

Merrimack College

Merrimack ScholarWorks

Organization Studies and Analytics Faculty
Publications

Organization Studies and Analytics

2015

A Longitudinal Study of CIS Students, Course Performance and MBTI Personality Types

Patricia Sendall

Merrimack College, patricia.sendall@merrimack.edu

Alan Peslak

Wendy Ceccucci

S.E. Kruck

Follow this and additional works at: https://scholarworks.merrimack.edu/mgt_facpub



Part of the [Higher Education Commons](#), and the [Management Information Systems Commons](#)

Repository Citation

Sendall, P., Peslak, A., Ceccucci, W., & Kruck, S. (2015). A Longitudinal Study of CIS Students, Course Performance and MBTI Personality Types. *2015 EDSIGCon Proceedings Information Systems Educators Conference, Wilimington, NC*, 1-15.

Available at: https://scholarworks.merrimack.edu/mgt_facpub/12

This Conference Proceeding is brought to you for free and open access by the Organization Studies and Analytics at Merrimack ScholarWorks. It has been accepted for inclusion in Organization Studies and Analytics Faculty Publications by an authorized administrator of Merrimack ScholarWorks. For more information, please contact scholarworks@merrimack.edu.

A Longitudinal Study of CIS Students, Course Performance and MBTI Personality Types

Patricia Sendall
patricia.sendall@merrimack.edu
Management Information Systems
Merrimack College
N. Andover, MA 01845 USA

Alan Peslak
arp14@psu.edu
Information Sciences & Technology
Penn State University
Dunmore, PA 18512 USA

Wendy Ceccucci
wendy.ceccucci@quinnipiac.edu
Information Systems Management
Quinnipiac University
Hamden, CT 06518 USA

S.E. Kruck
kruckse@jmu.edu
Computer Information Systems
James Madison University
Harrisonburg, VA 22807 USA

Abstract

This research is a longitudinal study of Jungian personality traits and academic success of students enrolled in Computer Information Systems (CIS) courses. The Myers-Briggs Type Indicator (MBTI) measurement scale was self-analyzed by students in CIS courses from fall 2001 through spring 2013. The results of this study indicate that both Extroverts and Judgers have increased as percentage of enrollment between 2001-2003 and 2012-2013. There was no change in academic success, as measured by grades achieved, by personality type from 2001-2003 and 2012-2013.

Keywords: MBTI, Myers-Briggs, Computer Information Systems, personality traits

1. INTRODUCTION

A number of studies have been published that attempt to determine how the Myers-Briggs Type Indicator (MBTI) measurement scale can be used to predict outcomes in a number of areas in business and in academe. These studies include, but are not limited to:

- students' academic preference and performance (Ayoubi & Ustwani, 2014);
- students' choice of major (Lyons, 1985);
- human factors in accounting information systems (Dehghanzade, Moradi, & Raghibi, 2011; Weldon, 1995);
- predictors of success in student team-based information technology (IT) projects (Lyons, 1985);
- predictors of success for computer programmers (Sterling & Brinthaup, 2003); and professional information systems work (Kaluzniacky, 2004);
- the personalities of honors students (Fuiks & Clark, 2002);
- personalities in software engineering (Cruz, da Silva & Capretz, 2015);
- predictors of success of information technology professionals (Livingood, 2003); and
- managerial attributes, behaviors and effectiveness (Gardner & Martinko, 1996).

The purpose of this study is to determine if CIS students' MBTI personality type has changed over time. The study also looks at the academic success of CIS majors and their MBTI scores over time. Academic success is measured by grades achieved by the students.

2. BACKGROUND

Of CNNMoney/PayScale's 2015 Top 100 *Best Jobs in America* with "big growth, great pay and satisfying work" (Best Jobs, 2015), almost 25% (23) of those careers are in computer-related fields. Four of the top ten (#1, software architect; #2, video game designer; #8, database developer; and #9, information assurance analyst) are also in computer-related fields. Their expected 10-year growth rates are 23%, 19%, 23%, and 37%, respectively. According to Csorny (2013), it is estimated that employment in "nearly all of the computer occupations" are projected to grow much greater than the 14% average growth rate for all occupations. Employees with an

earned Bachelor's degree should expect to earn high wages in these fields.

Further, according to the National Center for Education Statistics (n.d.), the number of students attending college in the U.S. is at a record high. In the fall of 2015, approximately 20.2 million students attended American colleges and universities, an increase of more than 30 percent of students since fall 2000.

However, undergraduate enrollments in technology-related degree programs such as computer science, computer information systems, management information systems, etc. have been declining over the years. According to Ali and Shubra (2010), computer science enrollments peaked in the mid-1980's and then again in the early 2000's. Enrollment of females in CS programs peaked in the mid-80's. In 2008, Lenox, Woratschek, and Davis explored declining enrollments in computer information systems (CIS), Information Systems (IS) and Information Technology Programs (IT). The reasons for the declining enrollments were many including: outsourcing of CS/IS/IT jobs; the economy; the dot.com bust; business cycles; decline in students' analytic abilities; and insufficient institutional recruiting of qualified students (Lenox, Woratschek & Davis, 2008).

