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# Indications of Personality Trait Difference between ICT and Other Students

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# INDICATIONS OF PERSONALITY TRAIT DIFFERENCE BETWEEN ICT AND OTHER STUDENTS

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## Abstract

*The paper reports on a survey undertaken amongst first year students who were taking introductory courses in departments within Schools of IT at two South African universities. The purpose of the survey was to understand factors influencing career choice and how educationalists could use this to encourage enrollment in computer-related degree programmes. This paper considers association of values with chosen careers, other career outcomes that students consider important and their perceptions regarding personal characteristics of ICT students. The responses of students who intend taking computer-related courses up to third year and those who are taking other majors are compared. Gender is also considered. Significant differences were discovered and are associated with a variety of different theories that are broadly related to personal characteristics and personality (Hofstede's cultural dimensions, Myers-Briggs Type Indicator and the Five Factors Model). An INTJ profile for males and an INFJ profile for female students intending to major in computer-related courses seem to emerge. Low Power Distance, low Uncertainty Avoidance, and high Masculinity are tentatively proposed as cultural dimensions of the ICT career culture.*

*Keywords: computing education, cultural dimensions, personality traits.*

# 1 INTRODUCTION

This paper reports on an extensive survey amongst students who recently began studying at two South African universities. The paper compares responses regarding factors believed to affect career choices of the students who intended majoring in courses considered to be computer-related (CM) versus those of students who had chosen non-computer-related majors (referred to as O). The paper will attempt to explain these differences by referring to personal differences arising from culture and personality. Understanding the differences will allow us to focus campaigns to attract students appropriately.

# 2 PERSONALITY THEORY

Contemporary personality theory originates from two opposing paradigms for defining personality. The first proposes that people can be *classified.* The researcher using this approach observes contrasting behavioural patterns called the *dimensions* of personality. When classifying a person the expert has to decide to which of the two extremes of each of dimension a person belongs. This constitutes a *type theory* of personality. When the second viewpoint is adopted the researcher analyses the meaning of words describing human behaviour and different *factors* of personality are identified using lexical factor-analysis. This approach prefers not to classify people. Rather, the degree to which a person leans towards the extremes of the identified factors is calculated. This is a *trait theory* of personality. These theories seem to converge to support the Five Factor model of personality (FFM).

## 2.1 Myers-Briggs Type Indicator

The Myers-Briggs Type Indicator (MBTI) [Myers et al. 1985] was devised to clarify a personality theory originally proposed by Jung [Bayne 1995: p. 15]. It supports the type theory of personality and uses four bipolar dimensions of preferences (summarised in Table 1). The combinations define sixteen personality types denoted by the letters of the preferred orientations (e.g. ISTJ, ENFP, INTP). Individuals can hence be classified as one of the sixteen personality types [Gregory 2004: p. 524].

| Factor label | Factor | Left extreme | Right extreme | |
|---|---|---|---|---|
| Social interaction | I/E | **I**ntroverted | **E**xtraverted | Introverts prefer to work alone and find social interaction tiresome, while extroverts are energized by it. |
| Informa-tion gathering | S/N | **S**ensing | i**N**tuitive | A sensing person prefers tangible results, pays attention to detail and values information based on concrete facts. An intuitive person has a more holistic view, sees facts as contributors to concepts and tends to be more imaginative. |
| Decision making | T/F | **T**hinking | **F**eeling | A thinking person is orderly and critical and bases decisions on logic and objective consideration. A feeling person is driven by personal values and bases judgments on subjective and personal considerations. |
| Work style | J/P | **J**udging | **P**erceiving | Judgers are organised. They plan ahead and prefer closure to avoid last minute stresses. They tend to be dictatorial. Perceivers are flexible people. They are spontaneous and to leave things open in anticipation of a better opportunity that might arise. They are energized by pressure. |

*Table 1: The four personality dimensions defined by Briggs and Briggs-Myers*

### 2.2 The Five Factors Model of Personality

Few topics in contemporary psychology have generated as much research and theoretical interest as the Five Factor Model of personality (FFM) proposed by Costa and McCrae [1985]. It is a widely used taxonomy with established validity [Ehrhart and Makransky 2007]. The Big Five personality factors first presented by Norman [1963] were later refined by others [Digman and Takemoto-Chock 1981; Goldberg 1981]. The facets associated with the five factors describe them more fully (see Table 2). This widely accepted model is used in practice by the NEO Personality Inventory (NEO-PI-R) and research indicates that it covers the majority of the constructs and variables assessed by other traditional personality assessment measures [Newgent et al. 2004].

