Creativity Among Information Technology Professionals in Thailand

Sunya Uthaivoravit

Information Technology Program, School of Science and Technology, Assumption University, Thailand
Corresponding author: sunyakeng@gmail.com

Abstract

This study examined creativity among IT professionals employed in organizations in Thailand. Using a theoretical basis for creativity derived from neuroscience and represented by 20 creative traits/abilities data was collected by questionnaire from samples of 187 IT Managers and 206 IT Officers. For each of the traits/abilities it is hypothesized that IT Managers consider it to be significantly important as a characteristic of IT Officers employed in the organizations and for the IT Officers it is hypothesized that each trait/ability is significantly evident in their behavior. The findings confirm that IT Managers consider these traits/abilities to be significantly important and that they are evident to a significant extent in the behaviors of IT Officers. In general these findings are supported for males and females in both groups. However, differences between males and females in both groups are described. Traits/abilities where the importance assigned by IT Managers is not matched by the behaviors of IT Officers are identified and are incorporated in a discussion of the practical implications of the findings and ideas for further studies.

Keywords: Information technology managers; Information technology officers; Creativity traits and abilities

Introduction

A world of globalized or borderless business consists of dynamic competitive circumstances. Consequently, to survive and succeed with suitable strategies and executions a sustainable competitive advantage is of great important in coping in these dynamic environments (Kamya et al., 2011). Competitive advantage consists of gaining preference over competitors among target customers by offering them greater and distinct value with finer efficiencies (Al-alak and Tarabieh, 2011). As shown in numerous studies in various fields of research innovation is the essential source and leverage for firms, industries, or even whole nations to bring about competitive advantage (Clarry, 1994; Weerawardena and Sullivan-mort, 2001; Tuominen and Hyvönen, 2004; Kamya et al., 2011; Gupta and Trusko, 2014). Many organizations have recognized the significant relationships among information (and communication) technology (IT), innovation, and competitive advantage and they have invested in IT in order to develop innovative strategies and executions to ensure the enhancement of competitive advantage (Chen and Tsou, 2007).

The emerging ASEAN Economic Community (AEC) has put pressure on Thailand, Thai organizations, and individuals to innovate in order to achieve sustainable competitive advantages in a borderless world with fierce competition. For Thailand's IT professionals innovation is a key issue for the nation's sustainable competitive advantage. Wongwuttiwat (2015) investigated the readiness of IT in Thailand for participation in the AEC and showed that with respect to IT development Thailand is lagging behind other AEC nations especially with respect to business innovation. The findings showed that for the overall aspects of innovation Thailand ranks in seventh position among the ten ASEAN member nations. Therefore, Thailand urgently needs real improvement in innovative capabilities and attaining the status of an innovation-driven economy must be promoted urgently as a top priority in national policies and programs.

Creativity is a significant prerequisite for innovation (Anderson et al., 2014; Gupta and Trusko, 2014; Sameen and Burhan, 2014). Novel and realistic ideas originated by an organization's members is the basic and

meaningful source of innovative practices which can bring about sustainable competitive advantage, wealth, and economic prosperity (Batey, 2012; Anderson et al., 2014). Consequently, creativity among IT professionals in Thailand represents a significant precursor for innovative capability which will then ensure the achievement of competitive advantage for organizations and ultimately for the whole nation.

Theoretical evidence shows that assessing creativity in individuals has been conducted using a variety of methodological bases with different philosophical underpinnings. Most investigations have been conducted in psychological, behavioral, sociological, or biographical studies. However, the advancement of technology in neuroimaging in the field of neuroscience has been effectively applied to uncover intricate insights into human brain functioning which enhances knowledge about ideational processes (Cacioppo et al., 2008). Creativity is one area that has benefited from the neuroscience approach to examining ideational patterns in the human brain. This study assesses creative thinking using traits/abilities derived by Carson (2010) from this neuroscience approach.

The study addresses four related research questions:

Research Question 1: Which personal traits and abilities have been identified as important indicators of an individual's creative thinking capability?

Research Question 2: In the context of the Information Technology profession in Thailand which of the personal traits and abilities identified in Question 1 are:

a) Considered by IT managers to be of significant importance among IT officers?

b) Evident to a significant extent among the behaviors of IT officers?

Research Question 3: How do the results for IT managers and IT officers in Question 2 compare?

Research Question 4: What are the theoretical and practical implications of the answers to Questions 1 - 3?

The article is structured in order as follows: related literature and research hypotheses are presented next; the research design and methodology

is described; data preparation and analysis; discussion of the results of data analysis; and finally the conclusion.

Related Literature and Research Hypotheses

The three terms creativity, imagination, and innovation are often confused and while there are differences among them they represent tools that are utilized together like tools in a toolbox designed to achieve a particular outcome (Christensen, 2015).

Imagination: The term imagination has its roots in the Latin verb for making pictures by oneself (Liang et al., 2012). Typically, imagination is defined in dictionaries as the ability to create mental images or conscious ideas that one has never met, seen, or experienced (Oxford Dictionary, 2014). In different fields of study, imagination has been defined in similar ways such as: the ability to envision a thing as it might not be; the consciousness of things that are not present to the senses; the ability that reproduces images or ideas originated from basic senses and reflected in one's consciousness as fantasies; and the ability to create fiction or fantasy with untruth in relation to reality (Johnson, 1991; Angell, 1906; Condon, 2014; Rudell, 2013; Egan and Judson, 2009). The various definitions of imagination refer to behaviors to imagine or create new mental pictures/images which may be invisible, not-present, and fanciful or absent from reality (Perkly, 1910; Liang et al., 2012).

Innovation: This term is derived from the Latin term innovare, which means renewing or making change (Vadrot, 2011). Dictionaries define innovation as a product/process that is newly introduced or is the latest (Oxford Dictionary, 2014). Innovation has been interpreted widely in different fields as: action to introduce a significant different idea; improvement of a procedure, method, or system structure with the final goal of strategic change, ultimate benefits, and competitiveness; the production of new factors or components in a new combination that can be included in new technologies, products, markets, organizations, processes, or material resources; and the ability to initiate and implement new methods, new management styles, or new products that can then generate results for efficiency (Tidd et al., 1997; Liao and Chuang, 2006; Yin and Wang, 2012; Lambooij and Hummel, 2013;

Toole et al., 2013; Perez-Luno et al., 2014; Xue et al., 2014). In addition, the results of innovation are normally used in practice, manipulated, implemented, or improved in order to achieve sustainable and successful results of superiority, competitiveness, or cost reduction (Gupta and Trusko, 2014).

Creativity: The term creativity has its roots in the Latin term creates which means to bring about, to produce, to conjure up, or to create (Latdict, 2014). Dictionaries typically define creativity as the mental state, innate force, or capability of ideation that can create novel and meaningful things with imagination or sophisticated bending of conventional rules (Oxford Dictionary, 2014). In many studies creativity is explained as the ability to create new surprising and useful: thoughts; conceptual ideas; skills, combinations; solutions; products/processes; performances; interpretations; ideas that are novel and valuable; changes or rearrangements and connections of knowledge to create novel and surprising ideas which others perceive as valuable and practical; and development of new fresh and relevant ideas to create what is original and useful (Plsek, 1997; West, 2002; Badran, 2007; Davis, 2009; Doan and Kennedy, 2009; Carson, 2010; Perry-Smith and Coff, 2011; Batey, 2012; Wang et al., 2012; Chamakiotis et al., 2013; Hahn et al., 2013; Horng et al., 2013; Bissola et al., 2014; Huang et al., 2014). Creativity involves four major related domains: idea creation that connects or rearranges innate knowledge or intuitive senses (Plsek, 1997; Badran, 2007; Horng et al., 2013); a novel, original, or never before realized idea (Kaufman and Sternberg, 2007; Carson, 2010; Horng et al., 2013); an idea that is widely accepted as useful or of good quality (Kaufman and Sternberg, 2007; Carson, 2010; Lee et al., 2014); and an idea that is fit, proper, or appropriate to a particular task or problem (Kaufman and Sternberg, 2007; Wang et al., 2012).

Many scholars have described relationships between imagination, creativity, and innovation. Creativity is typified as a process that emerges from imagination and imagination is the key source for creativity. Creativity involves an escape from rational or analytic thinking using the process of imagination and fantasy. Creativity is related to the balance of synthesis capability and imagination which is interpreted as a basis or driving force for an individual to cultivate potential thoughts called creativity (Johnston,

2009; Pelaprat and Cole, 2011; Fleer, 2012; Hsu et al., 2012; Wang et al., 2012). Many studies adopt the view that creativity refers to the creation of new and appropriate ideas or changes while innovation refers to the implemention of those creative ideas or changes. Consequently, creativity starts the process of innovation and is the foundation for innovation (Cheng and Chen, 2009; Doan and Kennedy, 2009; Im et al., 2013; Bissola et al., 2014). In summary, in agreement with Chapman (2012) and Letcher (2014) this study adopts the view that imagination is the key source for creative thinking capability. Creativity acts as a significant bridge in connecting imagination and innovation which in turn has the potential to lead to competitive advantage.

Carson (2010) notes that a human's creative brain is like a miracle supercomputer that has limitless, utmost, and incredible capability to make change for life or even change the world (Carson, 2010). In one's work life creativity is regarded as the inherent creative capability to generate fresh solutions or ways to change products, services, and processes for an organization's better achievements or "aha" moments (DeHaan, 2009). Creative ideas are the major constituents in innovative technology development and growth (Runco, 2010). Fillis and McAuley (2000) reported on a study done by Eugene Raudsepp where the focus was to explore the relationships between human competencies/characteristics and creative capability and to determine key common competencies among creative people who work in the computing industry. The results identified eleven competencies shown in Figure 1.

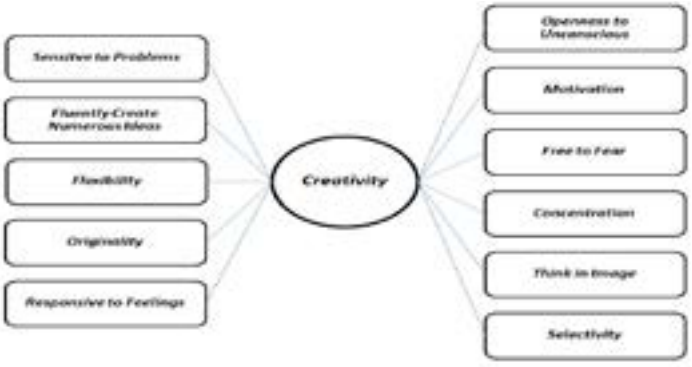

Figure 1 Key competencies of creative thinking

A study in the field of engineering found a combination of fifteen major characteristics shown in Table 1 among creative thinkers (Chen & Hsu, 2006). Table 1 also identifies for each characteristic previous studies which have examined the characteristic.

