality traits and programmer characteristics and presented some of the traits that can be indicators of success or failure in computer programming. Weinberg [13] explored the psychology of computer programming and noted that there could be variations in individual productivity due to personality type factor. Capretz [6] investigated personality types of software engineers based on the combined Jung and Myers Briggs bipolars. The study suggested that they were more (Introvert Sensing Thinking Judging (ISTJ) software engineers than other types in his data. Furthermore, Capretz [2] suggested that people possessing personality traits extrovert and feeling might be preferred when appointing systems analysts. Turley and Bieman [12] studied the attributes of individual software developers in order to identify their professional competencies using biography data and Myers- Briggs Type Indicator (MBTI) and concluded that there was no simple predictor of performance. Although experience variables in their study were related to performance, it could only predict classification of exceptional and non-exceptional of 63% of the subjects.

Chung [7] studied the cognitive abilities in computer programming using 523 Form Four secondary school students in Hong Kong. Test administered to the students included mathematics, space, symbols, hidden figures and programming ability. Results of the study suggest that performance in mathematics and spatial tests were significant predictors in programming ability. Similarly, Bishop-Clark and Wheeler [5] investigated the Myers-Briggs personality

type and its relationship to computer programming. Using 114 students, the study sought to know if college students with certain personality types performed better than others in an introductory programming course. In Bishop-Clark and Wheeler [5] study, results suggest that sensing students performed significantly better than intuition students in programming assignments while judging students performed better than perception students on computer programs although the results were not significant statistically.

Irani, Telg, Scherler, and Harrington [9] studied the relationship between personality type and distance education students course perception and performance using 39 graduate students of distance education. Results of the study indicate that of the MBTI type preferences, only thinking and perceiving types showed no significant correlations between course perceptions and performance indicators. The study concludes that performance outcomes for distance education students may be closely related to course perceptions as a function of personality type preference. Perceptions of instructional technique used by the distance instructor were strongly correlated to the students' course grade and overall grade point average for the following personality types: extravert, introvert, intuitive, sensing, feeling, and judging.

Da Cunha and Greathead [8] investigated if a specific personality type is correlated with performance on code review task. The subjects of study were 64 second year undergraduate students at New Castle University, UK. To examine the possible links with MBTI type and code review ability, the researchers computed some correlations between task score and each bipolar factor Extrovert-Introvert (EI), Sensing-iNtuition(SN), Thinking-Feeling(TF) and Judging-Perceiving(JP). The result of the study indicates that only a single bipolar within the SN bipolar significantly correlated with code review task, suggesting that people more intuitively inclined performed better than others on code review.

III. STUDY METHODOLOGY

The study uses a quantitative research approach to measure the personality traits or attributes of 60 student computing professionals who registered for the System Analysis and Design (SAD) course (CSI 342) in the first semester of 2013/2014 session at the University of Botswana, Gaborone.

A human metric tool (Myers Brigg's Type Indicator, MBTI) was administered on 60 third year students taking Systems Analysis and Design course (CSI 342) at the University of Botswana. The students were drawn from those majoring in the programmes: Bachelor of Information Technology (BSC204), Bachelor of Computing with finance (BSC 205), Bachelor of Computer Science (BSC280), Bachelor of Information System (BIS 210) and Bachelor of Education, Computer Science option (BED 240) programmes of study. The MBTI tool classified the 60 students according to their individual personality traits.

Furthermore, additional questionnaires were designed in order to gather information from the students concerning what motivated their choice of programme of study at the University of Botswana (UB): BSC204, BSC 205, BSC 280, BIS 210 and BED 240. Additional questionnaires also sought

to gather information on how the students study to understand the SAD course they take at the university. In order to measure achievement in Systems Analysis and Design, a model was used as follows:

$$\alpha_{ij} = \beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + \beta_3 x_{3j} + \beta_4 x_{4j} + \dots + \beta_n x_{nj}$$

Where α_{ij} represents a dependent variable, and the independent variables are represented as $\beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + \beta_3 x_{3j} + \beta_4 x_{4j} + \dots + \beta_n x_{nj}$. The dependent variable in this study is a student's performance or score in Systems Analysis and Design; the independent variables are the various personality traits exhibited by a student in terms of the level (in percentages) of Extroversion, Introversion, Thinking, Feeling, Sensing, iNtuition, Judging and Perceiving.