| Factor | Facets |
|---|---|
| Extraversion | Warm, Assertive, Gregarious, Active, Excitement seeking, Positive |
| Openness to Experience | Fantasy, Aesthetics, Feelings, Actions, Ideas, Values |
| Agreeableness | Trusting, Straightforward, Altruistic, Compliant, Modest, Tender-Minded |
| Conscientiousness | Competent, Orderly, Dutiful, Achieving, Self-Disciplined, Deliberate |
| Neuroticism (Inverted) | Anxious, Angry and Hostile, Depressed, Self-Conscious, Impulsive, Vulnerable |

*Table 2: The factors and facets of the Five Factor Model of personality*

### 2.3 Correlations between the personality theories

The degree of agreement between MBTI and FFM has received much attention. McCrae and Costa [1989] found that the MBTI dimension IE is significantly (negatively) correlated with Extraversion, SN with Openness, TF with Agreeableness, and JP (negatively) with Conscientiousness. Furnham [1996; 2003] confirmed this and also found Neuroticism to be correlated with both IE and TF.

| MBTI Dimension | NEO-PI Dimension | Remark |
|---|---|---|
| Extroversion- Introversion | Extraversion | This correlation is obvious |
| Sensing-Intuitive | Openness to Experience | Openness to Experience & Intuition: both are predictors of creativity. |
| Thinking-Feeling | Agreeableness | Agreeableness & Feeling: both refer to behaviour that is in essence considerate to other people. |
| Judging-Perceiving | Conscientiousness | Conscientiousness & Judging: both are measures of orderliness and self-discipline. |
| EI and TF | Neuroticism | Neuroticism is correlated to both EI and TF |

*Table 3: Furnham's explanations and correlation between MBTI and FFM*

### 2.4 Personality of IT/IS professionals

The idea that ICT professionals share a distinctive personality profile was observed informally many years ago and the term "programmer personality" has been considered to be a cliché for some time. Although the ICT profession has evolved to include a variety of careers researchers continue to be fascinated by the idea of the existence of unique characteristics of ICT professionals.

Most studies found use MBTI to characterise the personality of computing professionals. Studies since the mid 1980's have found that ICT professionals are more likely to fall in the ISTJ and in the INTJ categories compared with the general population, while extraversion and feeling types do not feature prominently [Capretz 2003; Choi et al. 2008; Teague 1998; Turley and Bieman 1995]. A recent study found ISTJ and ESTJ to be most common [Galpin et al. 2007]. In contrast with studies conducted in

the 1980's, this study showed that INTJ is not very common and ENFJ was moderately represented whereas they were previously underrepresented. As in previous studies, INFJ remained scarce.

Similarly, studies that aim to identify personality attributes of IT professionals in terms of the FFM agree on high levels of Conscientiousness (confirming the high occurrences of MBTI Judging types) and low levels of Neuroticism (confirming the low occurrences of Feeling types). Higher than usual levels of Conscientiousness, Agreeableness and Extraversion and a noticeably lower than usual level of Neuroticism in most of participants have been observed [Darcy and Ma 2005] and unusually high levels of Contentiousness and of Extraversion appear to distinguish non-exceptional from exceptional IS professionals [Clark et al. 2003]. Sodiya et al. [2007] found that high Agreeableness and low Neuroticism are essential for all IS roles and that medium to high Extraversion is required.