Table 1 Summary of 15 key characteristics of creative thinkers and related studies

Characteristics	**Related Studies**
Originality	Tardif and Sternberg, 1988 / Davis, 1992 / Chan and Chan, 1999
Imagination	Tardif and Sternberg, 1988 / Chan and Chan, 1999 / Diakidoy and Kanari, 1999 / Montgomery and Bull, 1993
Curiosity or Inquisitiveness	Tardif and Sternberg, 1988 / Davis, 1992 / Chan and Chan, 1999 / Montgomery and Bull, 1993
Novelty	Tardif and Sternberg, 1988 / Davis, 1992 / Montgomery and Bull, 1993
Intellectuality	Tardif and Sternberg, 1988 / Chan and Chan, 1999 / Diakidoy and Kanari, 1999
Aesthetic Taste (Artistic Sense)	Tardif and Sternberg, 1988 / Davis, 1992 / Chan and Chan, 1999 / Diakidoy and Kanari, 1999 / Montgomery and Bull, 1993
Risk Taking (Challenging)	Tardif and Sternberg, 1988 / Davis, 1992 / Chan and Chan, 1999
Less Conventional	Tardif and Sternberg, 1988 / Feist, 1999 / Chan and Chan, 1999
Flexibility	Tardif and Sternberg, 1988 / Feist, 1999 / Chan and Chan, 1999
Energetic	Davis, 1992 / Chan and Chan, 1999 / Montgomery and Bull, 1993
Open mindedness	Davis, 1992 / Chan and Chan, 1999 / Montgomery and Bull, 1993
Drive Accomplishment and Recognition	Tardif and Sternberg, 1988 / Feist, 1999 / Montgomery and Bull, 1993
Independence	Davis, 1992 / Feist, 1999 / Chan and Chan, 1999 / Diakidoy and Kanari, 1999 / Montgomery and Bull, 1993
Self-Confident	Tardif and Sternberg, 1988 / Feist, 1999 / Chan and Chan, 1999 / Diakidoy and Kanari, 1999 / Montgomery and Bull, 1993
Open to New Experience	Tardif and Sternberg, 1988 / Feist, 1999 / Montgomery and Bull, 1993

Neuroscience has been widely applied in examining creativity activation. In the nineteenth century neuroscientists conducted experiments on the human brain in order to examine correlations between brain activities and creative behaviors (Liu et al., 2015). These studies of the relationships between human creativity and the activities of the left and right cerebral hemispheres unveiled the notion of the creative activation process within the human brain. Since then much more has been discovered about neurobiology and brain functions related to the creative thinking process (Mandel, 2010). With advanced computational technologies in neuroimaging neuroscientists have been able to identify the activities in regions of the brain that are correlated with creative enhancement processing (Sawyer, 2011). Based on neuroscientific evidence of neural activation processes Carson (2010) has identified 20 key traits/abilities which indicate creative capability in an individual. These 20 traits/abilities are defined in Table 2.

Table 2 Definitions for traits/abilities

Trait/Ability	**Definition**
Novelty Attraction	The mental openness to explore things that are novel.
Suspended Judgment	Free to explore the world, memories, and ideas from multiple points of view withholding censorship and premature judgments regardless of the logic.
Cognitive Disinhibition	Information is not pre - categorize as irrelevant or dismissed and innate cognitive screening is abandoned so that more information flows into the state of conscious awareness.
Mental Imagination	The ability to think without words, by imagining, and with the visualization to create novel solutions.
Hypothetical Thinking	The ability to make guesses in the form of thoughts that might not be limited by any restriction in the real world.
Divergent Thinking	Fluency in developing numerous possible ways of thinking.
Unusual Association	The capability to make links or connections of ideas and information that are remarkably dissimilar or even unconformable.
Goal Enjoyment	Displaying a good mood in pursuing goals that generate creative tasks.
Thought Control	The ability to control and direct logical and deliberate thoughts.

Table 2 Definitions for traits/abilities (Continues)

Trait/Ability	Definition
Realism	The ability to have ideas which are realistic, practical, or workable.
Sequential Processing	The ability to display thinking patterns of the form of one-by-one, one thing at one time, or in a planned sequence.
Categorization	The ability to make judgments by filtering good ideas from poor or unworkable ideas.
Concentration	The ability to pay attention, especially concentrating on small details rather than the surrounding information in order to explore the pros and cons of diverse alternatives.
Impersonality	Not blaming or accusing generated ideas and not caring about criticism, evaluation, or ridiculousness from others about proposed solutions.
Self-conscious Thought	Self-investigation that allows comparing self-knowledge with the circumstances or other people.
Negative Feeling	The ability to use a negative feeling or depressive mood to do things in order to find release from a negative situation or unwanted state. The negative feeling can be in form of sadness, frustration, anxiety, dysfunction, melancholy, discomfort, troubled, angst, mental disorder or illness, psychosis, madness, insane, bizarre behavior, and eccentricity.
Dissatisfaction	The ability to look objectively for dissatisfaction, unhappiness, discontent, and annoyance with things that need to be or could be improved.
Being Expertise	The ability to possess and utilize the appropriate level and type of memorial or innate expertise.
Intrinsic Motivation	The ability to display creativity for an internal reward rather than an extrinsic reward.
Improvisation	The ability to display impulsive and extemporaneous responses.

The 20 traits/abilities in Table 2 proposed by Carson (2010) are used in this study because: these constructs were generalized from evidence in diverse fields of study; the traits/abilities were identified from studies of brain processes in human beings; from a neuroscience standpoint this approach is quite recent and its validity will be enhanced by application in

this study. Table 3 states each of the research hypotheses that are tested in this study. The first 20 relate to the opinions of IT Mangers about the importance of each of Carson's 20 traits/abilities as characteristics of IT Officers employed in organizations in Thailand. The next 20 are concerned with the extent to which each of Carson's traits/abilities are evident in the behaviors of these IT Officers.

Table 3 Research hypotheses

	Research Hypothesis
Related to IT Managers:	
M1	Novelty attraction is significantly important as a trait among IT officers employed in organizations in Thailand.
M2	Suspended judgment is significantly important as a trait among IT officers employed in organizations in Thailand.
M3	Cognitive disinhibition is significantly important as a trait among IT officers employed in organizations in Thailand.
M4	Mental imagination is significantly important as a trait among IT officers employed in organizations in Thailand.
M5	Hypothetical thinking is significantly important as a trait among IT officers employed in organizations in Thailand.
M6	Divergent thinking is significantly important as a trait among IT officers employed in organizations in Thailand.
M7	Unusual association is significantly important as a trait among IT officers employed in organizations in Thailand.
M8	Goal enjoyment is significantly important as a trait among IT officers employed in organizations in Thailand.
M9	Thought control is significantly important as a trait among IT officers employed in organizations in Thailand.
M10	Realism is significantly important as a trait among IT officers employed in organizations in Thailand.
M11	Sequential processing is significantly important as a trait among IT officers employed in organizations in Thailand.
M12	Categorization is significantly important as a trait among IT officers employed in organizations in Thailand.
M13	Concentration is significantly important as a trait among IT officers employed in organizations in Thailand.
M14	Impersonality is significantly important as a trait among IT officers employed in organizations in Thailand.
M15	Self-conscious thought is significantly important as a trait among IT officers employed in organizations in Thailand.
M16	Negative feeling is significantly important as a trait among IT officers employed in organizations in Thailand.

Table 3 Research hypotheses (Continues)

Related to IT Managers:	
M17	Dissatisfaction is significantly important as a trait among IT officers employed in organizations in Thailand.
M18	Being expertise is significantly important as a trait among IT officers employed in organizations in Thailand.
M19	Intrinsic motivation is significantly important as a trait among IT officers employed in organizations in Thailand.
M20	Improvisation is significantly important as a trait among IT officers employed in organizations in Thailand.
Related to IT Officers:	
O1	Novelty attraction is a significantly evident trait among IT officers employed in organizations in Thailand.
O2	Suspended judgment is a significantly evident trait among IT officers employed in organizations in Thailand.
O3	Cognitive disinhibition is a significantly evident trait among IT officers employed in organizations in Thailand.
O4	Mental imagination is a significantly evident trait among IT officers employed in organizations in Thailand.
O5	Hypothetical thinking is a significantly evident trait among IT officers employed in organizations in Thailand.
O6	Divergent thinking is a significantly evident trait among IT officers employed in organizations in Thailand.
O7	Unusual association is a significantly evident trait among IT officers employed in organizations in Thailand.
O8	Goal enjoyment is a significantly evident trait among IT officers employed in organizations in Thailand.
O9	Thought control is a significantly evident trait among IT officers employed in organizations in Thailand.
O10	Realism is a significantly evident trait among IT officers employed in organizations in Thailand.
O11	Sequential processing is a significantly evident trait among IT officers employed in organizations in Thailand.
O12	Categorization is a significantly evident trait among IT officers employed in organizations in Thailand.
O13	Concentration is a significantly evident trait among IT officers employed in organizations in Thailand.
O14	Impersonality is a significantly evident trait among IT officers employed in organizations in Thailand.
O15	Self-conscious thought is a significantly evident trait among IT officers employed in organizations in Thailand.
O16	Negative feeling is a significantly evident trait among IT officers employed in organizations in Thailand.

Table 3 Research hypotheses (Continues)

Related to IT Officers:	
O17	Dissatisfaction is a significantly evident trait among IT officers employed in organizations in Thailand
O18	Being expertise is a significantly evident trait among IT officers employed in organizations in Thailand.
O19	Intrinsic motivation is a significantly evident trait among IT officers employed in organizations in Thailand.
O20	Improvisation is a significantly evident trait among IT officers employed in organizations in Thailand.

Research Design and Methodology

The study uses a field study approach which is partly basic and applied, mainly exploratory, and cross-sectional in time. Quantitative techniques are used for data preparation, analyses, and hypothesis testing. The study appears to be the first of this kind conducted in the context of the IT profession in Thailand. The overall design and conduct of the study follows the guidance provided in Neuman (2011).