The variables which influenced students' choice of programme of study include: parental influence, personal desire to be in the computing profession, students ability in science and mathematics, students ability in science without mathematics, other reasons; and the variables which indicate student study habit : reading of text books, reading only class notes, reading from online lecture notes (module), use of internet materials, use of university library to read text books and other relevant materials, none use of university library, going to university library to read personal materials; reading class notes, text books and online lecture notes; reading class notes and online lecture materials only because student don't have enough money to purchase recommended text; any other reasons were also considered as independent variable. Data analysis was performed on the data using the Statistical Package for the social sciences (SPSS). Linear regression was done in order to fit the model and justify its significance or none significance at the 0.05 level of significance. The result of regression model was also used to determine the impact of the independent variable on student's performance.

IV. RESULT AND DISCUSSION

A. Model Fitting

The model $\alpha_{ij} = \beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + \beta_3 x_{3j} + \beta_4 x_{4j} + \dots + \beta_n x_{nj}$ was tested for fitness using regression statistic. The result as shown in Table 1 (a, b) suggests that the model is not significant. However, the R square of 52% implies that about 52% of the predictors explain the variations in the dependent variable. This means that the personality traits contribute to achievement in CSI 342: Systems Analysis and Design.

a) *Dependent Variable: CSI342*

b) *Predictors in the Model:*

(Constant), PERCEIVING, THINKING, INTRVERT, INTUITIVE, SENSING, FEELING

TABLE I. (A): MODEL SUMMARY

Model	R	R Sqr	Adjustd R Sqr	Std Error of The estimate
1	.227 ^a	.052	-.056	7.83561

a. Predictors: (Constant), PERCEIVING, THINKING, INTRVERT, INTUITIVE, SENSING, FEELING

TABLE I. (B): ANOVA^A

Model	Sum of Sqr.	df	Mean Sq	F	Sig
1	176.702	6	29.450	.480	.820 ^b
Regrsion	3254.031	53	61.397		
Residual	3430.733	59			
Total					

B. Analysis of Students Systems Analysts and Designers by Programme of Study

Table 2 below shows the frequencies for Student Systems Analysts and Designers by programme of study.

TABLE II. PROGRAMME OF STUDY

	Frequency	Percent	Valid %t	Cumulative %
BSC204	14	23.3	23.7	23.7
BSC205	17	28.3	28.8	52.5
BSC280	27	45.0	45.8	98.3
BIS210	1	1.7	1.7	100.0
Total	59	98.3	100.0	
Missing System	1	1.7		
Total	60	100.0		

BSC 204 Bachelor of Information Technology

BSC 205 Bachelor of Computing with Finance

BSC 280 Bachelor of Computer Science

BIS 210 Bachelor of Information systems

BED 240 Bachelor of Science Education (Computer Science)

C. Analysis of Students Systems Analysts and Designers by Personality Trait

Table 3 below shows the frequency distribution of students Systems Analysts and Designers by personality types. A distribution of the traits by programme of study is shown in Table 4.

TABLE III. PERSONALITY TYPE

	Frequency	Percent	Valid %	Cum %
ENTJ	10	16.7	16.7	16.7
ENFJ	10	16.7	16.7	33.3
ENFP	1	1.7	1.7	35.0
ESFJ	3	5.0	5.0	40.0
ESFP	2	3.3	3.3	43.3
ISFJ	4	6.7	6.7	50.0
ISTJ	4	6.7	6.7	56.7
ISTP	1	1.7	1.7	58.3
INFJ	12	20.0	20.0	78.3
INTJ	12	20.0	20.0	98.3
ISFP	1	1.7	1.7	100.0
Total	60	100.0	100.0	

D. Analysis of Students Systems Analysts and Designers by Personality traits

TABLE IV. DISTRIBUTION OF PERSONALITY TRAIT BY COMPUTING PROGRAMME OF STUDY

Trait	BSC204	BSC205	BSC280	BIS210	BED240
ENTJ	3	4	2		1
ENFJ	5	3	2		
ENFP			1		
ESFJ			3		
ESFP	2				
ISFJ	1	2			
ISTJ		1	4	1	
ISTP			1		
INFJ	1	6	5		
INTJ	1	1	10		
TOTAL	13	17	28	1	1