Does personality type play a role in the success of the budding technology major or in the student's desire to enroll in a technology major? Personality awareness is a desirable "soft skill" for IT professionals. Studies have shown that not only must technologists possess "hard" skills in programming, analysis and design, but they must also know how to communicate both written and orally (Woodward, Sendall, & Ceccucci, 2010). Students can significantly benefit from not only understanding their own particular characteristics, but also the characteristics of others (Kaluzniacky, 2004). According to Weldon (1995), "Computer literacy isn't enough. IS managers and pros [*sic*] need emotional literacy to build teams and work well with users" (pp. 3-4).

Between 1942 and 1944, an early version of the Myers-Briggs Type Indicator (MBTI) personality indicator was developed by a mother-daughter team, Katherine Briggs and Isabel Briggs Myers. The instrument, based on Carl G. Jung's typological approach to personality, is represented by the following four dichotomies (bipolar dimensions where

each pole represents an opposite preference). The first three are based on Jung's work; the last was later introduced by Myers and Briggs: Extraversion – Introversion, Sensing – Intuition, Thinking – Feeling and Judging – Perceiving.

Based on Jung's typology (1971), individuals can be classified using two mental functions or dichotomies (sensing-intuition and thinking-feeling), and attitude (extraversion-introversion). The fourth parameter (judging-perceiving) helps to determine the dominant function. David Keirse and Marilyn Bates popularized the MBTI system in their 1980's book, *Please Understand Me* (Institute for Management Excellence, 2003).

All possible permutations of the 4 dichotomies above define 16 different personality types (Table 1). Each type can be assigned a name (personality type formula), as an acronym of the combination of the 4 dimensions that defines the Personality Type. For example: ISTJ: Introvert, Sensing, Thinking, Judging and ENFP: Extravert, iNtuitive, Feeling, Perceiving. Appendix A provides a detailed description of each of the 16 personality types (McPherson & Mensch, 2007). Appendix B outlines the distribution of the personality types in the general population (CareerPlanner.com, n.d.)

Table 1: MBTI Personality Types

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

Source: Montequin, Balsera, Fernandez & Nieto (2012)

Some organizations have attempted to correlate the 16 personality dispositions to choice of academic major. In *MBTI and Major Choice*, the University of Toledo (Teague, 1998) organized majors by personality type based on DiTiberio & Hammer's (1993) *Introduction to Type in College* and Isabel Briggs Myers' 1998 *Introduction to Type* (Appendix C). Personality types that were found to be suited toward technology-based majors were: Information Systems (INTP, ESTP); Information Technology (ENTP); and generic Technology (INTJ, ENTP). Personality types for Computer Science or Computer Information Systems were not provided.

McPherson & Mensch (2007) sought to determine if there was a correlation between

personality type and information technology students' choice of major. They defined information technology to include Business Information Systems (BIS), Computer Information Systems (CIS), and Management Information Systems (MIS). They determined that a relationship did in fact exist, with a significance level of .001, between personality type and choice of major. The top three personality types were drawn toward the following majors:

- BIS: ESTJ, ESTP, ESFJ
- MIS: ISTJ, ESTJ, ESFJ
- CIS: ISTJ, INTJ, ISTP

The findings concluded that the dominant personality dispositions for those who chose BIS were extrovert/sensing; MIS were sensing/judging; and CIS were introvert/thinking.

Sterling and Brinthaupt (2003) studied twenty university computer science (16) and computer information systems (4) (CIS) faculty members (15 males, 5 females) to determine personality types of the participants. The group predicted that the majority would fall into the ESTJ category. However, what they found, based on the responses of the participants, was that the programmers tended to be ENTPs, with the majority being thinking-perceiving types.

According to Montequin, Balsera, Fernandez & Nieto (2012), ISTJ and INTJ are the most common personality types found in the computer industry. Lyons (1985) concluded that IT people have very different MBTI results as compared to the general public. Teague (1998) found "preferred" MBTI personality types for various technology jobs. The top characteristics were:

- System Analysts: ENFP, ENTP, ENFJ, ENTJ
- Computer Designers: INTJ, INTP, ENTP, ENTJ
- Computer Programmers: ISTJ

The Institute for Management Excellence used MBTI to look at people who tend to migrate toward the computer-related industry. This group was defined as Corporate Information Services, Information Systems, Information Technology or Data Processing. They found that computer professionals and managers tended to be more introverted, slightly more intuitive, more thinking oriented and somewhat more judging (INTJ).

3. RESEARCH QUESTIONS

This study centered upon the following research question: Have personality types of students enrolled in CIS courses changed over time? Have different personality type factors mapped to student success in 2001-2003 as compared to 2012-2013?

The research hypotheses that were tested are as follows:

H1: There is no significant difference in CIS grades between 2001-2003 and 2012-2013.