# 3 CULTURE

## 3.1 Hofstede's cultural dimensions

Hofstede [1984] identified four dimensions of culture from data obtained from large world-wide surveys involving IBM employees during 1968 and 1972 (See Table 4). In a later study a fifth dimension was identified [Hofstede and Bond 1988].

| Dimension | Description | Contrasting aspect |
|---|---|---|
| Power Distance | Attitudes towards authority and status | Hierarchical vs Egalitarian |
| Uncertainty Avoidance | Level of threat of unstructured situations | Adopting rules versus abandoning fear of the unknown |
| Individualism | Degree of assertiveness | Putting individual concerns ahead versus Valuing the group's concerns |
| Masculinity | Extent to which motivation is based on egoistic work goals | Getting ahead versus Getting along |
| Confucian Dynamism | Degree of acceptance of the legitimacy of hierarchy and valuing of perseverance and thrift | A long-term versus a short-term orientation in life |

*Table 4: Cultural Dimensions*

## 3.2 GLOBE cultural dimensions

| GLOBE Dimension | Originating idea | Definition |
|---|---|---|
| Assertiveness | Masculinity [Hofstede 1984] | Degree of assertive, confrontational and aggressive behaviour |
| Gender Egalitarianism | | Extent of equity and equality of genders |
| Future Orientation | Temporal mode [Kluckhohn et al. 1961] | Degree of engagement in planning and investing in future and delaying gratification. |
| Humane Orientation | Affiliative motive [McClelland 1987] | Degree of being fair, altruistic, friendly, caring and generous. |
| Institutional Collectivism | Individualism (Neg) [Hofstede 1984] | Degree of sharing resources and acting collectively |
| In-Group Collectivism | | Degree of pride, loyalty to organisations , groups and family. |
| Performance Orientation | Need for achievement [McClelland 1987] | Extent of encouraging and rewarding individual excellence |
| Power Distance | Power Distance [Hofstede 1984] | Degree of unequal distribution of power |
| Uncertainty Avoidance | Uncertainty Avoidance [Hofstede 1984] | Extent to which social norms, rituals and bureaucratic practices are used to decrease uncertainty |

*Table 5: Definition of the GLOBE cultural dimensions*

A considerable amount of further research has contributed to the identification of dimensions used to describe observed cultural differences. The works of Kluckhohn et al [1961], McClelland [1987], Hall [1990] and Gannon [2008] have contributed significantly to understanding cultural differences.

The ongoing Global Leadership and Organisational Behaviour Effectiveness (GLOBE) Research Project, conceived by Robert J. House, began formally in 1993. It uses nine dimensions that were derived from those of some of the above mentioned large-sample studies [Chhokar 2007]. These dimensions are defined in Table 5 and their relationship to other cultural dimensions is also shown.

### 3.3 Culture and Personality

Many studies linking cultural dimensions and personality dimensions have been conducted resulting in an impressive list of culture-level correlates. Smith and Bond [1998] associated the FFM with Hofstede's cultural dimensions based on inferences made from empirical work done in Asia. Hofstede and McCrae [2004] compared data from the IBM study with country-level scores of the FFM collected in the 1990's and identified clear correlations. Even more recently McCrae et al [McCrae et al. 2008] conducted a study to correlate the GLOBE Societal Practices scales with that of the NEO-PI-R. Findings related to a selected subset of the cultural dimensions from these studies are summarised in Table 6. The items that were confirmed by at least one of the other studies are shown in italics.

| Dimension of Culture | NEO-PI Dimension (Smith & Bond) | NEO-PI Dimension (Hofstede & McCrae) | NEO-PI Dimension (McCrae et al) |
|---|---|---|---|
| Power Distance | *High Conscientiousness*<br>High Agreeableness | *High Conscientiousness*<br>*Low Extraversion*<br>Low Openness | *Low Extraversion* |
| Uncertainty Avoidance | *Low Openness*<br>Low Neuroticism | Low Agreeableness<br>High Neuroticism | *Low Openness* |
| Individualism | *High Extraversion* | *High Extraversion* | *High Extraversion* |
| Assertiveness (Masculinity) | High Conscientiousness<br>*Low Agreeableness* | High Neuroticism<br>High Openness<br>*Low Agreeableness* | *Low Agreeableness* |

*Table 6: Comparison between some cultural dimensions and the FFM*

Hofstede [2009] cautions that the links between FFM and the cultural dimensions are statistical and should not be used to stereotype individuals. Although cultural dimensions are primarily used to illuminate cultural differences between nations, they can also be used to describe grouping such as people belonging to the same organisation, practicing the same religion or pursuing the same occupation. In this article cultural dimensions are used to describe an observed group personality profile that has emerged from our data and that can be considered to indicate an ICT career culture.