Data were collected using self-administered questionnaires with two target populations: IT Managers and IT Officers employed in organizations in Thailand. The questionnaires were prepared in the Thai and English languages and were reviewed by a focus group of five representatives from each target population. The Thai language versions of the questionnaires were administered as pilot studies with ten participants from the target populations and modifications were made before the Thai language versions were used in the full study. A notated final English language version of the questionnaires is included in Appendix A1. Section 1 of each questionnaire collected information about the personal characteristics of the respondents. Section 2 for IT Managers asked how important it is for an IT Officer to have the 20 creativity traits/abilities. Section 2 for IT Officers asked the extent to which they displayed the behaviors associated with the traits/abilities.

The size of these target populations was not able to be determined exactly from official sources. Estimates based on information from the

National IT Committee Secretariat in Thailand were used: 7,000 for IT Managers (strategists and project managers); and 45,000 for IT Officers (software developer (programmer, analyst), system administrator, specialist (database, security, quality assurance, distributed system specialist), and webmaster/graphic designer). Based on these estimates using a 95 percent confidence level and a precision of 7 percent the minimum sample sizes for IT Managers and IT Officers was 200 (Israel, 2013).

Participants were selected through organizations using sampling frames available from the Thailand Company Information (2006-2007), Organizations Database (ICT Ministry), E-Directory and E-Commerce Registration (Department of Business Development Database, Ministry of Commerce), the Association of the Thai ICT Industry (ATCI), as well as the researcher's personal contacts. After two months 212 questionnaires from IT Managers and 218 from IT Officers were returned.

Data Preparation and Analyses

The data from questionnaires was entered into an SPSS worksheet and 10 percent were selected randomly (21 for IT Managers and 22 for IT Officers) and checked for data entry errors. No errors were found. However, 25 questionnaires from IT Managers and 12 from IT Officers contained an outlier value for at least one of the variables measured. These were removed from the samples leaving 187 for IT Managers and 206 for IT Officers.

Analyses of the personal characteristics in section 1 in each questionnaire showed that 68 percent of both groups were male. Fifty three percent of IT Managers hold a master degree and 73 percent of IT Officers hold a bachelor degree as their highest level of education. The average age is 38 years for IT Managers and 33 years for IT Officers but the majority of IT Officers (90 percent) and IT managers (67 percent) is in age range of 21 – 40 years. On average IT Managers have 13 years of experience in IT related positions compared to 9 years for IT Officers and both groups have been in their current positions for about 7 years. Thirty five percent of IT Officers work as Software Developers (programmers and analysts) or as

System Administrators (32 percent). It was seen that the sample of IT Managers and IT Officers are sufficiently mature, experienced, and educated to provide valid and reliable responses to the questionnaire items.

Descriptive statistics for the traits/abilities are displayed in Appendix Table A1 for all IT Managers and Officers and for male and female IT Managers and Officers. The magnitudes of skewness and kurtosis are less than twice the values of their respective standard errors and satisfy the conditions for the statistical techniques used for analyses. For IT Managers and Officers the mean values were used to rank the traits/abilities from position 1 (i.e. the most important trait/ability of IT Officers according to IT Managers and the most evident trait/ability in the behavior of IT Officers) to position 20 (i.e. the least important trait/ability of IT Officers according to IT Managers and the least evident trait/ability in the behavior of IT Officers). The distributions of the ranks are divided into the top, middle, and bottom third described as types of ranks with High (H) for rank positions 1-7, Medium (M) for rank positions 8-13, and Low (L) for rank positions 14-20. The data analyses consider both the *absolute* measures of traits/abilities characterized by means and standard deviations as well as their *relative* measures characterized by ranks and types of ranks.

T-tests were used to identify significant differences between the mean values for the traits/abilities and the neutral value of 4 which represents Neither Important or Unimportant for responses from IT Managers and Neither Agree or Disagree for responses from IT Officers. The results showed that the mean values for all 20 traits/abilities for IT Managers and IT Officers were significantly greater than 4 ($p < 0.001$) and the same is true for both groups of males and females.

T-tests were used to identify significant differences between the mean values for personal characteristics of IT Managers and IT Officers as well as for the mean values they assigned to the 20 traits/abilities. On average at a level of significance of 0.001 or less IT Managers: are significantly older than IT Officers (38 years compared to 33 years); have significantly higher

levels of education compared to IT Officers; and have significantly more years of work experience than IT Officers (13 years compared to 9 years). Among the 20 traits/abilities the mean values assigned by IT Managers are significantly greater than the mean values assigned by IT Officers ($p < 0.05$) with the exceptions of four traits/abilities: Mental Imagination and Dissatisfaction where there is no significant difference between the mean values for IT Managers and IT Officers at a level of 0.05 or less; and Goal Enjoyment and Negative Feeling where the means for IT Managers are significantly less than the means for IT Officers ($p < 0.05$).

T-tests were used to identify significant differences between the mean values for characteristics of male and female IT Managers as well as for the mean values they assigned to the 20 traits/abilities. This analysis was repeated for male and female IT Officers. On average, compared to females the male IT Managers have a significantly greater period of IT related work experience (14 years for males and 11 years for females) and they place significantly more importance on the three traits/abilities Novelty Attraction, Divergent Thinking, and Intrinsic Motivation as important characteristics of IT Officers ($p < 0.05$). On average male IT Officers are significantly older than female IT Officers (34 years for males and 32 years for females) and they exhibit behaviors associated with the three abilities/traits Thought Control, Sequential Processing, and Being Expertise to a significantly greater extent than female IT Officers ($p < 0.05$).

Significant associations between the values assigned to the 20 traits/abilities by IT Managers and IT Officers were identified using Chi-Square. The same analysis was done for the values assigned to the traits/abilities by male and female IT Managers as well as by male and female IT Officers. The statistically significant associations are displayed and described in Table 4 ($p < 0.05$).

Table 4 Significant associations between the values of traits/abilities assigned by IT Managers and IT Officers

Comparison	Significant Association	Trait/Ability
IT Managers and IT Officers	High values of these traits/abilities are more likely for IT Managers than for IT Officers and low values of these traits/abilities are more likely for IT Officers than for IT Managers.	Novelty Attraction, Suspended Judgment, Cognitive Disinhibition, Divergent Thinking, Unusual Associations, Thought Control, Realism, Categorization, Concentration, Impersonality, Self-conscious Thought, Being Expertise, Improvisation.
	A low value of this trait/ability is more likely for IT Managers than for IT Officers and a high value of this trait/ability is more likely for IT Officers than for IT Managers.	Goal Enjoyment.
Male IT Managers and female IT Managers	High values of these traits/abilities are more likely for male IT Managers than for female IT Managers and low values of these traits/abilities are more likely for female IT Managers than for male IT Managers.	Novelty Attraction, Divergent Thinking, Intrinsic Motivation.
Male IT Officers and female IT Officers	High values of these traits/abilities are more likely for male IT Officers than for female IT Officers and low values of these traits/abilities are more likely for female IT Officers than for male IT Officers.	Intrinsic Motivation, Hypothetical Thinking, Realism.

Correlations among four personal characteristics (Age, Level of Education, Years of IT Work Experience, and Years in Current Position) and the 20 traits/abilities are displayed in Appendix Table A2 separately for IT Managers and Officers and for males and females in both groups. The correlations among the 20 traits/abilities are not shown in Table A2 but they were positive and statistically significant ($p < 0.05$).

Kendall's tau was used to compare the rankings of the 20 traits/abilities. The results are displayed in Table 5.

Table 5 Comparison of the rankings of traits/abilities

Groups Compared	Kendall's Tau	Level of Statistical Significance
IT Managers and IT Officers	0.706	0.01
Male IT Managers and Female IT Managers	0.716	0.01
Male IT Officers and Female IT Officers	0.735	0.01

From Table 5 it is seen that there is statistically significant agreement ($p < 0.01$) between the rankings of the traits/abilities by IT Managers and IT Officers as well as between the rankings by males and females in each group. These agreements are displayed Table 6 in terms of the types of ranks (high, medium, and low) associated with the individual traits/abilities.

Table 6 Comparison of the types of ranks

Groups Compared		**IT Managers**		
IT Managers and IT Officers		*High*	*Medium*	*Low*
IT Officers	*High*	Novelty Attraction, Divergent Thinking, Thought Control, Realism, Categorization, Being Expertise	Goal Enjoyment	*Nil*
	Medium	Improvisation	Suspended Judgment, Sequential Processing, Concentration, Intrinsic Motivation	Mental Imagination
	Low	*Nil*	Hypothetical Thinking	Cognitive Disinhibition, Unusual Associations, Impersonality, Self-conscious Thought, Negative Feeling, Dissatisfaction

Table 6 Comparison of the types of ranks (Continues)

Groups Compared		**IT Managers**		
Male and Female IT Managers		Male IT Managers		
Female IT Managers	*High*	Novelty Attraction, Divergent Thinking, Thought Control, Realism, Categorization, Being Expertise	Improvisation	*Nil*
	Medium	Intrinsic Motivation	Suspended Judgment, Goal Enjoyment Sequential Processing, Concentration,	Cognitive Disinhibition
	Low	*Nil*	Hypothetical Thinking	Mental Imagination, Unusual Associations, Impersonality, Self-conscious Thought, Negative Feeling, Dissatisfaction
Male and Female IT Managers		Male IT Managers		
Female IT Officers	*High*	Novelty Attraction, Divergent Thinking, Goal Enjoyment, Realism, Categorization, Being Expertise	Concentration	*Nil*
	Medium	Thought Control,	Suspended Judgment, Sequential Processing, Intrinsic Motivation, Improvisation	Cognitive Disinhibition
	Low	*Nil*	Mental Imagination	Hypothetical Thinking , Unusual Associations, Impersonality, Self-conscious Thought, Negative Feeling, Dissatisfaction

Discussion

The IT Managers and Officers displayed personal and work related characteristics which are typical of IT Managers and Officers employed in organizations in Thailand and identified them as experienced, mature, and well educated study participants able to provide valid and reliable responses to the questionnaire items. As expected, there are significant differences between IT Managers and IT Officers. On average, IT Managers are significantly older than IT Officers (38 years compared to 33 years) and they have significantly more years of IT work experience (13 years compared to 9 years). The highest level of education among the majority of IT Managers is a master degree and among IT Officers it is a bachelor degree. Both groups have been in their current positions for about 7 years and the majority of IT Officers (66 percent) is working as either a software developer (34 percent) or a system administrator (32 percent).