H2-5: There is a significant difference in CIS course performance by each Jungian dichotomy, past vs. present.

H6-9: There is a significant difference in the percentage of each dichotomy enrolled in CIS courses, past vs. present.

4. METHODOLOGY

The MBTI personality indicator was distributed to students enrolled in CIS courses at a public university located in Virginia, USA. Twelve years of data were collected, from 2001 through 2013. Each semester the MBTI was distributed to undergraduate and graduate CIS classes.

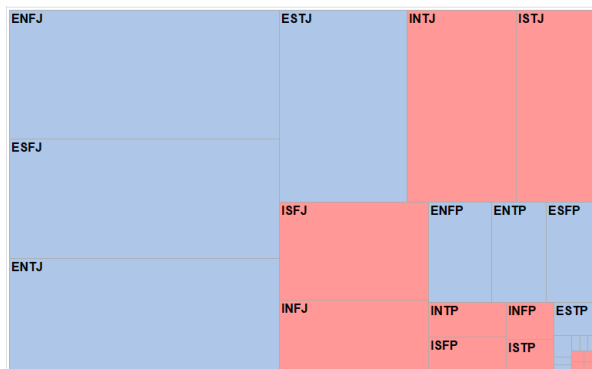


Figure 1. Relative Distribution of Personality Types

Students from 9 different classes were examined with the following course distribution from 2001-2013: Programming (4), and Enterprise Architecture (2), and Graduate Managerial Information Systems (1); and from 2012-2013: Programming (7) and Security (2).

A total of 1,661 valid surveys were collected. Figures 1 and 2 show the distribution of personality types.

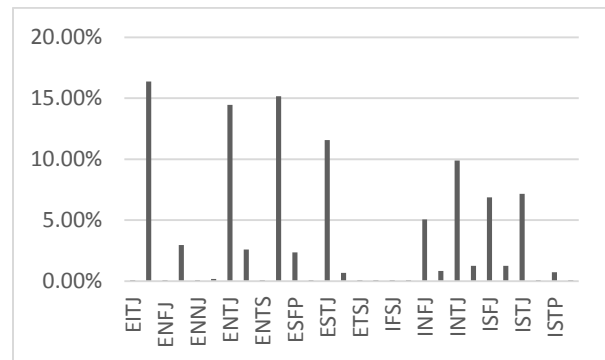


Figure 2. Relative Distribution of Personality Types

Figures 3 through 6 show the student MBTI dichotomies over the span of twelve academic years.

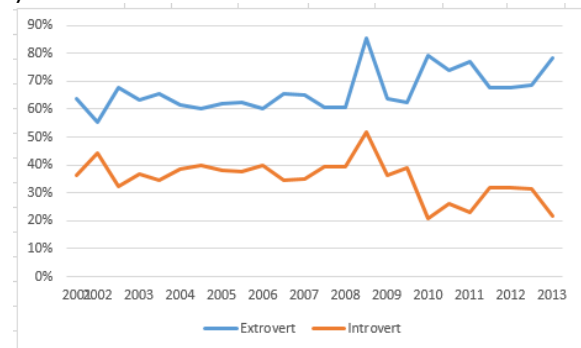


Figure 3. Percentage of Extrovert vs Introvert Types over Time

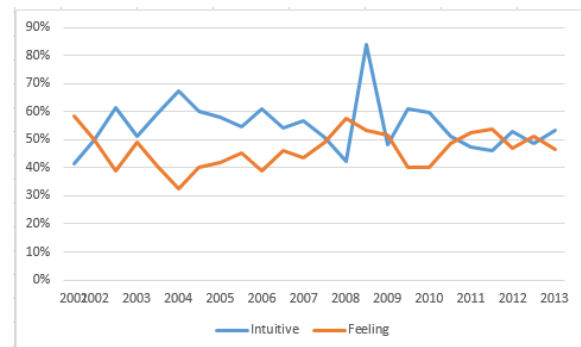


Figure 4. Percentage of Intuitive vs Feeling Types over Time



Figure 5. Percentage of Thinking vs Sensing Types over Time

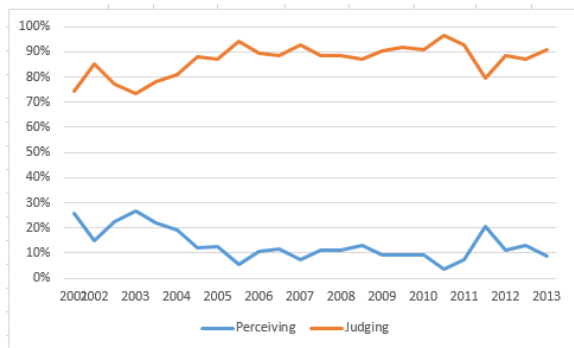


Figure 6. Percentage of Perceiving vs Judging Types over Time

The distribution of majors enrolled in the CIS courses are shown in Figure 7.

