

THE DIFFERENCE IN PERSONALITY TRAITS OF CONSTRUCTION ENGINEERS IN VIETNAM USING THE KTS INSTRUMENT

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Abstract

Understanding the individual characteristics of an engineer in which personality traits contribute to the efficient use of human resources is important. This study was conducted to determine the distribution of personality traits of construction engineers and the differences in personality in their engineering careers. Data were collected using the Keirsey Temperament Sorter II and analyzed by descriptive statistics. The results show that the characteristics of the design engineer are different from the other construction engineers. The personality traits of design engineers are extraverted, intuition, thinking, and perceiving, while the others (construction engineers, supervisors, and project managers) are extraverted, sensing, thinking, and judging.

Keywords: Construction, construction engineers, design engineers, KTS II, personality

Introduction

In the trend of globalization, organizations and large corporations have been developing their management systems based on technology and human resources (Nguyen *et al.*, 2018; Trangkanont, 2017). The application of research achievements in production systems and

management creates competitive advantages and tremendous economic benefits for their organizations. According to Barney and Wright (1998), human resources are clearly the most important of the assets which contribute to creating sustainable competitive advantages

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for organizations. Therefore, the companies not only need to develop the technology to optimize the production system but also need to increase the efficiency of human labor (Quyen *et al.*, 2017).

The construction industry has distinct characteristics that separate it from other industries (Ngowtanawan, 2017). The process of project implementation needs the coordination of a variety of partners in the project. Each specific project is different from the others and contains more complications than factory production lines. The result is that projects are related to the characteristics of the individuals involved in the project such as managers, design engineers, construction engineers, engineering supervisors, and the teams on the site; the characteristics include behavior, attitudes, personality traits, experience, and coordination in their work.

A theoretical model of Creasy and Anantamula (2013) proposed that a successful project will be affected by the characteristics of managers such as their leadership styles and personality traits. Additionally, a theoretical model (Johnson, 2004) refers to the relationship between personality traits and the work effectiveness of each employee in an organization. Further, the study of Elankumaran (2004) shows that a worker has higher job indulgence if he has the appropriate personality traits for his work.

Personality traits are crucial components of the project manager and are used to determine the level of successful management and the success of the project in which they are involved (Bedingfield and Thal, 2008). The construction project manager has to complete the work under the pressure of complex conditions, job uncertainty, high risks, and time limits; he/she also needs to ensure cost savings, and meet quality standards and the satisfaction of the owners. So, the successful project manager needs to have both high qualifications and appropriate personality traits within the work environment.

A project manager's skills include hard skills, soft skills, and the effective management of projects (Skulmoski and Hartman, 2010). Hard skills are technical skills which are

acquired by training to control the time, schedule, and the cost of the project. Soft skills are used in the communication between managers and others, and include personality traits, behavior, and attitudes. Creasy and Anantamula (2013) stated that "Lechler and Posner have pointed out that soft skills will have a great influence on the hard skills to achieve successful results of the project". A successful United States Department of Defense project manager is affected by the Big Five personality traits (Thal and Bedingfield, 2010). Research has shown that conscientiousness and openness are the scales used to predict a successful project manager. This result is 1 of the considerations when recruiting project managers.

The performance of the project manager is affected by his/her professional competence and communicative activities. Also, communicative activities directly affect the project coordination and project operation through the personality traits and guidance styles of the manager (Prince, 2011).

Although soft skills, such as the personality traits and attitudes of the project manager, may have not been appropriately considered (Skulmoski and Hartman, 2010), the relationship between personality traits and a successful project are still being found. Dvir *et al.* (2006) and Malach-Pines *et al.* (2009) have pointed out that the personality traits of the project manager contributing to the increase of the success of the project show the relationship between the personality traits and the leadership capability of the project managers. The personality traits in the Myers-Briggs Type Indicator (MBTI) such as introverted, sensing, thinking, judging (ISTJ), introverted, intuition, feeling, judging (INFJ), introverted, intuition, thinking, judging (INTJ), extraverted, intuition, thinking, perceiving (ENTP), extraverted, sensing, thinking, judging (ESTJ), extraverted, intuition, feeling, thinking (ENFJ), and extraverted, intuition, thinking, judging (ENTJ) have functions which highlight the project management ability (Gehring, 2007). Cohen *et al.* (2013) discussed the personality traits of the project manager and successful management and identified the relationship between the personality traits and

a successful project (Prince, 2011). To collect information, the intuition, thinking (NT) project manager's deducibility did not succeed like the sensing, feeling (SF) project manager's by using senses to collect information (Cohen *et al.*, 2013). The study of Madter *et al.* (2012) proposed a framework for personality traits of project managers in England appropriate for management levels in the construction industry. The different personality traits between construction engineers and architects were found in the study. The percentage of construction engineers with sense and feeling (SF) is higher than the group of architects with sense and thinking (ST).

