



Finding Effective Nodes of Personality Type in a Paperless Environment

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Abstract

Quite a number of researchers have acknowledged diverse team personality traits for the development of software projects. However, effective leadership traits is still a question. This study's purpose is to establish the correlation between leadership traits and other team members' personality traits by finding effective nodes of personality type in a paperless environment. To achieve the objective, the study was conducted on respondents in a paperless environment. Myer-Briggs Type Indicator (MBTI) personality assessment tool was used to obtain the personality traits of respondents including leadership traits. Furthermore, degree centrality, betweenness centrality, and closeness centrality metrics measures were used to measure and establish a team most favorable communicative leadership traits and the correlation between leadership traits and other team members' personality traits.

Keywords: Finding, Effective, Nodes, Personality Type, Paperless, Environment.

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INTRODUCTION

According to Kissell (2013), offices which were previously defined by paper-based records management processes that included the handling of physical documents such as typed letters and documents, photocopied materials, receipts and files, as well as the archiving and retrieval of physical documents from a file cabinet are no longer reliable.

Technology have advanced significantly during the last few years and have permeated nearly every aspect of contemporary culture. These advancements have significantly increased the means available for producing, storing, retrieving, disseminating, safeguarding, keeping, and disposing of records. The 21st century has brought about the proliferation and integration of Software applications into everyday human existence. It has become a part of almost every aspect of human life. No wonder the increasing demand of software commodity has led to the progress of continual research in the areas of delivering quality and effective product (Watts, 2008).

Over the years the software industry has been plagued with detrimental development failure (Gilal et al. 2016), due to over budgeted (cost overrun), late delivery where only 6% of software under development is being delivered on time and on budget (Gilal et al. 2016). There is also poor quality and unsatisfied user's requirement .The failures are sometimes caused by factors which are usually discovered post-mortem, or only after it is too late to change direction. Till date clients continue to get disappointed because of the unsuccessful completion of reliable software related products within their expected time frame. Unfortunately, the development of high-quality products that is as a result of the effective utilization of electronic records management skills is not cost effective. Sometime, due to the lapses in the performance of the team involved in the entire production process, that includes electronic records creation, storage, retrieval, dissemination, protection, retention and disposition skills, final software related products do not meet performance specifications and are not delivered on time. This continues to be a major struggle to companies employing the paperless system of operations.

Quite a number of past studies have attributed the decrease in delivering successful software related projects at the right time to human factor issues (Capretz & Ahmed, 2010; Gilal et al., 2014). Researchers have shown that human resources have a direct impact in the successful delivering of product (Tsol, 2011) and that human factors are very critical to any project development process than technical factors (Constantine, 2001; Cruz et al. 2018; Gilal et al. 2017). Many research works have been carried out on team formation, team composition, task scheduling, personnel resources, software skills, resource allocation, assigning roles and roles formation (Baykasoglu et al, 2007; Wi et al, 2009; Chi and Cheng, 2009; Egwali and Otokiti, 2019) in the quest to find out the major keys to successful software projects. As the cost of paperless related operations and project development continues to soar, management need to pay more attention to control the progress of the entire development processes.

Research have highlighted that the personality factor of human impacts the overall performance of any software development team and this have an important influence on any team performance (Capretz, 2014). Thus far, ineffective software team composition and team assignments have become recognized as a prominent cause of software project failures (Gilal et al. 2017). Assigning the appropriate roles to software practitioners has become a central issue for improving the quality of software processes (Omar et al. 2015).

A number of frameworks and models have been proposed with diverse techniques and solutions for composing effective teams (Gilal et al., 2014; Omar et al., 2011). Based on the best of researchers' knowledge, personality based team composition by using complex network approaches is weakly explored. It is a fact in human psychology that one cannot generalize individual behaviors or personalities of team member. Personality is an element of human behavior and composed complex in nature. According to González et al. (2012), personality is "a system comprising of many intermingling units whose collective behavior cannot be elucidated

from the behavior of the individual units". Similarly, any paperless project team consists of quite a number of members to behave like a single unit.