# 4 RESEARCH QUESTIONS

Main research question: What cultural and personality related differences can be observed between groups of students selecting different majors?

Sub-questions

- How do CM students differ from O students in terms of values associated with chosen careers?
- How do CM students differ from O students regarding importance of other career outcomes?

- How CM students differ from O students in terms of their perceptions of personal characteristics of ICT students?
- How does gender affect the differences in the above three comparisons?

# 5 RESEARCH METHODOLOGY

Questionnaires were given out to 1868 students early in 2009, before they had much exposure to the course content and lecturers. 1741 students were taking introductory IT courses at university A in South Africa and 127 at from university B. Registrations were: 316 for computer-related degrees; 876 for financial sciences degrees; 325 for other B Com degrees; and 347 for other degrees. The apparent bias due to the large number of students in the sample taking financial sciences degrees is unavoidable as they are required to take the classes to whom the questionnaire was given. 424 students intended taking a computer-related major although some of these were taking non-computer related degrees. Further analysis is in terms of this larger group of CM students versus the rest. There were 262 CM males, 149 CM females, 629 O males and 828 O females (not all indicated gender).

Lecturers used different strategies for eliciting responses as circumstances differed. This resulted in very different return percentages. The overall response was 48.86% but varied from 13.43% to 95%. This is acknowledged as a limitation. Research regarding career choice is generally quantitative but in our next survey we intend utilising more open ended qualitative questions particularly to collect data on values and perceptions.

The questions were based on previously published sets [Beyer 2008; Seymour et al. 2005; Walstrom et al. 2008]. This paper focuses on those questions considered to be relevant to attributes related to personality and values. Although they include perceptions of working and personal life, all relating to the chosen career, *they were not set up taking any personality theory into account and hence are not explicitly aligned with any of the theories discussed above*. Students were asked to indicate agreement with a statement using a scale with 6 as most in agreement, 1 least in agreement and zero for "Do not know or have not really thought about it". These were subsequently reduced to low, medium and high. Option zero was ignored in the analyses. All analyses were done using SPSS. Pearson Chi-Square was used to determine significant difference. In the discussion only the percentage of students selecting the High Agreement is used for analysis and this value is shown in the tables.

# 6 FINDINGS

## 6.1 Work related values

| | Q4.1 **Having a job where I work with people is important.** | | Q4.2 **Information Systems careers allow one to help people.** | | Q4.3 **It is important to be able to combine career and family.** | | Q4.4 **My career will give meaning to my life.**[1] | | Q4.5 **I'd never let my career take priority over my family** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CM | O | CM | O | CM | O | CM | O | CM | O |
| female | 70.5% | 71.0% | 73.6% | 64.7% | 72.2% | 80.4% | 70.7% | 70.3% | 70.7% | 74.7% |
| male | 53.9% | 67.3% | 59.8% | 65.4% | 62.1% | 78.4% | 59.0% | 66.2% | 68.2% | 72.1% |

*Table 7: % of groups of students who indicated High agreement with the questions on values*

[1] Not significant at $p < 0.05$.

- CM(m) are involved in all the largest differences. Thus we can deduce that a combined effect, involving both computer major and male gender, has some influence on values.
- CM(m) are in every case lower than both CM(f) and O (both genders). The influence identified here consistently shows the male CM students as being less people-oriented than either women or students of both genders who are not studying computer-related topics.
- The O(m) and O(f) scores tend to be very similar for all five questions. Hence the gender differences are not as noticeable amongst the ”Other” majors. This emphasizes that the gender difference between CM students is unusual and worth noting.
- Questions 4.1, 4.2, 4.3 and 4.4 have a big difference between CM(m) and CM(f) (16.6%, 13.8%, 10.1% and 11.7% respectively). This supports what has been said above.
- In contrast with males, the O(f) and CM(f) are very close in all cases except Q 4.2 and Q4.3.
- Question 4.2 is the only one in this set referring to an IT career and not the chosen career. Hence the different pattern is understandable and probably predictable. Females from the two groups of majors appear to have different perceptions of Information Systems with many more (a difference of 8.9%) of the female CM students believing that it is people oriented. This is similar to the response difference between the two groups of male students to this question.
- Question 4.3 is surprising and has a big CM(m) vs O(m) difference as well as a big CM(f) vs O(f) difference. This is the only question where CM(f) is much lower than O(f). Balance between career and family seems both less expected and less important to CM students (both genders) than for the other students. Possibly the expectation that family would have to be sacrificed in a computer-related career persuades people that find this hard to accept not to embark on such a career.
- Question 4.5 has a very similar percentage of High responses for all four groups. This question is one of two that refer to family. It is interesting that the CM students are so much more in line with the other students in this question than in 4.3.