E. Bipolar Factor Analysis of Students Systems Analysts and Designers

Tables 5 - 12 present the frequency distribution of students' Systems Analysts and Designers by considering the level (in percentages) of each recognizable personality trait: extraversion, introversion, thinking, Judging, Sensing, iNtuition, Feeling, and Perceiving. Interestingly, this is still along the bipolar dimensions of human personality. The tables enable the construction of a personality matrix upon which the dominant personality traits of Student systems Analysts and Designers are constructed as shown in Table 13.

TABLE V. EXTROVERT (E)

E %	Frequency	Percent	Valid %	Cum %
.00	34	56.7	56.7	56.7
1.00	6	10.0	10.0	66.7
6.00	1	1.7	1.7	68.3
11.00	6	10.0	10.0	78.3
22.00	5	8.3	8.3	86.7
Valid 33.00	3	5.0	5.0	91.7
44.00	2	3.3	3.3	95.0
56.00	1	1.7	1.7	96.7
63.00	1	1.7	1.7	98.3
67.00	1	1.7	1.7	100.0
Total	60	100.0	100.0	

TABLE VI. INTROVERT (I)

Frequency	Percent	Valid %	Cum %
26	43.3	43.3	43.3
4	6.7	6.7	50.0
3	5.0	5.0	55.0
5	8.3	8.3	63.3
4	6.7	6.7	70.0
2	3.3	3.3	73.3
1	1.7	1.7	75.0
12	20.0	20.0	95.0
1	1.7	1.7	96.7
2	3.3	3.3	100.0
60	100.0	100.0	

TABLE VII. THINKING (T)

T%	Frequency	Percent	Valid %	Cum %
.00	34	56.7	56.7	56.7
1.00	10	16.7	16.7	73.3
12.00	3	5.0	5.0	78.3
Valid 25.00	4	6.7	6.7	85.0
31.00	3	5.0	5.0	90.0
50.00	5	8.3	8.3	98.3
75.00	1	1.7	1.7	100.0
Total	60	100.0	100.0	

TABLE VIII. FEELING (F)

F%	Frequency	Percent	Valid %	Cum %
.00	26	43.3	43.3	43.3
1.00	1	1.7	1.7	45.0
12.00	11	18.3	18.3	63.3
25.00	10	16.7	16.7	80.0
Valid 38.00	6	10.0	10.0	90.0
44.00	1	1.7	1.7	91.7
50.00	4	6.7	6.7	98.3
62.00	1	1.7	1.7	100.0
Total	60	100.0	100.0	

TABLE IX. SENSING(S)

S%	Frequency	Percent	Valid %	Cum %
.00	46	76.7	76.7	76.7
1.00	8	13.3	13.3	90.0
12.00	2	3.3	3.3	93.3
Valid 19.00	1	1.7	1.7	95.0
25.00	1	1.7	1.7	96.7
38.00	1	1.7	1.7	98.3
48.00	1	1.7	1.7	100.0
Total	60	100.0	100.0	

TABLE X. INTUITION (N)

N%	Freq	Percent	Valid %	Cum %
.00	15	25.0	25.0	25.0
1.00	1	1.7	1.7	26.7
12.00	6	10.0	10.0	36.7
25.00	9	15.0	15.0	51.7
Valid 31.00	1	1.7	1.7	53.3
38.00	11	18.3	18.3	71.7
50.00	11	18.3	18.3	90.0
62.00	5	8.3	8.3	98.3
75.00	1	1.7	1.7	100.0
Total	60	100.0	100.0	

TABLE XI. JUDGING (J)

J%	Frequency	Percent	Valid %	Cum %
.00	5	8.3	8.3	8.3
1.00	2	3.3	3.3	11.7
11.00	6	10.0	10.0	21.7
17.00	1	1.7	1.7	23.3
22.00	8	13.3	13.3	36.7
33.00	7	11.7	11.7	48.3
Valid 44.00	10	16.7	16.7	65.0
50.00	1	1.7	1.7	66.7
56.00	6	10.0	10.0	76.7
67.00	8	13.3	13.3	90.0
78.00	5	8.3	8.3	98.3
89.00	1	1.7	1.7	100.0
Total	60	100.0	100.0	