IT Managers

All of the IT Managers and the males and females separately consider each of the 20 traits/abilities to be significantly important characteristics of IT Officers in organizations. Consequently, the findings support each of the 20 research hypotheses for IT Managers (M1 - M20) described in Table 3.

On average, the male IT Managers have a significantly longer period of IT work experience than female IT Managers (14 years compared to 11 years). Male IT Managers place significantly more importance than the female IT Managers on the three traits/abilities:

Novelty Attraction (i.e. *the mental openness to explore things that are novel*);

Divergent Thinking (i.e. *fluency in developing numerous possible ways of thinking*);

Intrinsic Motivation (i.e. *the ability to display creativity for an internal reward rather than an extrinsic reward*).

These differences between male and female IT Managers were confirmed by the results of analyzing the associations between the gender of IT Managers and the importance of the 20 traits/abilities. The different

emphases may be entirely due to gender difference but in part they may be explained by the greater period of IT work experience for the males compared to the females which has strengthened the male IT Managers' opinions about the importance of these three traits/abilities.

There are significant positive correlations among almost all of the 20 traits/abilities for the group of all IT Managers and separately for the male and female IT Managers. This is not surprising considering that although each trait/ability is measuring a characteristic behavior of a creative individual that behavior is not expected to independent of behaviors associated with the other creative traits/abilities.

For all IT Managers and separately for the males and females the older managers have longer periods of IT work experience in their previous and current positions and those with more previous IT work experience have been in their current positions for longer periods of time. Interestingly, IT Managers with higher levels of education have been in their current positions for shorter periods of time which reflects a requirement for the more recently appointed IT Managers to have higher levels of formal education (e.g. master and doctoral degrees) compared to those appointed previously.

Based on the significant correlations between the personal characteristics of the IT Managers and the 20 traits/abilities it is seen that for:

IT Work Experience: IT Managers with longer periods of IT work experience place high importance on the three traits/abilities:

Novelty Attraction (i.e. *the mental openness to explore things that are novel*);

Thought Control (i.e. *the ability to control and direct logical and deliberate thoughts*);

Intrinsic Motivation (i.e. *the ability to display creativity for an internal reward rather than an extrinsic reward*) and low importance on Improvisation (i.e. *the ability to display impulsive and extemporaneous responses*).

However, these significant correlations were not found among the female IT Managers where instead greater amounts of previous IT work experience is associated with higher levels of importance for the two traits/abilities:

Realism (i.e. *the ability to have ideas which are realistic, practical, or workable*)

Categorization (i.e. *the ability to make judgments by filtering good ideas from poor or unworkable ideas*)

while for male IT Managers greater amounts of IT work experience is associated with a high level of importance for Thought Control (i.e. the ability to control and direct logical and deliberate thoughts).

Age: Older IT Managers express a high level of importance for Thought Control (i.e. *the ability to control and direct logical and deliberate thoughts*) but this is not true for either the male or female IT Managers. Instead, older female managers place high levels of importance on the two traits/abilities:

Realism (i.e. *the ability to have ideas which are realistic, practical, or workable*);

Sequential Processing (i.e. *the ability to display thinking patterns of the form of one-by-one, one thing at one time, or in a planned sequence*) while for the males there are no significant correlations between managers' ages and the levels of importance of any of the 20 traits/abilities.

Level of Education: IT Managers with high levels of education place high importance on Self-conscious Thought (i.e. self-investigation that allows comparing self-knowledge with the circumstances or other people) but this is not true for either males or females separately. Instead, the females with high levels of education indicate high importance for two traits/abilities:

Mental Imagination (i.e. *the ability to think without words, by imagining, and with the visualization to create novel solutions*);

Divergent Thinking (i.e. *fluency in developing numerous possible ways of thinking*)

while for the males there are no significant correlations between their level of education and the importance of any of the 20 traits/abilities.

Time in Current Position: The more experience female IT Managers have in their current position the less importance they place on Improvisation

(i.e. *the ability to display impulsive and extemporaneous responses*). However, this significant correlation does not hold for either male IT Managers or for the whole group of IT Managers.

When considering the findings concerned with relative importance of the traits/abilities (i.e. ranks and types of ranks) it is noted that even though a trait/ability may be ranked low in position 20 as the least important among the 20 traits/abilities it still has a significant level importance. According to the IT Managers the most important traits/abilities ranked highly (i.e. in the top third of the distribution of ranks) are:

Novelty Attraction (i.e. *the mental openness to explore things that are novel*);

Divergent Thinking (i.e. *fluency in developing numerous possible ways of thinking*);

Thought Control (i.e. *the ability to control and direct logical and deliberate thought*s);

Realism (i.e. *the ability to have ideas which are realistic, practical, or workable*);

Categorization (i.e. *the ability to make judgments by filtering good ideas from poor or unworkable ideas*);

Being Expertise (i.e. *the ability to possess and utilize the appropriate level and type of memorial or innate expertise*).

Improvisation (i.e. *the ability to display impulsive and extemporaneous responses*).

There is significant agreement between the rankings by male and female IT Managers. In particular, the seven traits/abilities above that are ranked highly by the whole group of IT Managers were also ranked highly by the male and female IT Managers separately except that males included Intrinsic Motivation (i.e. *the ability to display creativity for an internal reward rather than an extrinsic reward*) instead of Improvisation (i.e. *the ability to display impulsive and extemporaneous responses*). The strong level of agreement between male and female rankings is not surprising considering the very few differences between male and female IT Managers in the absolute measures of the importance of the 20 traits/abilities.

IT Officers

All the IT Officers and the males and females separately display the behaviors associated with each of the 20 traits/abilities to a significant extent. Consequently, the findings support each of the 20 research hypotheses for IT Officers (O1 - O20) described in Table 3.

On average male IT Officers are significantly older than female IT Officers (34 years compared to 32 years) and they exhibit to a significantly greater extent behaviors associated with the three abilities/traits:

Thought Control (i.e. *the ability to control and direct logical and deliberate thoughts*);

Sequential Processing (i.e. *the ability to display thinking patterns of the form of one-by-one, one thing at one time, or in a planned sequence*);

Being Expertise (i.e. *the ability to possess and utilize the appropriate level and type of memorial or innate expertise*).

Also, from the analysis of associations between the gender of IT Officers and the extent to which they display the behaviors associated with the 20 traits/abilities it is evident that male IT Officers are significantly more likely than female IT Officers to display the three traits/abilities:

Intrinsic Motivation (i.e. *the ability to display creativity for an internal reward rather than an extrinsic reward*);

Hypothetical Thinking (i.e. *the ability to make guesses in the form of thoughts that might not be limited by any restriction in the real world*);

Realism (i.e. *the ability to have ideas which are realistic, practical, or workable*).

These significant differences may be due to gender difference alone but they may also reflect the older age of the male IT Officers who have had more opportunity than the younger female IT Officers to develop behaviors associated with these six traits/abilities.

As noted for IT Managers, there are significant positive correlations among almost all of the 20 traits/abilities for the group of all IT Officers and separately for the male and female IT Officers. For all IT Officers there are significant positive correlations among all of the personal characteristics (age, level of education, years of IT work experience, and years in current

position). The same is true for the female IT Officers and also, with some exceptions, for the male IT Officers where: there is no significant correlation between age and level of education or between level of education and years of IT work experience. The male IT Officers with higher levels of education have not been in IT Officer positions for long periods of time but the opposite is true for female IT Officers. This might mean that males with higher levels of education are more likely than females with the same levels of education to be promoted beyond the level of IT Officer or move to other employment.

Based on the significant correlations between the personal characteristics of the IT Officers and the 20 traits/abilities it is seen that for:

Age: Older IT Officers are highly likely to exhibit three traits/abilities:

Divergent Thinking (i.e. fluency in developing numerous possible ways of thinking);

Thought Control (i.e. *the ability to control and direct logical and deliberate thoughts*);

Realism (i.e. *the ability to have ideas which are realistic, practical, or workable*).

For males the only trait/ability that is significant positively correlated with their age is Divergent Thinking (i.e. fluency in developing numerous possible ways of thinking) while for females age is significantly positively correlated with:

Thought Control (i.e. *the ability to control and direct logical and deliberate thoughts*);

Cognitive Disinhibition (i.e. *information is not pre-categorize as irrelevant or dismissed and innate cognitive screening is abandoned so that more information flows into the state of conscious awareness*).

Level of Education: IT Officers with higher levels of education strongly display three traits/abilities:

Cognitive Disinhibition (i.e. *information is not pre-categorize as irrelevant or dismissed and innate cognitive screening is abandoned so that more information flows into the state of conscious awareness*);

Divergent Thinking (i.e. *fluency in developing numerous possible ways of thinking*);

Improvisation (i.e. *the ability to display impulsive and extemporaneous responses*).

Separately, females with higher levels of education strongly exhibit Cognitive Disinhibition (i.e. *information is not pre-categorize as irrelevant or dismissed and innate cognitive screening is abandoned so that more information flows into the state of conscious awareness*)

while males strongly exhibit:

Divergent Thinking (i.e. *fluency in developing numerous possible ways of thinking*);

Goal Enjoyment (i.e. *displaying a good mood in pursuing goals that generate creative tasks*).

IT Work Experience: IT Officers with longer periods of IT work experience strongly display 10 of the 20 traits/abilities (Novelty Attraction, Suspended Judgment, Divergent Thinking, Unusual Associations, Thought Control, Realism, Sequential Processing, Categorization, Concentration, and Being Expertise). For male IT Officers seven of these same 10 traits/abilities have a significant positive correlation with the period of IT work experience (Novelty Attraction, Suspended Judgment, Divergent Thinking, Unusual Associations, Categorization, Concentration, and Being Expertise). For female IT Officers significant positive correlations with the period of IT work experience involve four traits/abilities (Cognitive Disinhibition, Divergent Thinking, Thought Control, and Sequential Processing). It is evident that accumulated IT work experience leads to the development of many creative traits/abilities among the IT Officers.

Years in Current Position: IT Officers with longer periods of experience in their current position strongly display eight of the 20 traits/abilities (Suspended Judgment, Hypothetical Thinking, Divergent Thinking, Unusual Associations, Thought Control, Categorization, Concentration, and Being Expertise). For male IT Officers three of these same eight traits/

abilities have a significant positive correlation with their period of experience in their current position (Hypothetical Thinking, Divergent Thinking, and Categorization). For female IT Officers significant positive correlations with their period of experience in their current position involve five traits/abilities (Suspended Judgment, Cognitive Disinhibition, Divergent Thinking, Thought Control, and Improvisation).