Consequently, researchers have shown an increased interest in the methods for team member selection and roles assignment, especially while selecting a team leader for a specific paperless or software project (Gilal et al. 2016). Team formation always start with allocating a project leader for each project, which then end up with allocating the other human resources. Focusing on this fact, this study's intention is to investigate the correlation of leadership traits and other personality team traits by using network measures. The main objectives are:

- To establish the team most favorable communicative leadership traits among team members
- To establish the correlation between leadership traits and other team members personality traits

RELATED WORKS

Duncan et al. (2004) developed a multi-objective optimization model. Competencies of developers were modeled using a categorical variable with five levels. Competency levels were associated with expected productivities per day, and expected numbers of defects per unit of productivity. Chien and Chen (2008) designed a model to recruit the right talents most suitable for a particular organization. Downey (2008) proposed an artifact-oriented approach for building improved job descriptions for teams based on roles in software development. Otero et al (2009) presented a methodology to assign resources to tasks when optimum skill sets are not available. The methodology took into account existing capabilities of candidates, required levels of expertise, and priorities of required skills for the task. Gutjahr et al. (2010) presented a model for project selection and resource allocation while focusing on increasing the competences of the staff through experience.

Andre et al. (2011) developed a model to define several software development job positions and associated each position with a set of required skills. The positions were ordered in a hierarchical fashion, and a number of human resources with the needed skills were mapped to the positions to form a team. Gilal et al. (2017) proposed a technique which includes a set of 24 decision rules for finding effective team resources. The model developed was composed of three predictors: team role, personality types, and gender variables; to highlight the appropriate personality profile for software developers.

Apparently not much work have been carried in establishing the correlation of leadership traits and other personality team traits in the software project domain.

METHODS

To achieve the study objective, the research design adopted for this study was the survey research design. Specifically, the design is an online opinion survey since the researcher sought the perceptions of participants. The instrument used in the study is a questionnaire uploaded into Google Forms. The questionnaires were distributed online via respondents' Gmail accounts using Google forms. The data collection experiments were conducted on 32 (dataset) Computer Science students of the National Open University of Nigeria (NOUN).

The study adopted the Role Assignment Methodology for Software Engineering Teams, a technique that relates personality, abilities and team roles in a software related activity. RAMSET consist of a set of personality tests, a sociometric technique and the use of role theory in Software Engineering Developing Team Projects. RAMSET steps consists of: i) Survey for abilities and skills; ii) Implementation of Personality Tests; iii) Execute Personal Interviews; iv) Implementation of the Sociometric Technique; v) Assignment of Team Roles; and vi) Follow up of Team Role fulfillment (Martínez et al., 2010). The RAMSET methodology begins with a survey instrument itemizing related courses in computer science the students have taken, to recognize his or her area of expertise. It was used to ascertain the impact of role assignment methodology on the personality preferences of paperless related activity based on role. Questions relating to students likes, academic goal, present personal academic assessment, relationship with others, desired participatory role in a team assignment and their desired team leader traits were proffered. The satisfactory (confidence) level of each collated data was established.

Next the MBTI Personality Type Test (Myers et al., 1998) was used to extract the leadership traits of respondents. MBTI is a widely used personality inventory based on psychological theories and often used to understand and discover different normal human personalities that is applicable in a variety of applications. MBTI was used to analyse how respondents usually feel or act based on 26 items and to ascertain which word meaning in a set of 24 pairs appeals to them more (24 items).

MBTI uses pairs of opposing concepts to identify how introverted or extroverted, intuitive or sensing, thinking or feeling, and judging or perceiving an individual is. Combinations based on these four categories of type preferences result in the following 16 different personality types shown in table 1:

Table 1: MBTI 16 Personality Types

1	ISTJ	Introverted Sensing with Thinking	9	ISFJ	Introverted Sensing with Feeling
2	INFJ	Introverted Intuition with Feeling	10	INTJ	Introverted Intuition with Thinking
3	ISTP	Introverted Thinking with Sensing	11	INFP	Introverted Feeling with Intuition
4	ISFP	Introverted Feeling with Sensing	12	INTP	Introverted Thinking with Intuition
5	ESTP	Extraverted Sensing with Thinking	13	ENTP	Extraverted Intuition with Thinking
6	ESFP	Extraverted Sensing with Feeling	14	ESFJ	Extraverted Feeling with Sensing
7	ENFP	Extraverted Intuition with Feeling	15	ENTJ	Extraverted Thinking with Intuition
8	ESTJ	Extraverted Thinking with Sensing	16	ENFJ	Extraverted Feeling with Intuition

Network analysis was employed, in which personality type were position as nodes and confidence level as weights. The derived network was a weighted as one-mode network, due to the fact that some nodes have similar capabilities and properties.