### 6.2 Perceptions of ICT students

| Students studying computer-related courses are: | Q5.2 **Hard working** | | Q5.3 **Interesting** | | Q5.4 **Enjoy socializing** | | Q5.5 **Enjoy being around other people** | |
|---|---|---|---|---|---|---|---|---|
| | CM | O | CM | O | CM | O | CM | O |
| female | 72.8% | 55.1% | 64.6% | 42.5% | 45.5% | 33.9% | 41.0% | 30.4% |
| male | 60.4% | 48.4% | 62.8% | 42.5% | 41.9% | 31.9% | 41.7% | 29.0% |
| Overall mean | 59.18% | | 53.10% | | 38.30% | | 35.53% | |

*Table 8: % of students who indicated High agreement regarding perceptions of ICT students*

- As would be predicted, CM students consistently agree far *more often than other students do* that other students studying computer-related courses as hard working, interesting, sociable and enjoy being around other people. These are perceptions and are highly subjective but may well influence a decision as to whether an individual chooses to join take computer courses and join this group of students.
- There is least agreement about how hard working computer students are. Since the “Other” group rated them less hard working than the CM group did it is unlikely that people are choosing “Other” majors because they think they are less work or easier.
- The largest disagreement between CM and other students is how interesting they are. There is some correlation between “your own interests” and “how interesting you find others”. This set of responses reinforces the general belief [see for example Lent and Brown 1994]) that interest is a primary motivator in choosing to study a topic. The fact that O students do not find computer-related topics interesting both reduced the likelihood of their taking a computer major *and* makes them less likely to find CM students interesting.

- Questions 5.4 and 5.5 are very similar and the High agreement results confirm one another. The view of CM students by all students is that they are not very people oriented either in a social context or more generally, possibly including wanting to work in teams.
- Across questions, whereas an average of nearly 60% of all the students (with O(m) being the least in agreement with 48.4%) thought CM students are hardworking, both CM and other students were far less in high agreement that they are interesting (53%) and even less in high agreement that they are people oriented (35% and 38%) (see overall means in Table 8). These last two results confirm the results for question 4.2 to some extent.

### 6.3 Career expectations

Table 9 lists the results for questions reflecting expectation of outcomes (and their importance when selecting a career).

| Question | | Rank O | Rank CM | Difference | Flexible/ secure |
|---|---|---|---|---|---|
| 8.1 | A flexible work schedule | 6 | 4 | -4.7 | f |
| 8.2 | Job security | 2 | 2 | +11.7 | s |
| 8.3 | Good prospects for a better than average starting salary | 3 | 2 | +6.7 | |
| 8.4 | Good prospects of obtaining a first job | 5 | 4 | +4 | |
| 8.5 | A good image / status in the chosen profession | 4 | 3 | +8.9 | |
| 8.6 | Opportunities to work overseas | 3 | 2 | +9.1 | f |
| 8.7 | Opportunities to work in different kinds of businesses | 1 | 1 | +7.4 | f |
| 8.8 | Good prospects for professional development | 1 | 2 | +16 | |
| 8.9 | Different tasks at different times (variety) | 5 | 3 | -3.1 | f |
| 8.10 | Good long-term salary prospects | 1 | 1 | +10.5 | |
| 8.11 | A stable career with fairly guaranteed employment no matter what the general economic climate | 4 | 5 | +20 | |
| 8.12 | Job satisfaction | 1 | 1 | +10 | |