The study aims to find the difference in personality distribution of construction engineers in Vietnam. The working environment of a construction engineer is different between inside the office and outside. Good compatibility between the types of working environment and the personality created excellent work efficiency. For example, design engineers working in a design office have less of a communication environment. In contrast, engineers work on the construction site which is an environment of interaction and communication between engineers and workers. The outcome from this study helps the human resources department in a construction company to better understand construction engineers and encourage their enthusiasm for work.

Preliminaries

The MBTI is a table of multiple questions about characterization, based on the theory of how to measure personality traits proposed by psychologist Carl Jung (1875-1961). Jung (2014) believed that although each person has many characteristics, the personality traits were most important. Katharine Briggs and Isabel Myers worked on Jung's personality theory and created a tool called the MBTI (Myers *et al.*, 1998). The personality test helps determine one of 16 personality traits. The 16 personality traits were determined from 4 classification scales; each scale has an opposite state. These are extraversion and introversion; sensing and

intuition; thinking and feeling; and judging and perceiving.

Keirsey (1998) presented a tool to estimate personality traits named the Temperament Sorter II (KTS-II). KTS-II is a personality trait measurement tool that is widely used, and it can be replaced for MBTI (Yan *et al.*, 2013). KTS-II used 4 pairs of personality trait and 4 pairs of characterizations from the MBTI. It determines personal characterization, first based on the use of language (concrete and abstract) and then using a tool (cooperative and utilitarian) based on the 16 characterizations from the MBTI. According to Keirsey, characterizations are divided into 4 groups: artisan, guardian, idealist, and rational (Keirsey and Bates, 1984). KTS-II differs from the MBTI which focuses on the S-N scale (sense-intuition). It represents an understanding of the cognitive function and has attracted many researchers in the field of education (Felder and Brent, 2005; Shen *et al.*, 2007).

Researchers have tested the correlation between the MBTI and KTS-II. Kelly and Jugovic (2001) mentioned the use of the KTS-II as a free tool which is highly correlated with the MBTI, based on the result of a comparison between the 2 tools and the participants; it showed that there was a strong correlation between the MBTI and KTS-II for both males and females (Yilmaz and O'Connor, 2015). The correlation coefficients of the both the F scale (female, $r = 0.78$) and E-I scale (male, $r = 0.75$) have high degrees of equality. Additionally, 2 studies by Fearn and Wilcox (2001) and Waskel and Coleman (1991) have shown that the KTS scale is eligible for reliability by internal consistency. Cronbach's alpha coefficient of scale is relatively high: (1) extravert (E) of 0.68, introvert (I) of 0.68; (2) sensing (S) of 0.73, intuition (N) of 0.73; (3) thinking (T) of 0.75, feeling (F) of 0.74; and (4) judging (J) of 0.83, perceiving (P) of 0.84. Cronbach's alpha coefficient of 4 dichotomous types are indicated with the following results: E/I of 0.735; S/N of 0.888; T/F of 0.874; and J/P of 0.875. With the specific evidence pointed out, the KTS-II is a choice available for the MBTI. Surveys of the MBTI personality traits have been done in many nations, including

Vietnam during the period from June 2008 to April 2009 with a high internal consistency coefficient of 0.81-0.91 (Schaubhut *et al.*, 2009). In Vietnam, the information on the website posted that the content related to the MBTI is a tool to support people in choosing a job and discovering themselves (Vo, 2017).

Methods

The personality measurement tool (KTS-II) is a suitable tool for research and was used to categorize the personality traits of construction engineers. The tool was adapted to the characteristics of the study to create comfort for the respondents. The scales used in the KTS-II were designed with 2 answer options, A and B.

The questionnaire was distributed to civil engineers working in companies and projects in Ho Chi Minh City and some surrounding provinces. Data were collected according to the non-probability sampling methods. There were 2 ways to distribute the questionnaire: the paper questionnaire was sent directly to the engineers on sites, or a soft file questionnaire was sent by email. The questionnaires were aggregated and filtered before analysis.

The survey had a total of 242 valid survey participants and were recovered over a period of 120 days. In particular, there were 34 replies from email and more than 200 from the paper questionnaire. The response rate was approximately 30%. The sample data from the 242 participants divided their work as civil engineers as follows: 60 design consulting engineers (24.8%), 78 construction engineers (32.2%), 32 supervisors (13.2%), and 56 in project management (23.1%). The remaining 6.6% of respondents were engineers working in other fields such as the supply of materials, real estate, surveying, and testing.