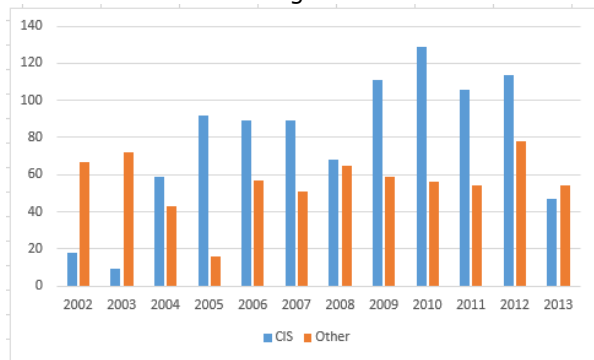


Figure 7. Count of CIS and Other Majors

In order to determine longitudinal differences, data from 2001-2003 and 2012-2013 were analyzed. A total of 516 surveys (224 from 2001-2003, and 292 from 2012-2013) were collected. This approximate 10 year gap was used to test whether there were significant differences over time. The mean grades by for the above time periods are given in Table 2.

PastPresent	N	Mean	Std. Deviation	Std. Error Mean
Grade 2001-2003	224	82.86	13.324	.890
2012-2013	292	82.37	15.228	.891

Table 2. Average Grades

5. RESULTS

Hypothesis 1

The first hypothesis examines whether there is a significant difference in grades between the two time periods 2001-2003 and 2012-2013. The test was necessary to see if grade inflation would distort any findings we would determine from the longitudinal statistical analysis of MBTI and course performance. With an overall past mean of 82.86 and an overall present mean of 82.37, there appears to be little difference over time. An independent samples t-test (Table 3) confirms that this difference is not significant at $p < .706$.

Hypothesis one is supported. There is no significant differences in CIS grades between 2001-2003 and 2012-2013. We can therefore dispel any effect of grade inflation over this time period and can test for the independent variables of MBTI personality factors.

		Levene's Test for Equality of Variances			
		F	Sig.	t	Sig. (2-tailed)
Grade	Equal variances assumed	6.294	.012	.377	.706

Table 3. Test for Equality in Means

Hypothesis 2 Extrovert/Introvert

The first Jungian personality dichotomy tested was extrovert versus introvert. A Univariate Analysis of Variance was performed to test the effect of past/present time periods, the effect of the Jungian variable and the possible interaction effects of each. Though there were more Extroverts than Introverts (349 vs. 167), there was no significant difference in performance in Extroverts versus Introverts, past versus present, and no interaction effects between past/present and Extrovert/Introvert

personality type were found. Significance levels are shown in Table 4. None are less than .05. This factor is not a significant influence in performance in the CIS courses. Both types performed similarly.

Source	F	Sig.
Corrected Model	.164	.921
Intercept	14596.276	.000
PastPresent	.024	.877
EorI	.069	.793
PastPresent * EorI	.263	.608

Table 4. Interaction Results Past/Present & E/I

Hypothesis two was rejected. There was no significant difference in course performance based on whether a student self-classified as an Extrovert or an Introvert. The grade distributions are shown in Table 5.

Past/Present	EorI	Mean
0	I	82.643
	E	82.986
1	I	83.133
	E	82.072

Table 5. Average Grades Past/Present & E/I

Hypothesis 3 Thinking/Feeling

The second Jungian personality dichotomy tested was Thinking versus Feeling. A Univariate Analysis of Variance was performed to test the effect of Past/Present time periods, the effect of the Jungian variable and the possible interaction effects of each. Though there were more Feeling than Thinking (267 vs 249), no significant difference in performance in Thinking versus Feeling, Past versus Present, and no Interaction Effects between Past/Present and Thinking versus Feeling personality type were found. Significance levels are shown in table 6. None are less than .05. This factor is not a significant influence in performance in our CIS course. Both types perform similarly.

Source	F	Sig.
Corrected Model	.307	.821
Intercept	16559.812	.000
PastPresent	.157	.692
TorF	.584	.445
PastPresent * TorF	.288	.592

Table 6. Interaction Results Past/Present & T/F

Hypothesis three was rejected. There was no significant difference in performance in Thinking versus Feeling, Past versus Present,

and no Interaction Effects between Past/Present and Thinking/Feeling personality type. This factor is not a significant influence in performance in our CIS course. Both types perform similarly. The grade distributions are shown in Table 7.

PastPresent	TorF	Mean
0	F	82.052
	T	83.722
1	F	82.232
	T	82.525

Table 7. Average Grades Past/Present & T/F

Hypothesis 4 Intuition/Sensing

The third Jungian personality dichotomy tested was Intuition/Sensing. A Univariate Analysis of Variance was performed to test the effect of Past/Present time periods, the effect of the Jungian variable and the possible interaction effects of each. Though there were more Intuition than Sensing (266 vs 250), no significant difference in performance in Intuition/Sensing, Past versus Present, and no Interaction Effects between Past/Present and Intuition/Sensing personality type were found. Significance levels are shown in Table 8. None are less than .05. This factor is not a significant influence in performance in our CIS course. Both types perform similarly.