*Table 9: Career expectations: % students who indicated High agreement*

Differences (CM vs O) were significant at $p < 0.05$ in nine cases with three having no significant difference, namely starting salary, prospects of getting a first job, and different tasks at different times. In only two cases did a higher percentage of CM than O students select High importance. The first was for a flexible work schedule (51.1% versus 46.5%) and the second for different tasks at different times (variety) (61.4% versus 58.3%)[2]. Although these variances are not large, they go against the trend. Hence, CM students rate a less constrained or regimented career (flexibility factors) more highly than the others. It is interesting that "opportunities to work in different kinds of businesses" and "opportunities to work overseas", both also related to variety and flexibility, do not show this difference. It can be surmised that the latter two questions relate more to context or macro issues, while the first two are more to do with the nature of the working day and of work.Regarding the other outcomes expectations, the two groups are largely motivated by the same factors but these were more pronounced in the O group. For example, good long term salary prospects was a primary (rank 1) issue for both groups, but 85.5% of O students gave a high score to this compared with 75% of CM students. Job satisfaction, good prospects for promotion and professional development, and opportunities to work in different kinds of businesses showed a more than a 10% positive difference (O felt more strongly about the importance) in all except the last.

[2] Already noted as found to be a not significant difference.

The largest variation in high scores is for: "A stable career with fairly guaranteed employment …". 68.4% of O considered this to be highly important whereas fewer than half (48.4%) of CM students saw this as highly important to career choice. This might indicate that CM student have a higher risk taking profile than others. This conclusion is possibly confirmed by the question with the second biggest difference ("Good prospects for promotion and professional development") (O 85% vs CM 69%). Job security has an 11% difference.

The questions regarding career outcomes expectations display interesting differences which might relate to different personal characteristics between the two groups (possibly group personality traits). A preliminary finding is that in terms of work content, rather than work environment, people choosing computer-related careers seek variety and possibly autonomy. They are rather less interested in security than others. If ranking of options[3] is used rather than percentage of group choosing the 'high' option, there is fairly close correspondence (the same or one place different) for all the outcomes other than for the two flexibility issues.

# 7 DISCUSSION

## 7.1 Work-related values

The work-related values questions discussed in Section 6.1 refer to people-oriented aspects rather than work style or conscientiousness. Consideration of other people is associated with the Agreeableness factor in the FFM and Feeling in MBTI (see Table 3). From the analysis, the CM(m) group can be seen to be distinct in terms of these values and, since it has consistently lower agreement with the questions posed, its members seem to be more on the Thinking extreme of MBTI T/F decision-making factor. The CM(f) group on the other hand is found generally to be more like the O students and could be categorised as Feeling since for all of these questions more than 70% of CM(f) selected a High agreement. This is in overall agreement with the research findings discussed in Section 2.4. Hofstede [1984] found clear indication that women's values differ less among societies than do men's values.

In terms of Hofstede's cultural dimensions, the Masculine dimension seems to match the values being discussed with more egoistic work goals apparent for CM(m). As noted previously, Hofstede's cultural dimensions were never meant to be used in this way and there is very little if any research which does this. Hence, this finding is only a tentative one. However literature on the personalities of ICT professionals, as discussed in Section 2.3, has linked them to higher levels of conscientiousness and lower levels of agreeableness and, as shown in **Error! Reference source not found.**, these are linked to the Masculinity dimension of culture. Our findings are, therefore, in line with this research. It is probably not coincidence that Hofstede named this dimension "Masculine" and that it is the male students that fit the high end of its scale. However, possibly less predictable is the link between a career choice and this dimension although low enrolment by female students into computer-related courses is frequently reported [Adya and Kayser 2005; Galpin et al. 2003; Johnson et al. 2008; Trauth et al. 2003].

Using FFM, we can relate the low level of agreement by CM(m) in this set of questions to lower levels of Agreeableness and conversely would expect males who are more altruistic to choose 'Other' majors rather more often than computer-related majors. This means that our findings in terms of CM(m) do not concur in this respect well with the Darcy and Ma [2005] who observed higher levels of Agreeableness. Since the CM(f) group seems to be more agreeable, we might risk being accused of

[3] In this case options were grouped as small differences were considered immaterial (see Table 7: % of groups of students who indicated High agreement with the questions on values ).

being sexist and use the findings of Sodiya et al.[2007] to recommend this group as being more likely to meet the requirements of the IS profession.