The findings for years of IT work experience and years of experience in current position together emphasize that work experience plays an important role in determining the abilities/traits which will be most evident in the behaviors of IT Officers.

When the rankings of the traits/abilities by IT Officers are considered it must be remembered that even though a trait/ability may be ranked in position 20 (i.e. it is the trait/ability displayed to the least extent) it is still a trait/ability that is significantly evident in the behaviors of IT Officers. The seven traits/abilities ranked as the most evident among IT Officers (i.e. highly ranked in the top third of the distribution of ranks) are:

Novelty Attraction (i.e. *the mental openness to explore things that are novel*);

Divergent Thinking (i.e. *fluency in developing numerous possible ways of thinking*);

Thought Control (i.e. *the ability to control and direct logical and deliberate thoughts*);

Realism (i.e. *the ability to have ideas which are realistic, practical, or workable*);

Categorization (i.e. *the ability to make judgments by filtering good ideas from poor or unworkable ideas*);

Being Expertise (i.e. *the ability to possess and utilize the appropriate level and type of memorial or innate expertise*);

Goal Enjoyment (i.e. *displaying a good mood in pursuing goals that generate creative tasks*).

There is significant agreement between the rankings of the 20 traits/abilities by male and female IT Officers. In particular, among the seven traits/abilities above that were ranked highly by the whole group of IT Officers

six (Novelty Attraction, Divergent Thinking, Goal Enjoyment, Realism, Categorization, and Being Expertise) were ranked highly for both the male and female IT Officers separately. In addition, Thought Control (i.e. the ability to control and direct logical and deliberate thoughts) was included among the highly ranked traits/abilities by male IT Officers and Concentration (i.e. the ability to pay attention, especially concentrating on small details rather than the surrounding information in order to explore the pros and cons of diverse alternatives) was included by female IT Managers. The strong level of agreement between the rankings for males and females is not surprising considering the very few differences found between the absolute measures of the extent to which the 20 traits/abilities are displayed by these two groups.

Comparisons between IT Managers and IT Officers

For 16 of the 20 traits/abilities the mean level of importance assigned by IT Managers is significantly greater than the mean value of the extent to which the trait/ability is displayed by IT Officers with only four exceptions:

Mental Imagination (i.e. *the ability to think without words, by imagining, and with the visualization to create novel solutions*) and Dissatisfaction (i.e. *the ability to look objectively for dissatisfaction, unhappiness, discontent, and annoyance with things that need to be or could be improved*) where there is no significant difference between the mean values for IT Managers and IT Officers;

Goal Enjoyment (i.e. *displaying a good mood in pursuing goals that generate creative tasks*) and Negative Feeling (i.e. *the ability to use a negative feeling or depressive mood to do things in order to find release from a negative situation or unwanted state*) where the means for IT Managers are significantly less than the means for IT Officers.

These exceptions which are based on considering significant differences between mean values suggest that the expectations of IT Managers are being met or exceeded by the behaviors displayed by IT Officers in relation to these four traits/abilities. However, with respect to the other 16 traits/abilities the suggestion is that the expectations of IT Managers may not be satisfied by the behaviors displayed by the IT Officers even though

the IT Officers are displaying those traits/abilities to a significant extent.

Considering associations between the level of importance of the traits/abilities according to IT Managers and the extent to which the traits/abilities are displayed by IT Officers it was found that the associations are significant for 14 of the 20 traits/abilities (Novelty Attraction, Suspended Judgment, Cognitive Disinhibition, Divergent Thinking, Unusual Associations, Thought Control, Realism, Categorization, Concentration, Impersonality, Self-conscious Thought, Being Expertise, Improvisation, and Goal Enjoyment). Among these 14 traits/abilities with the exception of Goal Enjoyment the suggestion is that the expectations of IT Managers are not being satisfied by the behaviors of the IT Officers but for Goal Enjoyment the IT Managers expectations are being exceeded by the behavior of the IT Officers.

Combining the findings based on mean values with those based on associations it is suggested that for 13 traits/abilities (Novelty Attraction, Suspended Judgment, Cognitive Disinhibition, Divergent Thinking, Unusual Associations, Thought Control, Realism, Categorization, Concentration, Impersonality, Self-conscious Thought, Being Expertise, and Improvisation) there is reason to believe that the expectations of IT Managers is not being satisfied by the behaviors of IT Officers but for the remaining seven traits/abilities the expectations of IT Managers being satisfied (Mental Imagination, Hypothetical Thinking, Sequential Processing, Dissatisfaction, and Intrinsic Motivation) or exceeded (Goal Enjoyment and Negative Feeling) by the behaviors of IT Officers.

There is significant agreement between the rankings of the traits/abilities in terms of their importance by IT Managers and the extent to which they are evident among IT Officers. In particular, six traits/abilities are highly ranked for both IT Managers and IT Officers:

Novelty Attraction (i.e. *the mental openness to explore things that are novel*);

Divergent Thinking (i.e. *fluency in developing numerous possible ways of thinking*);

Thought Control (i.e. *the ability to control and direct logical and deliberate thoughts*);

Realism (i.e. *the ability to have ideas which are realistic, practical, or workable*);

Categorization (i.e. *the ability to make judgments by filtering good ideas from poor or unworkable ideas*);

Being Expertise (i.e. *the ability to possess and utilize the appropriate level and type of memorial or innate expertise*).

In addition, Goal Enjoyment (i.e. displaying a good mood in pursuing goals that generate creative tasks) is a highly ranked trait/ability among IT Officers and Improvisation (i.e. the ability to display impulsive and extemporaneous responses) is highly important to IT Managers.

Conclusion

The findings for the study are discussed in full detail in the preceding section. The purpose here is to highlight and summarize the findings directly related to the research questions set for the study.

The samples of IT Managers and IT Officers displayed personal and work related characteristics which are typical of IT professionals employed in organizations in Thailand. For both groups most of the personal characteristics (age, level of education, IT work experience, and years in their current position) were positively correlated with each other and with the 20 traits/abilities associated with creative thinking. In particular, it is evident among the IT Officers that as they accumulate greater amounts of work experience the more likely it is that they will display many of the creative traits/abilities to a significant extent.

Research Question 1: Which personal traits and abilities have been identified as important indicators of an individual's creative thinking capability?

From the review of the literature it was decided to use the 20 traits/abilities for creativity proposed by Carson (2010). This selection was motivated by the strong neurological evidence and theory from which Carson derived the 20 traits/abilities and it is evident that these traits/abilities have captured successfully the concept of creative thinking.

Research Question 2: In the context of the Information Technology profession in Thailand which of the personal traits and abilities identified in Question 1 are:

a) Considered by IT managers to be of significant importance among IT officers?

b) Evident to a significant extent among the behaviors of IT officers?

For the IT Managers all of the 20 traits/abilities were considered to be of significant importance as characteristics of IT Officers employed in their organizations in Thailand. For the IT Officers each of the 20 traits/abilities was evident in their behavior to a significant extent. These findings applied to male and female IT Managers and Officers.

Research Question 3: How do the results for IT managers and IT officers in Question 2 compare?

The rankings of the traits/abilities according to IT Managers and Officers from position 1 (i.e. most important according to IT Managers or most evident in the behaviors of IT Officers) to position 20 there was significant agreement between the rankings by IT Managers and IT Officers and the same was true among the male and female IT Managers and the male and female IT Officers. In particular, the highly ranked traits/abilities for IT Managers and Officers are: Novelty Attraction; Divergent Thinking; Thought Control; Realism; Categorization; and Being Expertise with Goal Enjoyment included by IT Officers and Improvisation included by IT Managers. The close agreement between the rankings by the two groups also applied to the traits/abilities ranked as medium and low. The same significantly levels of agreement applied to male and female IT Managers and Officers.

There were significant correlations among most of the personal characteristics (age, level of education, IT work experience, and years in their current position) for IT managers and Officers and for male and female IT Managers and Officers. For all these groups almost all of the traits/abilities were significantly positively correlated and certainly do not represent independent aspects of creative behavior.

Analyses of means and associations suggested that the expectations of IT Managers about the importance of the traits/abilities as characteristics

of IT Officers were matched by the behaviors of IT Officers in the cases of Mental Imagination, Hypothetical Thinking, Sequential Processing, Dissatisfaction, and Intrinsic Motivation and exceeded in the cases of Goal Enjoyment and Negative Feeling. However, for each of the other 13 traits/abilities the suggestion is that IT Officers need to improve these behaviors in order to meet the expectations of the IT Managers.

Research Question 4: What are the theoretical and practical implications of the answers to Questions 1 - 3?

From a theoretical perspective the study has shown that the 20 traits/abilities derived from neurological evidence associated with creative thinking have provided a sound theoretical basis for the purpose of exploring creative thinking among IT professionals employed in organizations in Thailand from two perspectives: the absolute and relative importance of creative traits/abilities among IT Officers according to senior IT Managers; and the absolute and relative extent to which those creative traits/abilities are evident in the behaviors of IT Officers.

From a practical perspective creativity is a precondition of innovation, and innovation is a critical concern in raising Thailand's position within the ASEAN Economic Community related to its readiness with respect to ICT and business competitiveness (Wongwuttiwat, 2015). It is expected that the findings of this study enhance an understanding of the level of creativity among IT professionals employed in organizations in Thailand and in particular the extent to which the creative behaviors of IT Officers on the 20 traits/abilities compare with the expectations of IT Managers in those organizations. There are very few studies of creativity conducted in Thailand and none were found that addressed the research questions of this study.

It is recommended that these traits/abilities be examined among potential new IT staff appointments and especially when determining the type of education and training that will be made available to existing IT staff. Educators involved in the preparation and continuing education and training of IT professionals should also note the practical importance of these traits/abilities and endeavor to incorporate them into the curricula. In particular, it is recommended that education/training curricula should give

attention to the traits/abilities displayed in Table 7 which represent the traits/abilities where the findings suggest the behaviors of IT Officers are below the expectations of IT Managers.