Source	F	Sig.
Corrected Model	.086	.968
Intercept	16536.394	.000
PastPresent	.149	.700
NorS	.008	.929
PastPresent * NorS	.114	.736

Table 8. Interaction Results Past/Present & N/S

Hypothesis four was rejected. There was no significant difference in course performance based on whether a student self-classified as an Intuition versus Sensing. The grade averages are shown in table 9. Both types perform similarly.

PastPresent	NorS	Mean
0	S	83.136
	N	82.588
1	S	82.207
	N	82.526

Table 9. Average Grades Past/Present & S/N

Hypothesis 5 Perceiving/Judging

The final Jungian personality dichotomy tested was perceiving versus judging. A Univariate Analysis of Variance was performed to test the effect of Past/Present time periods, the effect of the Jungian variable and the possible interaction effects of each. Though there were much more judging versus perceiving participants (435 vs 81), and there were significant difference in performance in perceiving versus judging, significance was found at $p < .009$. There was again no significant difference between Past versus Present, and no Interaction Effects between Past/Present and perceiving versus judging personality type were found. Significance levels are shown in table 10. None except P/J are less than .05. This factor is a significant influence in performance in our CIS course.

Source	F	Sig.
Corrected Model	2.440	.064
Intercept	8220.091	.000
PastPresent	1.582	.209
PorJ	6.833	.009
PastPresent * PorJ	1.031	.310

Table 10. Interaction Results Past/Present & J/P

Hypothesis five was supported. There was a significant difference in course performance based on whether a student self-classified as Perceiving versus Judging. The average grades are shown in table 11. This factor is a significant influence in performance in our CIS course and has not changed over the last 10 years. Overall Judgers scored an 83 versus 78 for Perceivers.

PastPresent	PorJ	Mean
0	J	83.494
	P	80.640
1	J	83.061
	P	76.581

Table 11. Average Grades Past/Present & J/P

Hypotheses 6-9: Changes in MBTI Types in CIS Courses

Another part of this study was to ascertain if the personality types have changed over the past 10 years.

There are major changes in two MBTI personality factors. In recent years we have seen a significant increase in Extroverts versus Introverts (from 62.5% in 2001-2003 to 71.7% in 2012-2013). This is significant at $p < .017$. Tables 12 & 13 show the analysis results for the Extravert vs Introvert dichotomy. Hypothesis 6 is supported. There is a significant difference in the percentage of E/I dichotomy enrolled in CIS courses, past vs present.

		EorI		Total
		I	E	
PstPr 0	Count	84	140	224
	% within PastPresent	37.5%	62.5%	100.0%
1	Count	83	210	293
	% within PastPresent	28.3%	71.7%	100.0%
Total	Count	167	350	517
	% within PastPresent	32.3%	67.7%	100.0%

Table 12. PastPresent * EorI Crosstabulation

		Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square		.027		
Continuity Correction ^b		.034		
Likelihood Ratio		.027		
Fisher's Exact Test			.029	.017

Table 13. E/I, Past vs Present Analysis

		NorS		Total
		S	N	
PstPr 0	Count	110	114	224
	% within PastPresent	49.1%	50.9%	100.0%
1	Count	141	152	293
	% within PastPresent	48.1%	51.9%	100.0%
Total	Count	251	266	517
	% within PastPresent	48.5%	51.5%	100.0%

Table 14. PastPresent * SorN Crosstabulation

Two of the other two Jungian dichotomies showed no change between the two time periods. Intuition versus Sensing remained relatively unchanged at 51 to 52%. This was not significant at $p < .824$. Also Thinking

versus Feeling was nearly identical at 52% and not significant at $p < .984$. Therefore Hypotheses 7 and 8 were rejected. The results of the analysis are shown in Tables 14-17.

	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.824		
Continuity Correction ^b	.894		
Likelihood Ratio	.824		
Fisher's Exact Test		.859	.447

Table 15. S/N, Past vs Present Analysis

		TorF		Total
		F	T	
PstPr 0	Count	116	108	224
	% within PastPresent	51.8%	48.2%	100.0%
1	Count	152	141	293
	% within PastPresent	51.9%	48.1%	100.0%
Total	Count	268	249	517
	% within PastPresent	51.8%	48.2%	100.0%

Table 16. PastPresent * TorF Crosstabulation

	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.984		
Continuity Correction ^b	1.000		
Likelihood Ratio	.984		
Fisher's Exact Test		1.000	.527

Table 17. T/F, Past vs Present Analysis

		PorJ		Total
		J	P	
PstPr 0	Count	174	50	224
	% within PastPresent	77.7%	22.3%	100.0%
1	Count	261	32	293
	% within PastPresent	89.1%	10.9%	100.0%
Total	Count	435	82	517
	% within PastPresent	84.1%	15.9%	100.0%

Table 18. PastPresent * JorP Crosstabulation

On the other hand, there has been a significant increase in Judgers versus Perceivers (from 77.7% in 2001-2003 to 89.1% in 2012-2013.) This is significant at $p < .001$. Hypothesis 9 is supported. There is a significant difference in the percentage of P/J dichotomy enrolled in CIS courses, past vs present (Tables 18 and 19).