### 7.2 Perceptions of ICT students

These questions look at the personality traits of 'computer people' through the eyes of students, only some of whom are themselves intending on joining this career. The questions included aspects which can be related to the FFM factors, conscientiousness, openness (Interesting was interpreted in this way but this is open to debate) and extraversion. In all groups a minority are in High agreement that students studying computer-related courses are extraverted. This general perception is in agreement with reported studies and may be influenced by popular perceptions fed by these early reports.

The students are more in agreement that students studying computer-related courses are conscientious. Openness is possibly not really addressed well by the questions. Conscientiousness, as noted in the Literature Survey is commonly associated with, and is considered necessary for ICT professions. Hence, referring to **Error! Reference source not found.**, we can once again tentatively associate 'computer people' with a masculine culture but also with high Power Distance culture. In fact it is more generally reported that the generations since generation X and including people who use technology a lot, are loyal to their discipline rather than organisations and value keeping up with new technology very highly [Mondy et al. 2002: p. 251, 255]. This seems to indicate openness and would argue against high Power Distance.

### 7.3 Career expectations

The research findings in Section 6.3 raise the issues of autonomy, flexibility and security and imply that CM students embrace change and seek flexibility. This agrees with what general Human Resource Management theory predicts [Mondy et al. 2002: p. 251, p. 255]. These characteristics are particularly easy to associate with openness (FFM) and low Uncertainty Avoidance, possibly together with low Power Distance, in the cultural dimensions. Flat organisation structures (low Power Distance) are closely associated with new-paradigm organisations and technology companies are prime examples of these [Van Tonder 2004: p. 36]. However, in the literature openness is seen as being related to some extent to intuitiveness (see Table 3) and this is only associated sporadically with ICT people. There appears to be an anomaly here that indicates a limitation in using MBTI in exploring personal characteristics of ICT professionals and a surprising lack of information from FFM studies which do not appear to focus on openness. The desire by CM students for a career where they have relatively high autonomy contrasts strongly with the greater desire for security noted in the rest of the students.

### 7.4 General

The work-related questions on values and perceptions of ICT students (social psychological variables) came from the research by Beyer [2008] which was limited to MIS students. That paper compared CM(f) with O(f) and found that, "… on some variables female and male majors were more alike than female majors and female non-majors".

## 8 CONCLUSION

Our research has identified differences between students who intend majoring in a broad spectrum of computer-related courses and a variety of students of a similar age, at a similar point in their studies but who are not planning to major in a computer-related course. In addition, in some of our analyses we also looked at differences within the groups in terms of gender. We then related the findings to three theories in which the social psychological variables used could be linked to theories of personality and culture.

This is considered to have been an exploratory study and has several limitations. The various computer related disciplines were all pooled as a single data set. Beyer [2008] for example, cautions against this. The set of data relating to career expectations was not analysed by gender within major although the other two sets of questions were analysed using the additional dimension. The questions were not compiled specifically with the intention of using any one of the theories that we have referred to in this paper and hence there are gaps. Nevertheless some interesting results have been obtained that could stimulate further, more focussed research.

Gender differences have been reported extensively in ICT educational research and it is clear from our research as well that ICT males and females embarking on a career in ICT may have different personality types with the males being more likely to be described as Thinking and the females tending more to Feeling. According to the literature these can make valuable but contrasting contributions. Conscientiousness and hence a Judging type was associated with computer majors. Together this indicates that male computer majors contribute to a strongly Masculine career culture and since the number of females participating is fairly low it may predominate. Our results also agree substantially with earlier reports that computer majors tend to be Introverted. However preferences for new ideas and challenges, associated with Openness and Intuitiveness are also evident. Thus a profile is INTJ for males and INFJ for females seems to emerge. (However, since the career expectations were not analysed in terms of gender, the S/N factor needs further analysis.) The concept of a career culture for ICT-related careers and the use of Hofstede's cultural dimensions to describe it is attractive. Low Power Distance, low Uncertainty Avoidance, and high Masculinity are proposed as characteristics of the ICT career culture that this research has revealed.

We recommend that we capitalise on features of our discipline that attract computer majors, for example, highlighting autonomy even though a great deal of conscientiousness and self-discipline must is also required. The variety of careers, with different career profiles that might suit different students should also be emphasized so that a single, undifferentiated career culture does not dominate.

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