Table 7 Traits/abilities to be strengthened among IT Officers

Trait/Ability	Definition
Novelty	The mental openness to explore things that are novel.
Attraction Suspended Judgment	Free to explore the world, memories, and ideas from multiple points of view withholding censorship and premature judgments regardless of the logic.
Cognitive Disinhibition	Information is not pre-categorize as irrelevant or dismissed and innate cognitive screening is abandoned so that more information flows into the state of conscious awareness.
Divergent Thinking	Fluency in developing numerous possible ways of thinking.
Unusual Association	The capability to make links or connections of ideas and information that are remarkably dissimilar or even unconformable.
Thought Control	The ability to control and direct logical and deliberate thoughts.
Realism	The ability to have ideas which are realistic, practical, or workable.
Categorization	The ability to make judgments by filtering good ideas from poor or unworkable ideas.
Concentration	The ability to pay attention, especially concentrating on small details rather than the surrounding information in order to explore the pros and cons of diverse alternatives.
Impersonality	Not blaming or accusing generated ideas and not caring about criticism, evaluation, or ridiculousness from others about proposed solutions.
Self-conscious Thought	Self-investigation that allows comparing self-knowledge with the circumstances or other people.
Being Expertise	The ability to possess and utilize the appropriate level and type of memorial or innate expertise.
Improvisation	The ability to display impulsive and extemporaneous responses.

It is evident that organizations which want to develop innovativeness for competitive advantage need to ensure that IT Officers have the opportunity to put their creative traits/abilities into action as a part of their work responsibilities. This means a careful examination of the nature of the work that IT Officers are expected to perform. If work duties only include routine mundane tasks then an IT Officer's creativity will not lead to innovations. Specific steps need to be taken in organizations to ensure that creativity is encouraged and managed in the workplace.

In East Asian countries such as Thailand creativity and innovativeness may be affected by cultural factors. IT Officers in organizations in these countries may have high levels of creative thinking capability but they may be hindered in demonstrating creativity in the workplace by cultural traditions which focus on utilitarianism or practicality. As a result novel ideas regardless of their practicality are dismissed (Lau et al., 2004). In addition, in these constrained workplaces collectivism opposed to individualism dictates that people will tend to place a high value on group harmony. Consequently, although individuals may have novel and creative ideas they are not eager to be seen as being different from the group and they will not express these ideas in case it affects their acceptance by the group or the overall harmony of the group (Averill et al., 2001).

There are limitations on the study. The findings show that IT Officers claim to have these creative 20 traits/abilities as parts of their behaviors to a significant extent. However, in practice this may be problematic since the notion of social desirability response bias (Van De Mortel, 2008) may be operating whereby individual IT Officers may have indicated a strong agreement that they exhibit behaviors associated with the traits/abilities in order to present themselves in a more positive or socially acceptable and desirable light. In future studies the assessment of an IT Officer's behaviors needs to address this possible bias. For example, indirect questioning, social desirability scales, forced-choice items, and randomized response techniques might be applied in order to avoid, reduce, or minimize the social desirability response bias among the group of IT Officers (Nederhof, 1985; Fisher &Tellis, 1998).

The external validity of the study can only be validated by repeating the study and this is strongly recommended. Further research needs to examine in detail the relationship between Thai culture and creative thinking capability. The results may reveal some cultural reforms designed to encourage or foster more creative thinking capability especially among IT professionals in Thailand. Also, future studies may focus on determining and comparing the level of creativity among different IT work positions (e.g. software developers, system administrators, specialists (database, security, quality assurance, and distributed systems), and webmaster/graphic designers). In addition, the study did not examine the issue about IT officers and managers according to their business sectors, which it is expected that there may be differences across these sectors and comparative studies addressing this issue are recommended for future studies.

References

Al-alak, A. B., &Tarabieh, S. (2011). Gaining Competitive Adavntage and Organizational Performance Through Customer Orientation, Innovation Differentiation and Market Differentiation. *International Journal of Economics and Management Sciences*, *1*(5), 80-91.

Anderson, N., Potocnik, K., & Zhou, J. (2014). Innovation and Creativity in Organizations: A State-of-the-Science Review, Prospective Commentary, and Guiding Framework. *Journal of Management*, *40*(5), 1297-1333.

Angell, J. R. (1906). An Introductory Study of The Structure and Function of Human Conscious (Third Ed.). New York: Henry Holt and Company.

Averill, J. R., Chon, K. K., & Hahn, D. W. (2001). Emotions and Creativity, East and West. *Asian Journal of Social Psychology*, *4*, 165-183.

Badran, I. (2007). Enhancing Creativity and Innovation in Engineering Education. European Journal of Engineering Education, *32*(5), 573-585.

Batey, M. (2012). The Measurement of Creativity: From Definitional Consensus to the Introduction oa a New Heuristic Framework. *Creativity Research Journal*, *24*(1), 55-65.

Bissola, R., Imperatori, B., & Colonel, R. T. (2014). Enhancing the Creative Performance of New Product Teams: An Organizational Configurational Approach. *The Journal Product Innovation Management*, *31*(2), 375-391.

Cacioppo, J. T., Bernston, G. G., & Nusbaum, H. C. (2008). Neuroimaging as a New Tool in the Toolbox of Psychological Science. *Current Directions in Psychological Science*, *17*(2), 62-67.

Carson, S. (2010). *Your Creative Brain: Seven Steps to Maximize Imagination, Productivity, and Innovation in Your Life* (1st Ed.). San Francisco: Jossey-Bass.

Chamakiotis, P., Dekoninck, E. A., & Panteli, N. (2013). Factors Influencing Creativity in Virtual Design Teams: As Interplay between Technology, Teams, and Individuals. *Creative and Innovation Management*, *22*(3), 265-279.

Chapman, S. (2012). Can Scorpions Smoke? Retrieved on October 05, 2015, from https://canscorpionssmoke.wordpress.com/2012/10/13/cpr-for-the-imagination.

Chen, C. -K., & Hsu, K. -Y. (2006). Creativity of Engineering Students as Perceived by Faculty: a Case Study. *International Journal Engineering Education*, *22*(2), 264-272.

Chen, J. S., & Tsou, H. T. (2007). Information Technology Adoption for Service Innovation Practices and Competitive Advantage: The Case of Financial Firms. *Information Research*, *12*(3), 314.

Cheng, K. -W., & Chen, Y. -F. (2009). Developing and Verifying a Business-Creativity Assessment Tool: A Nationwide Study in Taiwan. *Journal of Education for Business*, *85*(2), 78-84.

Christensen, T. (2015). *Creative Something*. Retrieved on October 5, 2015, from http://creativesomething.net/post/119280813066/the-differences-between-imagination-creativity.

Clarry, J. W. (1994). Innovation and National Competitive Advantages in Global Competition. *Journal of Euromarketing*, *3*(3-4), 37-76.

Condon, B. B. (2014). Imagination: The What-if in Thinking. *Nursing Science Quarterly*, *27*(3), 204-201.

Davis, M. A. (2009). Understanding the Relationship between Mood and Creativity: A Meta-Analysis. *Organizational Behavior and Human Decision Process*, *108*, 25-38.

Doan, T., & Kennedy, M. L. (2009). Innovation, Creativity, and Meaning: Leading in the Information Age. *Journal of Business and Finance Librarianship*, *14*(4), 348-358.

Egan, K., & Judson, G. (2009). Value and Imagination in Teaching: With a Special Focus on Social Studies. *Educational Philosophy and Theory*, *41*(2), 126-140.

Fillis, I., & McAuley, A. (2000). Modeling and Measuring Creativity at The Interface. *Journal of Marketing Theory and Practice*, *8*(2), 8-17.

Fleer, M. (2012). Imagination, Emotions, and Scientific Thinking: What matters in the Being and Becoming of a Teacher of Elementary Science. *Cultural Studies of Science Education Journal*, *7*, 31-39.

Gupta, P., & Trusko, B. E. (2014). *Global Innovation Science Handbook*. New York: McGraw-Hill Education.

Hahn, M. H., Lee, K. C., & Jo, N. Y. (2013). Scenario-Based Management of Individual Creativity. *Computers in Human Behavior*, 1-11.

Horng, J.-S., Liu, C.-H., Chou, S.-F., & Tsai, C.-Y. (2013). Creativity as a Critical Criterion for Future Restaurant Space Design: Developing a Novel Model with DEMATEL Application. *International Journal of Hospitality Management*, *33*, 96-105.

Hsu, Y., Huang, Y., Chen, S.-C., & Liang, C. (2012). How Learning Environments Can Stimulate Student Imagination. *The Turkish Online Journal of Educational Technology*, *11*(4), 432-441.

Huang, X., Hsieh, J. P.-A., & He, W. (2014). Expertise Dissimilarity and Creativity: The Contingent Roles of Tacit and Explicit Knowledge Sharing. *Journal of Applied Psychology*, 1-15.

Im, S., Montoya, M. M., & Workman Jr., J. P. (2013). Antecedents and Consequences of Creativity in Product Innovation Teams. *Journal of Product Innovation Management*, *30*(1), 170-185.

Israel, G. D. (2013). *Determining Sample Size*. Retrieved on December 20, 2014, from https://edis.ifas.ufl.edu/pd006.

Johnson, B. E. (1991). An Education of the Imagination: Expanding the World of Children Living in Poverty. *Journal of Instructional Psychology*, *18*(3), 174-177.

Johnston, L. B. (2009). Critical Thinking and Creativity in a Social Work Diversity Course: Challenging Students to "Think Outside the Box". *Journal of Human Behavior in the Social Environment*, *19*, 646-656.

Kamya, M. T., Ntayi, J. M., & Ahiauzu, A. (2011). Organisational Learning and Competitive Advantage: Testing for the Interacting Influence of Knowledge Management and Innovation. *International Journal of Innovation and Learning*, *10*(4).

Kaufman, J. C., & Sternberg, R. J. (2007). Creativity. *Change: The Magazine of Higher Learning*, *39*(4), 55-58.

Lambooij, M. S., & Hummel, M. J. (2013). Differentiating Innovation Priorities Among Stakeholder in Hospital Care. *Laboomij and Hummel BMC Medical Informatics and Decision Making*, *13*(91), 1-11.

Latdict. (2014). *Latdict Latin Dictionary and GrammarResources*. Retrieved on November 12, 2014, from www.latin-dictionary.net/search/latin.

Lau, S., Hui, A. H., & Ng, G. Y. (2004). *Creativity: When East Meets West*. Singapore: World Scientific Publishing Company.

Lee, C. S., Huggins, A. C., & Therriault, D. J. (2014). A Measurement of Creativity or Intelligence? Examination Internal and External Structure Validity Evidence of the Remote Associates Test. *American Psychological Association*, May 19, 1-15.