This study also adopted the Opsahl's et al. (2010) measures of node centrality in weighted networks. Opsahl's et al. (2010) approach was adopted because of the need for centrality measures that integrate both the number of node/ties and their respective weight, thus generating possibilities for the relative importance of each to be specified as required as is always the case in the original measures. Three measuring metrics were posited: Weighted degree centrality, Closeness centrality and Betweenness centrality see equations 1 to equation 3.

$$C_D^{w\alpha}(i) = k_i \times \left(\frac{s_i}{k_i} \right)^\alpha = k_i^{(1-\alpha)} \times s_i^\alpha \quad (\text{equ. 1})$$

$$C_D^{w\alpha}(i)$$

Equation 1 denotes Closeness centrality where denotes weighted degree centrality, α is a positive tuning parameter that is set according to the research data. If α is set above 1, a low degree is favorable, else if α is between 0 and 1, then having a high degree is taken as favorable, i is the focal node, k_i denotes node k , s_i denotes the weighted network, where w is the weighted adjacency matrix.

$$C_C^{w\alpha}(i) = \left[\sum_{j=1}^N d^{w\alpha}(i, j) \right]^{-1} \quad (\text{equ. 2})$$

Equation 2 denotes betweenness centrality while equation 3 denotes Betweenness centrality with parameters as defined in Opsahl's et al., (2010). Closeness centrality was defined 'as the inverse sum of shortest distances to all other nodes from a focal node'.

$$C_B^{W\alpha}(i) = \sum_J^N \sum_K^N \frac{g_{jk}^{W\alpha}(i)}{g_{jk}^{W\alpha}} \quad j \neq k \quad (\text{equ. 3})$$

Betweenness, assess the degree to which a node lies on the shortest path between two other nodes, and are able to funnel the flow in the network. In so doing, a node can assert control over the flow.

RESULTS AND DISCUSSION

Figure 1 shows a sample sociogram overview of the structure net of interpersonal relationships that resulted in the group survey applying the sociogram technique. The Results of the most favored leadership traits and effective triggering communication traits are presented in Table 2:

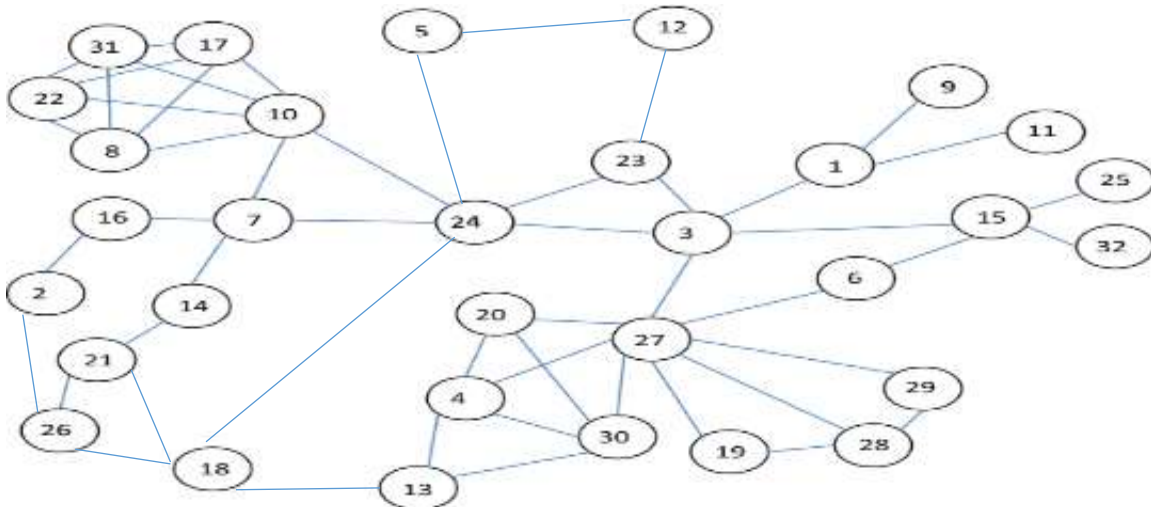


Figure 1. Sociogram Overview.

Table 2: The Results of the most favored leadership traits and effective triggering communication Traits