TABLE XII. PERCEIVING (P)

P%	Frequency	Percent	Valid %	Cum %
.00	56	93.3	93.3	93.3
11.00	1	1.7	1.7	95.0
22.00	1	1.7	1.7	96.7
Valid 50.00	1	1.7	1.7	98.3
56.00	1	1.7	1.7	100.0
Total	60	100.0	100.0	

Extracts from these Tables 5- 12 were used to construct a personality matrix table as shown in Table 13

TABLE XIII. PERSONALITY FREQUENCY MATRIX

Personality Type	Type Indicator	N
Extroversion (E) Introversion (I)	EI	60
Sensing (S) iNtuitioin (N)	SN	59
Thinking (T) Feeling(F)	TF	60

26	34	60	60
Judging (J)	Perceiving(P)	JP	60
55	4	59	

From Table 13, the dominant or prominent personality traits of Students Systems Analysts and Designers may be calculated as follows:

Judging (J) = 55, iNtuitioin (N) = 45, Introversion (I) = 34, and Feeling = 34 (F). This gives the trait INFJ. Furthermore, Extroversion (E) =26, Thinking (T) = 26. Hence the traits INTJ, ENFJ, ENTJ are also dominant. This is further supported by Table 2 (personality type). So, for these set of Systems Analysts, the traits INFJ, INTJ, ENFJ, ENTJ are very important indicators or attributes. Therefore, the most common valid personality attributes of systems analysts and designers here are Extroversion (E), Introversion (I), Feeling (F), iNtuitioin (N) Judging (J) and Thinking as shown in Table 13 above. However, the best achievers are not necessarily the dominant traits in a set (see section 4.6).

F. Type Matrix Construction

Arising from tables 13, a type matrix modelling table was constructed as shown in Table 14 (a, b). The table was composed by adding each bipolar to get the type indicator value which sum up to N, the class size in Table 13. However, the type indicator is not bound to sum up to N. Diagonals of the Table 14 must add up to the type indicator of Table 13, otherwise Table 14 (a) must be resized as shown in Table 14 (b).

TABLE XIV. (A) TYPE MATRIX TABLE

E 26	I 34	S 14	N 45
26 T	34 F	55 J	4 P

Resize

TABLE XIV. (B) TYPE MATRIX TABLE (NORMALIZED)

E 60	F 34	N 45	P 4
26 T	34 I	55 J	14 S

G. Achievement in Systems Analysis and Design Examination and Personality Type

TABLE XV. (A). SYSTEMS ANALYSIS EXAM AND PERSONALITY TYPE

Score %	PTYPE							Total
	E	E	E	E	E	IS	ISTJ	
Pass ≥ 50%	NTJ	NFJ	NFP	SFJ	SFP	FJ		
39.00	0	0	0	0	0	1	0	
41.00	0	0	0	0	0	0	0	
44.00	0	0	0	0	0	0	1	
45.00	0	0	0	0	0	0	0	
50.00	1	1	0	1	1	0	0	
51.00	0	0	0	0	0	0	1	
52.00	1	0	1	0	0	0	0	
53.00	1	1	0	0	0	0	0	
54.00	2	1	0	0	0	0	0	
56.00	0	1	0	0	0	1	1	
57.00	1	0	0	1	1	0	0	
58.00	0	0	0	0	0	0	0	
59.00	0	0	0	0	0	0	0	
60.00	1	1	0	0	0	1	0	
61.00	0	0	0	0	0	0	0	
62.00	0	0	0	0	0	0	1	
63.00	0	2	0	0	0	0	0	
64.00	0	0	0	0	0	0	0	
65.00	1	0	0	0	0	0	0	
67.00	0	0	0	1	0	0	0	
68.00	1	1	0	0	0	0	0	
70.00	1	2	0	0	0	1	0	
Total	10	10	1	3	2	4	4	