Letcher, D. C. (2014). Imagination: Innovation the Could Be. *Nursing Science Quarterly*, *27*(4), 287-291.

Liang, C., Chang, C.-C., Chang, Y., & Lin, L.-J. (2012). The Exploration of Indicators of Imagination. *The Turkish Online Journals of Education Technology*, *11*(3), 366-374.

Liao, C., & Chuang, S.-H. (2006). Expolring the Role of Knowledge Management for Engineering Firm's Innovation and Performance. *The 39th Hawaii International Conference on System Sciences*, IEEE, 1-10.

Liu, S., Erkkinen, M. G., Healey, M. L., Xu, Y., Swett, K. E., & Chow, H. M. (2015). Brain Activity and Connectivity During Poetry Composition: Toward a Multidimensional Model of the Creative Process. *Human Brain Mapping*, *36*, 3351-3372.

Mandel, G. N. (2010). Left-Brain versus Right-Brain: Competing Conceptions of Creativity in Intellectual Property Law. *U.C. Davis Law Review*, 44, 283.

Neuman, W. L. (2011). *Social Research Methods, Qualitative and Quantitative Approaches (7th Ed.)*. Boston, Massachusetts: Allyn and Bacon.

New World Encyclopedia. (2014). Retrieved on November 12, 2014, from www.newworldencyclopedia.org/entry.

Oxford Dictionary. (2014). Retrieved on November 2014, from www.oxforddictionaries.com/definition/english.

Pelaprat, E., & Cole, M. (2011). *"Minding the Gap": Imagination, Creativity and Human Cognition*. Integrative Psychological and Behavior Science.

Perez-Luno, A., Gopalakrishnan, S., & Cabrera, R. V. (2014). Innovation and Performance: The Role of Environmental Dynamism on the Success of Innovation Choices. *Engineering Mangement Journal*, *61*(3), 499-510.

Perkly, C. W. (1910). An Experimental Study of Imagination. *The American Journal of Psychology*, *21*, 422-452.

Perry-Smith, J. E., & Coff, R. W. (2011). In the Mood for Entrepreneurial Creativity? How Optimal Group Affect Differs for Generating and Selecting Ideas for New Ventures. *Strategic Entrepreneurship Journal*, *5*, 247-268.

Plsek, P. E. (1997). *Creativity, Innovation and Quality* (1st Ed.). Wisconsin: American Society For Quality.

Rudell, J. (2013). Re-reading Fichte's Science of Knowledge after Castoriadis: The Anthropological Imagination and The Radical Imagery. *Thesis Eleven*, *119*(1), 3-21.

Runco, M. A., Millar, G., Acar, S., & Cramond, B. (2010). Torrance Tests of Creative Thinking as Predictors of Personal and Public Achievement: A Fifty-Year Follow-Up. *Creativity Research Journal*, *22*(4), 361-368.

Sameen, S., & Burhan, M. (2014). Creativity and Its Link with Personality Tyoe A/B in Students. *Journal of Business Study Quarterly*, *6*(1), 156-166.

Sawyer, K. (2011). The Cognitive Neuroscience of Creativity: A Critical Review. *Creativity Research Journal*, *23*(2), 137-154.

Tidd, J., Bessant, J., & Pavitt, K. (1997). *Managing Innovation: Integrating Technological, Market and Organizational Change* (1st ed.). West Sussex, England: Wiley.

Toole, T. M., Hallowell, M., & Chinowsky, P. (2013). A Tool for Enhancing Innovation in Construction Organization. *The Engineering Project Organization Journal*, *3*(1), 32-50.

Tuominen, M., & Hyvönen, S. (2004). Organizational Innovation Capability: A Driver for Competitive Superiority in Marketing Channels. *The International Review of Retail, Distribution and Consumer Research*, *14*(3),277-293.

Vadrot, A. B. (2011). Innovation - Not Just a Technical and Economic Problem! *The European Journal of Social Science Research*, *24*, 1-5.

Van De Mortel, T. (2008). Faking It: Social Desirability Response Bias in Self-report Research. *Australian Journal of Advanced Nursing*, 25(4), 40-48.

Wang, C.-H., Armstrong, J., & Wu, T.-Y. (2012). Children's Poem Writing (CPW) for Learning about Children's Poetry and Developing Creativity and Imagination. *The International Journal of Learning*, *18*(4), 29-47.

Weerawardena, J., & Sullivan-mort, G. (2001). Learning, Innovation and Competitive Advantage in Not-for-Profit Aged Care Marketing: A Conceptual Model and Research Propositions. *Journal of Nonprofit and Public Sector Marketing*, *9*(3), 53-73.

West, M. A. (2002). Sparkling Fountains or Stagnant Ponds: An Integrative Model of Creativity and Innovation Implementation in Work Groups. *International Association of Applied Psychology Journal*, *51*(3), 355-387.

Wongwuttiwat, J. (2015). Thailand's ICT Readiness for the ASEAN Economic Community. *Electronic Journal of Information Systems in Developing Countries*, *72*(8), 1-21.

Xue, X., Zhang, R., Rebecca, Y. J., & Dai, J. (2014). Innovation in Construction: A Critical Review and Future Research. *International Journal of Innovation Science*, *6*(2), 111-125, Retrieved from www.academia.edu/7771690/Innovation_in_Construction_A_Critical_Review_and_Future_Research.

Yin, A., & Wang, D. (2012). Evaluatiion of Technological Innovation Performance in China and Comparison with Foreign Countries. 2012 International Conference on Information Management, *Innovation Management and Industrial Engineering*, IEEE, 344-347.

Appendix

A1. Notated Questionnaires

Both questionnaires are combined and abbreviated.

Section 1: Personal Characteristics

1. Gender: Male • Female 2. Age: _____ years

3. What is the highest level of education that you have completed? □ Secondary School □ Non-Formal Education (Adult School) □ Diploma □ Bachelor Degree □ Master Degree □ Doctoral Degree

4. In total, how long have you worked in positions related to IT? _____ years

5. How long have you worked in your current position _____years

6. (For IT Officers only) Please indicate the best description of your current position: □ Software Developer (programmer, analyst) □ System Administrator □ Specialist (database, security, quality assurance, distributed system specialist) □ Webmaster/ Graphic Designer

Section 2: Creative Traits/Abilities

Instruction for IT Managers: Each statement describes a characteristic of an individual. In each case, please indicate (√) on the scale provided how important it is for *an individual working at the level of* ***an IT Officer in an organization in Thailand*** to be able to demonstrate the characteristic.

Each of the 20 traits/abilities is listed together with the 7-point Likert scale for responses.

Very Unimportant	Unimportant	Slightly Unimportant	Neither Important or Unimportant	Slightly Important	Important	Very Important

Instruction for IT Officers: Each statement describes a personal characteristic of an individual. In each case, please indicate (√) on the scale provided the extent to which you agree or disagree that ***the given statement is applicable to you as an individual***.

Each of the 20 traits/abilities is listed together with the 7-point Likert scale for responses.

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree

Table A1: Descriptive statistics for traits/abilities

Variable (Trait/Ability)	Mean	Standar Deviation	Skewness	Kurtosis	Mean Type of Rank	Mean	Standar Deviation	Skewness	Kurtosis	Mean Type of Rank
	All IT Managers					**All IT Officers**				
Novelty Attraction	6.17	.898	-.829	-.181	3 H	5.76	1.040	-.497	-.589	2.5 H
Suspended Judgment	5.63	1.005	-.446	-.240	10.5 M	5.35	1.129	-.219	-.824	12 M
Cognitive Disinhibition	5.47	1.089	-.416	-.010	14 L	5.10	1.365	-.746	.455	15 L
Mental Imagination	5.40	1.246	-.636	.114	17 L	5.21	1.351	-.578	-.041	13 M
Hypothetical Thinking	5.49	1.220	-.817	.267	13 M	5.11	1.337	-.454	-.504	14 L
Divergent Thinking	6.19	.869	-.672	-.615	2 H	5.67	1.049	-.586	-.302	4 H
Unusual Associations	5.43	1.186	-.686	.390	15.5 L	4.91	1.313	-.638	.306	16 L
Goal Enjoyment	5.55	1.155	-.516	-.386	12 M	5.94	.986	-.746	-.142	1 H
Thought Control	6.21	.896	-.934	.000	1 H	5.55	1.052	-.447	-.422	7 H
Realism	5.99	1.005	-.749	-.103	6 H	5.65	1.015	-.544	-.169	5 H
Sequential Processing	5.63	1.081	-.562	-.074	10.5 M	5.37	1.096	-.449	-.065	11 M
Categorization	6.11	.918	-.816	.014	4 H	5.63	1.064	-.580	-.343	6 H
Concentration	5.77	.942	-.304	-.801	8 M	5.39	1.150	-.356	-.506	10 M
Impersonality	5.43	1.159	-.430	-.394	15.5 L	4.90	1.359	-.472	-.263	17 L
Self-conscious Thought	5.28	1.222	-.368	-.506	18 L	4.81	1.382	-.428	-.125	19 L
Negative Feeling	4.50	1.560	-.394	-.515	20 L	4.80	1.430	-.545	-.008	20 L
Dissatisfaction	4.87	1.355	-.553	.257	19 L	4.86	1.419	-.483	-.095	18 L
Being Expertise	6.07	.892	-.642	-.421	5 H	5.76	.982	-.525	-.428	2.5 H
Intrinsic Motivation	5.71	1.043	-.432	-.633	9 M	5.47	1.171	-.442	-.637	8 M
							1.135	-.520	-.275	9 M
Improvisation	5.79	1.030	-.633	-.120	7 H	5.41				
	Male IT Managers					**Male IT Officers**				
Novelty Attraction	6.29	.846	-.998	.199	2 H	5.80	1.016	-.379	-.964	3 H
Suspended Judgment	5.64	1.044	-.459	-.313	11 M	5.40	1.140	-.230	-.881	11 M
Cognitive Disinhibition	5.48	1.053	-.528	.554	15 L	5.04	1.426	-.872	.516	15 L
Mental Imagination	5.45	1.277	-.732	.212	16 L	5.30	1.361	-.677	.306	13 M
Hypothetical Thinking	5.56	1.270	-.913	.331	12 M	5.21	1.286	-.610	-.278	14 L

Table A1: Descriptive statistics for traits/abilities (Continue)