	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.000		
Continuity Correction ^b	.001		
Likelihood Ratio	.000		
Fisher's Exact Test		.001	.000

Table 19. J/P, Past vs Present Analysis

6. CONCLUSIONS

This study was conducted to determine whether Computer Information Systems Students and their success in the course is changing over time. A longitudinal study was performed using 10 years of data collected on CIS students, their course performance and MBTI Personality Types. The authors sought to ascertain whether personality factors of CIS majors have changed relative to their course success in 2001-2003 compared to 2012-2013. Overall no changes in CIS student grades were found between 2001-2003 and 2012-2013.

The MBTI personality types have changed over time. The number of Extroverts and Judgers have increased as percentage of enrollment between 2001-2003 and 2012-2013. There is also a significant difference in the percentage of P/J dichotomy enrolled in CIS courses, past vs present. In addition, there was a significant difference in course performance based on whether a student self-classified as Perceiving versus Judging. This factor is a significant influence in performance in our CIS course and has not changed over the last 10 years. Overall Judgers scored an 83 versus 78 for Perceivers. Due to relatively low numbers of students classified as Perceivers, the increase in percentage did not have an effect on overall average grades.

These are important findings for practitioners and researchers and deserve further study. In addition we plan to incorporate DISC

(Dominance, Influence, Steadiness, and Conscientiousness) in future surveys to further understand skills and behaviors that can improve workforce productivity. Another fertile area for research is to study gender differences that may exist within MBTI types. The authors will gather this data and study any interaction effect between gender and MBTI types.

7. REFERENCES

- Ali, A., & Shubra, C. (2010). Efforts to reverse the trend of enrollment decline in computer science programs. *Issues in Informing Science and Information Technology*, 7, 209-224.
- Ayoubi, R.M., & Ustwani, B. (2014). The Relationship between Student's MBTI, Preferences and Academic Performance at a Syrian University. *Education and Training*, 56(1), 78-90.
- Best Jobs in America*. (2015). Retrieved July 10, 2015, from CNN Money: <http://money.cnn.com/pf/best-jobs/2015/list/>
- CareerPlanner.com (n.d.). *How Rare is Your Personality Type?: Personality Type in the General Population*. Retrieved September 23, 2015 <http://www.careerplanner.com/MB2/TypeInPopulation.cfm>.
- Cruz, S., da Silva, F.Q., & Capretz, L.F. (2015). Forty years of research on personality in software engineering: A mapping study. *Computers in Human Behavior*, 46, 94-113.
- Csorny, L. (2013). *Careers in growing field of information technology services*. (U.S. Bureau of Labor Statistics) Retrieved July 10, 2015, from Beyond the Numbers: Employment and Unemployment: <http://www.bls.gov/opub/btn/volume-2/careers-in-growing-field-of-information-technology-services.htm>.
- Dehghanzade, H., Moradi, M. A., & Raghobi, M. (2011, November). A Survey of Human Factors' Impacts on the Effectiveness of Accounting Information Systems. *International Journal of Business Administration*, 2(4), 166-174.
- DiTiberio, J. & Hammer, A. (1993) *Introduction to Type in College*. Mountain View, CA: CPP, Inc.
- Fuiks, C.L., & Clark, L. (2002). *A Review of the Research on Personality Characteristics of Academically Talented College Students*. Retrieved July 9, 2015, from NCHC Monograph Series, Teaching and Learning in Honors: <http://digitalcommons.unl.edu/nchcmono/9>
- Gardner, W.L., & Martinko, M.J. (1996, February). Using the Myers Briggs Type Indicator to Study Managers: A Literature Review and Research Agenda. *The Journal of Management*, 22(1), 45-83.
- Institute for Management Excellence (2003, July). *Understanding Personality Differences*. Retrieved April 23, 2014, from ITsTime.com: <http://www.itstime.com/jul2003.htm>.
- Jung, C. G. (1971). *Psychological Types: The collected works of CG Jung* (Vol. 6). Princeton, NJ, USA: Princeton University Press.
- Kaluzniacky, E. (2004). Myers-Briggs Personality Types. In *Managing Psychological Factors in Information Systems Work: An Orientation to Emotional Intelligence*. (pp. 3-61). Hershey, PA, USA: Information Science Publishing.
- Lenox, T. L., Woratschek, C. R., & Davis, G.A. (2008). Exploring Declining CS/IS/IT Enrollments. *Information Systems Education Journal*, 6 (44). <http://isedj.org/6/44/>. ISSN: 1545-679X.
- Livingood, R.A. (2003). *Predicting Success of Potential Information Technology Professionals by Correlation to the Myers-Briggs Type Indicator* (Doctoral dissertation, Capella University). Retrieved from <http://202.28.199.34/multim/3112985.pdf>.
- Lyons, M.L. (1985, August). The DP Psyche. *Datamation*, 31(16), 103-110.
- McPherson, B. & Mensch, S. (2007). Students' Personality Type and Choice of Major. *Academy of Information and Management Sciences Journal*, 10(2), 1-18.