Results

In the first scale, the survey results indicated that the psychological characteristic of construction engineers had a preference for extraversion (58.4%), followed by introversion

(31.4%) and the remaining part of the sample (10.3%) did not identify a psychological characteristic from the questionnaire. Extraversion (E) was the main characteristic of the construction engineers in the first scale. Extraversion indicated that they were open, liked fun, were easy to talk to, easy to communicate with, and created new relationships that would help their work. However, in the second scale, sense (S) made up 61.2% of the observations in the sample. The remaining engineers had a preference for intuition (I) and (3.7%) did not identify. Therefore, the engineers used sense, which was the dominant trend in the second scale, to get information. The work environment of an engineer usually involves working with standards and principles. That environment is appropriate for the characteristic of sense (S) as they gain information by working with their senses.

The results in the third scale show that there was a strong preference for thinking with 75%, which is the rational decision-making tendency. The remaining results in the sample showed that 21% of the engineers preferred emotional decision-making, and 4% engineers did not identify a psychological characteristic in the third scale. Decision making is one of the most important and regular activities of an engineer in his daily work. In the work environment, there are always constraints from technical standards, time, and budget. So, engineers often use logic to deduce (T) and make decisions rather than use feeling (F). Their responsibility is related to the law and authority, so their decision-making will be right or wrong. This is consistent in the work environment of construction engineers.

The results show that the characteristics of the personality of the engineers in the fourth scale are not explicitly distinguished because the difference between the 2 psychological tendencies is small (5%). For the characteristics of personality in this scale, the engineers had a preference for judging of 50.4% and perceiving of 44.6%. There were 5% of the engineers in the sample who did not identify a characteristic. The work of a construction project is managed according to a plan. This work environment

will be very consistent with the psychological characteristics of judging (J), doing work according to the principle. This is because with the workflow, in principle the engineers will have clear information. They always take the initiative and know what to do for the next task, with a priority to complete the work on time. Conversely, they will be very stressed in the face of changing plans and work delays.

The results show that ESTJ is representative of the characteristics of construction engineers in Vietnam. The psychology of 242 engineers from all 4 types of jobs - design consultants, construction engineers, supervisors, and PMs was presented.

It points to the relationship between the psychological tendencies and the job characteristics of Vietnamese construction engineers. The conclusions on the personality traits of the construction engineers will be limited by the sample. The personality trait ESTJ demonstrates that most construction engineers are extroverted, sensibly take information, make decisions based on reason, and work according to principle. The personality characteristics of the engineers have similarities shown in Table 1. The research results on the personality traits of construction engineers in Vietnam have the same aspects as the personality traits of mechanical engineers (McDaid *et al.*, 1986). The similarities are shown in 3 scales (S-N, T-F, and J-P) and are represented by STJ. It is the same with the personality traits of construction engineers at a state public agency in 2 scales (S-N and J-P) which is SJ (Johnson

and Singh, 1998). In the second scale, the measure of how information is obtained from the environment is represented by S. This demonstrates that engineers prefer to receive information from sensation rather than intuition. Moreover, J in the fourth scale shows that engineers prefer to work in environments that have specific tasks and schedules. The personality traits of the engineers are represented by SJ except for the design engineers who are represented by NP which is different from other construction engineers. Design work is the creation of products based on the many requirements of the project. Their work needs creativity, so design engineers prefer to approach the information intuitively to satisfy the project owner. The personality traits of N, to get information intuitively, appears in design students and graduate students (Durling *et al.*, 1996; Yan *et al.*, 2013). The character of the design engineer in Vietnam is similar to the previous study and is NP.

The results of the KTS-II distribution of construction engineering show that there are differences, as shown in Figure 1. NT is dominant in the personality distribution of the design engineers. In contrast, SJ is dominant in the personality distribution of construction engineers, supervisors, and project managers. The question is whether or not there is a difference between the personality traits of engineers with different jobs.

Non-parametric tests were performed to compare the personality distributions of construction engineers for each pair of jobs shown in Table 2.