Variable (Trait/Ability)	Mean	Standar Deviation	Skewness	Kurtosis	Mean	Type of Rank	Mean	Standar Deviation	Skewness	Kurtosis	Mean	Type of Rank
	All IT Managers						**All IT Officers**					
Divergent Thinking	6.31	.852	-.970	-.067	1	H	5.70	1.026	-.620	-.122	4	H
Unusual Associations	5.53	1.160	-.858	1.052	14	L	4.87	1.346	-.691	.296	18	L
Goal Enjoyment	5.55	1.200	-.445	-.794	13	M	5.99	.952	-.791	.018	1	H
Thought Control	6.28	.899	-1.060	.171	3	H	5.66	1.034	-.535	-.267	7	H
Realism	6.02	1.039	-.852	.096	6	H	5.69	1.036	-.476	-.298	5	H
Sequential Processing	5.65	1.122	-.683	.073	10	M	5.51	1.053	-.475	-.009	9	M
Categorization	6.13	.937	-.918	.239	5	H	5.67	1.045	-.643	-.091	6	H
Concentration	5.80	.954	-.357	-.787	8	M	5.36	1.173	-.335	-.474	12	M
Impersonality	5.42	1.231	-.455	-.529	17	L	4.87	1.341	-.431	-.242	18	L
Self-conscious Thought	5.23	1.286	-.414	-.598	18	L	4.91	1.317	-.469	.091	16	L
Negative Feeling	4.49	1.618	-.293	-.737	20	L	4.72	1.493	-.611	.011	20	L
Dissatisfaction	4.85	1.431	-.590	.024	19	L	4.87	1.499	-.554	-.246	18	L
Being Expertise	6.14	.915	-.855	-.110	4	H	5.88	.960	-.640	-.235	2	H
Intrinsic Motivation	5.83	1.062	-.655	-.296	7	H	5.56	1.161	-.579	-.260	8	M
Improvisation	5.76	1.072	-.691	-.032	9	M	5.43	1.142	-.532	-.189	10	M
	Male IT Managers						**Male IT Officers**					
Novelty Attraction	5.90	.951	-.528	-.584	6	H	5.66	1.094	-.687	-.087	2	H
Suspended Judgment	5.60	.924	-.437	-.006	9	M	5.25	1.104	-.223	-.658	11	M
Cognitive Disinhibition	5.45	1.171	-.236	-.808	13.5	M	5.23	1.222	-.194	-.523	12	M
Mental Imagination	5.28	1.180	-.450	.080	17	L	5.02	1.317	-.410	-.644	14	L
Hypothetical Thinking	5.35	1.102	-.666	.360	16	L	4.89	1.427	-.138	-.696	18	L
Divergent Thinking	5.92	.850	-.181	-.885	4.5	H	5.60	1.101	-.516	-.584	3 1	H
Unusual Associations	5.22	1.223	-.374	-.406	18	L	4.98	1.244	-.473	.293	5	L
Goal Enjoyment	5.55	1.064	-.746	1.036	11	M	5.83	1.054	-.641	-.407	1	H
Thought Control	6.07	.880	-.749	-.018	1.5	H	5.32	1.062	-.285	-.552	9	M
Realism	5.93	.936	-.505	-.613	3	H	5.55	.969	-.795	.180	4	H
Sequential Processing	5.58	.996	-.238	-.498	10	M	5.08	1.136	-.353	-.119	13	M

Table A1: Descriptive statistics for traits/abilities (Continue)

Variable (Trait/Ability)	Mean	Standar Deviation	Skewness	Kurtosis	Mean	Type of Rank	Mean	Standar Deviation	Skewness	Kurtosis	Mean	Type of Rank
	All IT Managers						**All IT Officers**					
Categorization Concentration	6.07	.880	-.595	-.443	1.5	H	5.52	1.105	-.454	-.729	5	H
Impersonality	5.72	.922	-.201	-.766	8	M	5.45	1.104	-.398	-.579	7	H
Self-conscious Thought	5.45	.999	-.280	-.185	13.5	L	4.95	1.408	-.574	-.215	16.5	L
Negative Feeling	5.38	1.075	-.068	-.645	15	L	4.58	1.499	-.283	-.447	20	L
Dissatisfaction	4.52	1.444	-.699	.234	20	L	4.95	1.280	-.188	-.671	16.5	L
Being Expertise	4.90	1.189	-.364	.945	19	L	4.85	1.240	-.205	.327	19	L
Intrinsic	5.92	.829	-.210	-.738	4.5	H	5.49	.986	-.331	-.562	6	H
Motivation	5.47	.965	-.020	-.924	12	M	5.26	1.176	-.175	-1.185	10	M
Improvisation	5.83	.942	-.410	-.674	7	H	5.37	1.126	-.510	-.401	8	M

Note: High (H) for rank positions 1-7, Medium (M) for rank positions 8-13, and Low (L) for rank positions 14-20.

Table A2: Correlations of traits/abilities with personal characteristics

Variables	IT Managers				Male IT Managers				Female IT Managers				IT Officers				Male IT Officers				Female IT Officers			
	AGE	EDU	EXP	CEXP	AGE	EDU	EXP	CEXP	AGE	EDU	EXP	CEXP	AGE	EDU	EXP	CEXP	AGE	EDU	EXP	CEXP	AGE	EDU	EXP	CEXP
Age (AGE)	1				1				1				1				1				1			
Level of Education (EDU)	.129	1			.128	1			.145	1			**.348**	1			.128	1			**.426**	1		
Years of IT Work Experience (EXP)	**.679**	.006	1		**.716**	.072	1		**.599**	-.083	1		**.893**	**.346**	1		**.716**	.072	1		**.942**	**.453**	1	
Years in Current Position (CEXP)	**.359**	**-.216**	**.464**	1	**.319**	**-.182**	**.384**	1	**.439**	**-.259**	**.619**	1	**.699**	**.275**	**.768**	1	**.319**	**-.182**	**.384**	1	**.710**	**.309**	**.730**	1
Novelty Attraction	.139	.062	**.156**	.074	.157	.096	.146	.037	.082	.048	.073	.093	.078	.114	**.141**	.071	.157	.096	.146	.037	-.056	.069	.047	.035
Suspended Judgment	.022	.114	.043	-.095	.012	.075	.051	-.022	.046	.199	.010	**-.256**	.126	.056	**.221**	**.195**	.012	.075	.051	-.022	.130	-.041	.218	**.269**
Cognitive Disinhibition	-.090	.103	-.043	-.020	-.117	.019	-.066	-.067	-.038	.238	-.006	.056	.021	**.216**	.045	.051	-.117	.019	-.066	-.067	**.276**	**.343**	**.247**	**.258**
Mental Imagination	-.009	.135	-.048	-.024	-.017	.029	-.095	.017	.001	**.352**	.026	-.123	-.045	.017	.016	.092	-.017	.029	-.095	.017	.005	.011	.002	.163
Hypothetical Thinking	-.015	.089	.066	-.077	.024	.113	.037	-.093	-.135	.063	.093	-.067	.013	.073	.085	**.154**	.024	.113	.037	-.093	-.054	.128	-.002	.077
Divergent Thinking	.013	.051	.114	-.008	.024	-.103	.080	.003	-.046	**.366**	.070	-.082	**.205**	**.143**	**.265**	**.198**	.024	-.103	.080	.003	.211	.122	**.267**	**.251**
Unusual Associations	-.108	.115	.018	-.034	-.102	.152	-.014	-.023	-.142	.079	.014	-.085	.111	.033	**.153**	**.144**	-.102	.152	-.014	-.023	.082	.084	.134	.120
Goal Enjoyment	.078	.100	.093	.034	.029	.102	.065	.041	.204	.098	.172	.020	.098	.081	.122	.044	.029	.102	.065	.041	.052	-.044	.055	.058
Thought Control	**.176**	.030	**.208**	.018	.166	-.046	**.189**	-.017	.184	.188	.198	.056	**.201**	.097	**.217**	**.187**	.166	-.046	**.189**	-.017	**.302**	.119	**.336**	**.407**
Realism	.092	.001	.083	.068	.004	-.001	-.001	-.016	**.311**	.015	**.283**	.234	**.139**	.096	**.163**	.076	.004	-.001	-.001	-.016	.119	.166	.168	.156
Sequential Processing	.023	.041	.031	-.016	-.092	-.062	-.048	-.125	**.318**	.252	.225	.203	.129	.014	**.175**	.113	-.092	-.062	-.048	-.125	.173	-.039	**.272**	.180
Categorization	.073	-.061	.105	.064	.016	-.146	.036	.022	.209	.101	**.262**	.138	.101	.066	**.192**	**.187**	.016	-.146	.036	.022	.071	.118	.180	.213
Concentration	-.058	-.011	.049	.023	-.102	-.102	.024	.003	.039	.160	.088	.052	.049	.113	**.160**	**.164**	-.102	-.102	.024	.003	.061	.093	.130	.190
Impersonality	-.002	.109	.015	-.062	.022	.057	-.006	-.029	-.069	.228	.089	-.137	-.051	.022	.025	-.034	.022	.057	-.006	-.029	-.096	.053	.038	.043
Self-conscious Thought	-.055	**.158**	-.062	-.070	-.005	.170	-.015	-.069	-.186	.129	-.157	-.060	-.096	.009	-.021	.060	-.005	.170	-.015	-.069	-.180	.000	-.095	-.094
Negative Feeling	-.088	-.028	-.103	-.059	-.085	.007	-.168	-.078	-.096	-.100	.071	-.017	-.074	.021	.019	-.017	-.085	.007	-.168	-.078	-.075	-.073	-.003	-.041
Dissatisfaction	-.079	-.024	-.050	.059	-.124	-.097	-.110	.075	.047	.125	.129	.032	-.113	-.044	-.052	-.012	-.124	-.097	-.110	.075	-.103	-.122	-.030	.131
Being Expertise	.021	-.057	.033	-.092	.018	-.094	-.003	-.094	.009	.036	.045	-.125	.131	.092	**.217**	**.155**	.018	-.094	-.003	-.094	.080	.077	.192	.181
Intrinsic Motivation	.103	-.016	**.148**	.033	.109	.015	.088	.004	.063	-.046	.210	.050	.002	.089	.057	.085	.109	.015	.088	.004	.087	.096	.106	.113
Improvisation	-.068	.028	***-.155***	-.120	-.034	-.033	-.154	-.034	-.152	.145	-.147	**-.297**	.032	**.152**	.125	.124	-.034	-.033	-.154	-.034	.146	.152	.218	**.266**

Note: Coefficients in bold type are statistically significant at a level of 0.05 or less