- Montequin, V.R., Balsera, J.V., Fernandez, J.M., & Nieto, A.G. (2012). Using Myers-Briggs Type Indicator (MBTI) as a Tool for Setting up Student Teams for Information Technology Projects. *Journal of Information Technology and Application in Education*, 1(1), 28-34.
- Myers & Briggs Foundation, MBTI Basics retrieved May 9, 2014 from: <http://www.myersbriggs.org/my-mbti-personality-type/mbti-basics/>
- National Center for Education Statistics (n.d.). *Fast Facts-Back to School Statistics*. Retrieved July 1, 2015, from Institute of Education Sciences: <http://nces.ed.gov/fastfacts/display.asp?id=372>
- Sterling, G.D., & Brinthaup, T. M. (2003). Faculty and Industry Conceptions of Successful Computer Programmers. *Journal of Information Systems Education*, 14(4), 417-424.
- Teague, G.J. (1998). Personality Type, Career Preference, and Implications for Computer Science Recruitment and Teaching. *Proceedings of the Australian Computer Science Education Conference* (pp. 155-163). Brisbane: The Association of Computing Machinery.
- University of Toledo, *MBTI and Major Choice* (2005, February). Retrieved April 28, 2014 from: http://www.utoledo.edu/success/career/pdfs/MBTI_TYPE_TABLE_Majors_2.pdf.
- Weldon, D. (1995, May). A Mutual Understanding. *Computerworld*, 29(18), 103-11.
- Woodward, B., Sendall, P., & Ceccucci, W. (2010). Integrating Soft Skills Competencies Through Project-based Learning Across the Information Systems Curricula. *Information Systems Education Journal*, 8(8), 3-15. <http://isedj.org/8/8/>. ISSN: 1545-679X.

APPENDIX A: The 16 MBTI® Types

ISTJ

Quiet, serious, earn success by thoroughness and dependability. Practical, matter-of-fact, realistic, and responsible. Decide logically what should be done and work toward it steadily, regardless of distractions. Take pleasure in making everything orderly and organized – their work, their home, their life. Value traditions and loyalty.

ISFJ

Quiet, friendly, responsible, and conscientious. Committed and steady in meeting their obligations. Thorough, painstaking, and accurate. Loyal, considerate, notice and remember specifics about people who are important to them, concerned with how others feel. Strive to create an orderly and harmonious environment at work and at home.

INFJ

Seek meaning and connection in ideas, relationships, and material possessions. Want to understand what motivates people and are insightful about others. Conscientious and committed to their firm values. Develop a clear vision about how best to serve the common good. Organized and decisive in implementing their vision.

INTJ

Have original minds and great drive for implementing their ideas and achieving their goals. Quickly see patterns in external events and develop long-range explanatory perspectives. When committed, organize a job and carry it through. Skeptical and independent, have high standards of competence and performance – for themselves and others.

ISTP

Tolerant and flexible, quiet observers until a problem appears, then act quickly to find workable solutions. Analyze what makes things work and readily get through large amounts of data to isolate the core of practical problems. Interested in cause and effect, organize facts using logical principles, value efficiency.

ISFP

Quiet, friendly, sensitive, and kind. Enjoy the present moment, what's going on around them. Like to have their own space and to work within their own time frame. Loyal and committed to their values and to people who are important to them. Dislike disagreements and conflicts, do not force their opinions or values on others.

INFP

Idealistic, loyal to their values and to people who are important to them. Want an external life that is congruent with their values. Curious, quick to see possibilities, can be catalysts for implementing ideas. Seek to understand people and to help them fulfill their potential. Adaptable, flexible, and accepting unless a value is threatened.

INTP

Seek to develop logical explanations for everything that interests them. Theoretical and abstract, interested more in ideas than in social interaction. Quiet, contained, flexible, and adaptable. Have unusual ability to focus in depth to solve problems in their area of interest. Skeptical, sometimes critical, always analytical.

ESTP

Flexible and tolerant, they take a pragmatic approach focused on immediate results. Theories and conceptual explanations bore them – they want to act energetically to solve the problem. Focus on the here-and-now, spontaneous, enjoy each moment that they can be active with others. Enjoy material comforts and style. Learn best through doing.

ESFP

Outgoing, friendly, and accepting. Exuberant lovers of life, people, and material comforts. Enjoy working with others to make things happen. Bring common sense and a realistic approach to their work, and make work fun. Flexible and spontaneous, adapt readily to new people and environments. Learn best by trying a new skill with other people.