Personality Type	Weighted degree centrality			Closeness centrality			Betweenness centrality			
	$\alpha = 0$	$\alpha = 0.5$	$\alpha = 1$	$\alpha = 0$	$\alpha = 0.5$	$\alpha = 1$	$\alpha = 0$	$\alpha = 0.5$	$\alpha = 1$	
1	ISTJ	3	23.71	30	1	2	4	0.032	0.039	0.023
2	INFJ	7	49.26	90	9	1	2	0.033	0.035	0.045
3	ISTP	3	22.51	45	24	36	24	0.041	0.034	0.043
4	ISFP	9	44.16	110	6	18	24	0.043	0.040	0.041
5	ESTP	4	21.33	50	10	15	53	0.047	0.032	0.038
6	ESFP	7	51.11	100	6	3	0	0.045	0.037	0.027
7	ENFP	6	33.88	70	16	12	17	0.042	0.041	0.032
8	ESTJ	5	33.22	60	5	3	0	0.038	0.033	0.028
9	ISFJ	7	46.21	90	18	22	41	0.045	0.033	0.044
10	INTJ	5	31.18	55	25	18	16	0.034	0.035	0.031
11	INFP	9	48.24	120	11	9	13	0.028	0.047	0.033
12	INTP	4	21.33	55	3	5	2	0.032	0.046	0.041
13	ENTP	3	24.44	20	9	16	13	0.034	0.038	0.042
14	ESFJ	6	36.21	65	4	1	4	0.032	0.041	0.029
15	ENTJ	6	31.43	85	23	22	27	0.041	0.033	0.044
16	ENFJ	3	27.58	40	1	6	5	0.032	0.048	0.037

Weighted degree centrality was used to establish the strong personality tie based on degree and strength. This metrics helps to determine the team most favorable leadership traits among team members. From the results as shown in table 2, for the Weighted degree centrality $\alpha= 0$, leadership traits INTJ and ENTP were the most favorable leadership traits the respondents appreciated. This is not surprising because the INTJ personality trait lead with vision, rationality, and determination. Similarly, ENTP traits are strategic, enterprising and competitive leaders. They also have a knack for entrepreneurship and they endeavor to challenge themselves and persistently grow. Whereas, ISTJ, and ISTP were the least fouvorable traits admired in a team leader. For ISTJ, such personality traits can get caught up in the details of an issue that they lose sight of the big picture. They can also have difficulty taking into account the emotions and needs of team members. ISTP sometimes can struggle with seeing a long-term for the team.

In the Weighted degree centrality $\alpha = 0.5$, leadership traits ESFP was mostly favored. ESTPs are charismatic, effective, and fun-loving leaders. They are outstanding at searching and discovering opportunities and taking advantage of such opportunities quickly. They are also skilled troubleshooters and inspiring speakers. However, INTP is the least favoured as this personality traits are extremely independent, and will tire of leadership positions that put them in crowded rooms and at the mercy of other people's schedules and whims. They like leading in the background through submissions from others and with sufficient space to think creatively.

Closeness centrality was used to establish leadership traits that can flow very well in leading a team, such personality traits easily endears the leader to others in the team, which results in a close bond. From the study ESTP at Closeness centrality $\alpha = 0$, was found to be very effective. These personality traits are masters at solving problems on the fly and confronting adversity with courage and optimism. The ESTP also like to be as logical as possible when making decisions. They also tend to identify how to present plans logically in a way that motivate others.

Betweenness centrality was used to establish the personality type that is very effective at triggering communication within team members, a trait which is very effective at bridging the diversified personality traits inherent in a team. From the study, it was discovered that ISTP personality trait is highest in betweenness centrality ($\alpha = 0.5$) among all sixteen leadership traits a frequency of 41. An ISTP trait exhibits a quiet and observant disposition and is a very effective leader. Their open-mindedness and focus on realistic opportunities, tactics for success and plans makes them good communicators. The ISTP personality trait is followed by ENTJ with a betweenness centrality frequency of 24. Such personality traits inspires the people around them, also their rational logic and swift decisiveness makes them the most driven and intensely focused. Furthermore, during decision making, they always focus on what will work logically and most effectively in the long run. However, the least were INFJ and ESFJ.

CONCLUSION

Several studies have highlighted the increasing demand of paperless related commodities which and facilities which have led to the progress of continual research in the areas of delivering quality and effective product. These complexities of the paperless operational environment demand the effective amalgamation of different personality profiles. Researchers have shown an increased interest in the methods for team member selection, especially while selecting a team leader for a specific paperless or software project. Team formation always start with allocating a project leader for each project, which then end up with allocating the other human resources. Focusing on this fact, this study investigated the correlation of leadership traits and other personality team traits by using network measures. Degree centrality, betweenness centrality, and closeness centrality metrics measures were used to measure and establish a team most favorable communicative leadership traits and the correlation between leadership traits and other team members' personality traits.

REFERENCES

Andre M., Baldoqui M. G., & Acuna S. T. (2011). Formalmodel for assigning human resources to teams in software projects. *Information and Software Technology*, 53(3), 259-275.