H. Comparisons Between Personality characteristics and Systems Analysts Characteristics

a) Characteristics of various types

Extraversion (E): Focus on the outer world

Introversion (I): Focus own inner world

TABLE XV. (B) SYSTEMS ANALYSIS EXAMS AND PERSONALITY TYPE

Score %	PTYPE				Total
	ISTP	INFJ	INTJ	ISFP	
39.00	0	0	0	0	1
41.00	0	1	0	0	1
44.00	0	0	0	0	1
45.00	0	0	1	0	1
50.00	0	2	4	0	10
51.00	0	2	1	0	4
52.00	0	1	0	0	3
53.00	0	1	0	0	3
54.00	0	0	0	0	3
56.00	0	0	2	0	5
57.00	0	1	0	0	4
58.00	0	1	0	0	1
59.00	1	0	1	0	2
60.00	0	0	0	0	3
61.00	0	0	1	0	1
62.00	0	1	0	0	2
63.00	0	0	0	1	3
64.00	0	0	1	0	1
65.00	0	0	0	0	1
67.00	0	0	0	0	1
68.00	0	1	1	0	4
70.00	0	1	0	0	5
Total	1	12	12	1	60

Feeling (F): When making decisions, they look at the people and special circumstances

iNtuition (N) : Interpret and add meaning to information they taken in

Judging (J): In dealing with outside, they get things decided

Thinking (T): When making decisions they first look at the logic and consistency

b) Essential qualities and skills of Systems analysts and designers

Kendall [10] identified three essential qualities most systems analysts seem to display, namely:

- The analyst as a problem solver possesses the ability to tackle situation at hand through the application of essential tools, techniques and experience
- The analyst as a good communicator, with the ability to relate well with others which enhances his understanding of human needs with respect to use of technology and information systems
- The analyst as a possessor of strong personal and professional ethics which helps them have self-discipline, self-motivation and shape their relationship with others.

Tegarden, Dennis and Wixon [11] on the other hand identified the six essential skills of systems analysts to include:

- Technical skills. Analysts must have technical skills to understand organizational technologies
- Business skills. Analysts need business skills to enhance their understanding of how Information Technology (IT) can be applied to deliver business solutions
- Analytical skills. Analysts need analytical skills as problem-solvers to address project and organizational challenges
- Interpersonal skills. Analysts need interpersonal skills in their relationship with stakeholders which require that they effectively communicate with each other.
- Management skills. Analysts have the ability to manage projects and resources.
- Ethical skills. Honesty with team members and the ability to maintain appropriate confidentiality is expected of all analysts.

I. Discussion

A careful comparison of the systems analysts characteristics and the personality characteristics suggests that the analyst presumably could possess any of the personality characteristics especially the Feeling, iNtuition, Judging and Thinking. From Table 2, the dominant personality traits from the subject of this study are INFJ (12), INTJ (12), ENTJ (10), and ENFJ (10). However, these trait groups are not necessarily the best achievers in systems analysis and design examination. This is easily verified from Tables 13 and Table 15 (a, b) which show the performance of various personality traits in systems analysis and design examination. The best achievers in the personality traits are ENFJ, ENTJ, ISFJ and INFJ all scoring 70% each. Hence, the best achievers possess the personality traits of extroversion, iNtuition, Feeling, Judging, Thinking, Introversion, Sensing. Overall, the highest passes

are INFJ (11) and INTJ (11 passes) supporting hypotheses 1,3,4, 5; ENTJ (10 passes) and ENFJ (10 passes) which nullifies hypothesis 2; ESFP(3passes), ISFJ (3passes), ISTJ (3 passes), ESFP (2 passes), ENFP (1), ISTP (1), ISFP (1).

In terms of correlations between achievement in SAD examination and personality traits, there is no significant relationship between personality traits and achievement in systems analysis and design examination. Although personality traits might contribute to academic achievement in systems analysis and design, it is not significant to influence achievement.

J. Conclusion

In conclusion, systems analysts and designers may exhibit any of the bipolar personality traits especially the traits INFJ, INTJ, ENTJ, ENFJ, ISFJ, ISTJ, ESFP, ENFP, ISTP, ISFP in this order of priority (research question 1).

Personality is not a significant factor in the choice of systems analysis and design as a career (research question 2). Individuals do have distinctive personalities which do enhance their performance in certain tasks, including systems analysis and design (research question 3)

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