ENFP

Warmly enthusiastic and imaginative. See life as full of possibilities. Make connections between events and information very quickly, and confidently proceed based on the patterns they see. Want a lot of affirmation from others, and readily give appreciation and support. Spontaneous and flexible, often rely on their ability to improvise and their verbal fluency.

ENTP

Quick, ingenious, stimulating, alert, and outspoken. Resourceful in solving new and challenging problems. Adept at generating conceptual possibilities and then analyzing them strategically. Good at reading other people. Bored by routine, will seldom do the same thing the same way, apt to turn to one new interest after another.

ESTJ

Practical, realistic, matter-of-fact. Decisive, quickly move to implement decisions. Organize projects and people to get things done, focus on getting results in the most efficient way possible. Take care of routine details. Have a clear set of logical standards, systematically follow them and want others to also. Forceful in implementing their plans.

ESFJ

Warmhearted, conscientious, and cooperative. Want harmony in their environment, work with determination to establish it. Like to work with others to complete tasks accurately and on time. Loyal, follow through even in small matters. Notice what others need in their day-by-day lives and try to provide it. Want to be appreciated for who they are and for what they contribute.

ENFJ

Warm, empathetic, responsive, and responsible. Highly attuned to the emotions, needs, and motivations of others. Find potential in everyone, want to help others fulfill their potential. May act as catalysts for individual and group growth. Loyal, responsive to praise and criticism. Sociable, facilitate others in a group, and provide inspiring leadership.

ENTJ

Frank, decisive, assume leadership readily. Quickly see illogical and inefficient procedures and policies, develop and implement comprehensive systems to solve organizational problems. Enjoy long-term planning and goal setting. Usually well informed, well read, enjoy expanding their knowledge and passing it on to others. Forceful in presenting their ideas.

Source: The Myers & Briggs Foundation: <http://www.myersbriggs.org/my-mbti-personality-type/mbti-basics/the-16-mbti-types.asp>

APPENDIX B: Personality Type Distribution in the General Population

Type	Frequency in Population	
ISFJ	■■■■■■■■■■■■■■■■■■■■	13.8%
ESFJ	■■■■■■■■■■■■■■■■■■	12.3%
ISTJ	■■■■■■■■■■■■■■■■■■	11.6%
ISFP	■■■■■■■■■■■■■■■■	8.8%
ESTJ	■■■■■■■■■■■■■■■■	8.7%
ESFP	■■■■■■■■■■■■■■■■	8.5%
ENFP	■■■■■■■■■■■■■■	8.1%
ISTP	■■■■■■■■■■■■■■	5.4%
INFP	■■■■■■■■■■■■■■	4.4%
ESTP	■■■■■■■■■■■■■■	4.3%
INTP	■■■■■■■■■■■■■■	3.3%
ENTP	■■■■■■■■■■■■■■	3.2%
ENFJ	■■■■■■■■■■■■■■	2.5%
INTJ	■■■■■■■■■■■■■■	2.1%
ENTJ	■■■■■■■■■■■■■■	1.8%
INFJ	■■■■■■■■■■■■■■	1.5%

Source: CareerPlanner.com: <http://www.careerplanner.com/MB2/TypeInPopulation.cfm>

APPENDIX C: MBTI and Major Choice

<p>ISTJ Accounting Biology Criminal Justice Finance Exercise Science Geology Medical Technology Civil engineering</p>	<p>ISFJ Criminal Justice Psychology Finance History Medical Technology Religious Studies Social Work</p>
<p>ISTP Biology Finance Law and Social Thought Geology Economics Theatre Mathematics</p>	<p>ISFP Art Psychology Exercise Science Law and Social Thought Foreign Languages Nursing</p>
<p>ESTP Art Biology Information Systems Medical Technology Environmental Studies Theatre</p>	<p>ESFP Psychology Exercise Science Geology Nursing Speech Language Pathology Social Work</p>
<p>ESTJ Mechanical Engineering Public Relations Music Accounting Finance Political Science</p>	<p>ESFJ Psychology Marketing Nursing Physical Education Religious Studies Social Work Speech Language Pathology</p>
<p>INFJ Art Communication Psychology Latin American Studies Marketing Nursing Physical Education Sociology Urban Studies</p>	<p>INTJ Biochemistry Psychology Finance Mathematics Sociology Urban Studies Environmental Sciences Business Management Technology</p>
<p>INFP Management History Medical Technology Foreign Languages Music Psychology Religious Studies Social Work</p>	<p>INTP Chemistry Information Systems Criminal Justice Economics Finance History Legal Secretarial Technology</p>

<p>ENFP Anthropology Art Chemistry Early Childhood Education Marketing Foreign Languages Sociology Communication</p>	<p>Physics ENTP Information Technology Communication Criminal Justice Finance Mechanical Engineering Technology Marketing History</p>
<p>ENFJ Communication Psychology Management Marketing Public Relations Urban Studies Foreign Languages</p>	<p>ENTJ Economics Secondary Education Management International Business Political Science Sociology Anthropology</p>

Source: The University of Toledo Career Services, February 2005