Table 1. The personality of engineers

	Scale 1				Scale 2				Scale 3				Scale 4			
	E	None	I	S	None	N	T	None	F	J	None	P				
Design Engineers	53.30%	3.30%	43.30%	46.70%	1.70%	51.70%	73.30%	3.30%	23.30%	35.00%	5.00%	60.00%				
Construction Engineers	56.40%	12.80%	30.80%	64.10%	2.60%	33.30%	76.90%	2.60%	20.50%	56.40%	7.70%	35.90%				
Supervisors	71.90%	15.60%	12.50%	71.90%	9.40%	18.80%	65.60%	3.10%	31.30%	56.30%	3.10%	40.60%				
Project Managers	57.10%	10.70%	32.10%	62.50%	5.40%	32.10%	82.10%	3.60%	14.30%	50.00%	1.80%	48.20%				
Mechanical Engineers*	46.60%	0	53.40%	58.50%	0	41.50%	70.20%	0	29.80%	62.20%	0	37.80%				
Construction engineers*	34.0%	4.30%	61.70%	72.30%	2.10%	25.50%	29.80%	12.80%	57.40%	53.20%	4.30%	42.60%				

*A different study

Hypothesis Testing

H01: There is no distinction between the distribution of the personality of the design engineer and the construction engineer.

H02: There is no distinction between the distribution of the personality of the design engineer and the supervisor.

H03: There is no distinction between the distribution of the personality of the design engineer and project manager.

H04: There is no distinction between the distribution of the character of the construction engineer and the supervisor.

H05: There is no distinction between the distribution of the character of the construction engineer and the project manager.

H06: There is no distinction between the personality characteristics of the supervisor and the project manager.

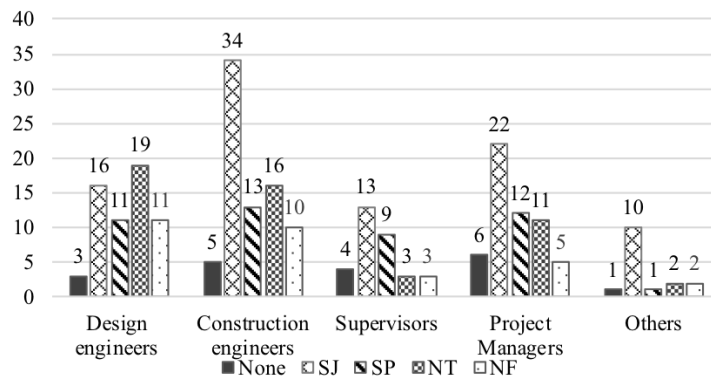


Figure 1. KTS distribution of construction engineers

Table 2. The result of the Chi-Square test on the KTS distribution of construction engineer personality

	Chi-square test	Design engineers	Construction engineers	Supervisors	Project managers
Design engineers	Chi-Square		8.956 (a)	38.202 (b)	12.068 (c)
	df		3	3	3
Construction engineers	Asymp. Sig.		0.03	0	0.007
	Chi-Square	8.956 (a)		13.826 (e)	2.275 (d)
Supervisors	df	3		3	3
	Asymp. Sig.	0.03		0.003	0.517
Project managers	Chi-Square	38.202 (b)	13.826 (e)		2.446 (f)
	df	3	3		3
	Asymp. Sig.	0	0.003		0.485
	Chi-Square	12.068 (c)	2.275 (d)	2.446 (f)	
	df	3	3	3	
	Asymp. Sig.	0.007	0.517	0.485	

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 7.8.

b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 6.1.

c. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 5.7.

d. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 7.3.

e. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 7.8.

f. 1 cell (25.0%) has expected frequency less than 5. The minimum expected cell frequency is 2.8.

The results show that Keirse's personality trait distribution has a difference between job pairs (Table 2): design engineer and construction engineer (Sig. = 0.03); design engineer and supervisor (Sig. = 0.00); design engineer and project manager (Sig. = 0.007); and construction engineer and supervisor (Sig. = 0.003). There is no difference in the distribution of the personality characteristics of the engineer (Table 2) except construction engineer and PM (Sig. = 0.517) and supervisor and project manager (Sig. = 0.485).

Conclusions

The initial results show that there are differences in personality traits of construction engineers in Vietnam. Project engineers, project supervisors, and project managers have the personality characteristics of ESTJ as opposed to design engineers with the personality characteristics of ENTP. The work environment could explain the differences between the personality of construction engineers and design engineers. Construction engineers work in the construction environment on the construction site. In contrast, design engineers primarily work in the office. For construction engineers, the tendency is to gather information through visual and practical work on principles. Contrary to that, design engineers tend to get information through judgment, inference, and intuition and to have a flexible working style. The difference in personality was further clarified when comparing the results with 2 character studies of mechanical engineers and design students.

Engineers with different jobs will have different personality traits. The results indicate that there is a difference in the personality traits of the design engineer and the rest of the construction engineers. The research results provide insights into the characteristics that contribute to the characteristics of a construction engineer such as qualifications and experience. The findings are only relevant in the sample used for research and human resources management in companies. It should

be considered for suitability when applied to a particular situation.

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