- Baykasoglu A., Dereli T., & Das S. (2007). Project team selection using fuzzy optimization approach. *Cybernetics and Systems*, 38(2) 155–185.
- Capretz, L. F., & Ahmed, F. (2010). Making sense of software development and personality types. *IT Professional*, 12(1), 6–13.
- Capretz L. F. (2014). Bringing the human factor to software engineering. *IEEE Software*, 31(2). 102-104. DOI: 10.1109/MS.2014.30.
- Chi, Y. L., & Chen, C. Y. (2009). Project teaming: Knowledge -intensive design for composing team members. *Expert Systems with Applications*, 36, 9479–9487.
- Chien C., & Chen L. (2008). Data mining to improve personnel selection and enhance human capital: A case study in high-technology industry. *Expert Systems with Applications* 34, 280–290.
- Constantine L. (2001). *People ware Papers: The Notes on the Human Side of Software*. Prentice-Hall.
- Cruz S., da Silva F. Q. and Capretz L. F. (2018). Forty years of research on personality in software engineering: A mapping study. *Computers in Human Behavior*. 46:94-113. DOI: 10.1016/j.chb.2014.12.008.
- Duncan, P. C., Rouse, W. B., Johnston, J. H., Cannon-Bowers, J. A., Salas, E. and Burns, J. J. (2004). Training teams working in complex systems: a mental model-based approach, in W. B. Rouse (ed.), *Human/Technology Interaction in Complex Systems*, vol. 8 (Greenwich: JAI Press), 173 – 231
- Egwali A. O. and Otokiti K. O. (2019). Enhancing Personnel Selection Criteria for Software Project Development via Probability Modeling. *Journal of the Nigerian Association of Mathematical Physics*. 9, 395 – 400.
- Gilal A. R, Jaafar J., Omar M., Basri S., & Waqas A. (2016). A rule-based model for software development team composition: Team leader role with personality types and gender classification. *Information and Software Technology*. 2016; 74:105-113
- Gilal A. R, Omar M., Jaafar J., Sharif K. I., Mahesar A. W. and Basri S. (2017). Software Development Team Composition: Personality Types of Programmer and Complex Networks. In: 6th International Conference on Computing and Informatics (ICOICI-2017). 2017. p. 153–159
- Gilal A. R., Omar M., Sharif K. I. (2014). “A rule-based approach for discovering effective software team composition. *Journal of Information Communication Technology*, 13:1–20.
- González-Carrasco I., Colomo-Palacios R., López-Cuadrado J. L. and García-Peñalvo F.J. (2012). SEffEst: Effort estimation in software projects using fuzzy logic and neural networks. *International Journal of Computational Intelligence Systems*, 5(4), 679-699.
- Gutjahr W. J., Katzensteiner S., Reite, P., Stummer C., and Denk M. (2010). Multiobjective decision analysis for competence-oriented project portfolio selection. *European Journal of Operational Research*, 205, 670–679
- Downey J. (2008). An artifact-centric method for creating software job descriptions. In *Proceedings of the 2008 ACM SIGMIS CPR conference on Computer personnel doctoral consortium and research*, ACM. pages 12 - 21.
- Kissell, J. (2013). Embracing the nearly paperless future. *Macworld*, 30(10), 76-77. [Http://connectionebsscohost.com/c/articles/90183419/embracing-nearlypaperless-future](http://connectionebsscohost.com/c/articles/90183419/embracing-nearlypaperless-future).

- Martínez, L. G., Licea, G., Myers, I. B., McCaulley, M. H., Quenk, N. L., & Hammer, A. L. (1998). *MBTI manual: A guide to the development and use of the Myers-Briggs Type Indicator (Vol. 3)*. Consulting Psychologists Press.
- Myers, I. B., McCaulley, M. H., Quenk, N. L., & Hammer, A. L. (1998). *MBTI manual: A guide to the development and use of the Myers-Briggs Type Indicator (Vol. 3)*. Consulting Psychologists Press.
- Omar, M. (2012). The effectiveness of an agile software methodology: empirical evidence on humanistic aspects (Doctoral dissertation, Universiti Teknologi MARA), 2012. 43(3), 264-295.
- Omar, M., Katuk N., Abdullah S. L., Hashim N. L., Romli R. (2015). Assessing Personality Types Preferences Amongst Software Developers: A Case Of Malaysia. *ARPN Journal of Engineering and Applied Sciences*, 10(3), 1499–1504.
- Opsahl, T., Agneessens, F., & Skvoretz, J. (2010). Node centrality in weighted networks: Generalizing degree and shortest paths. *Social Networks*, 32(3), 245–251.
- Otero, L. D., Centeno, G., Ruiz-Torres, A. J., & Otero, C. E. (2009). A systematic approach for resource allocation in software projects. *Computers and Industrial Engineering*, 56, 1333–1339.
- Rodríguez-Díaz, A., & Castro, J. R. (2010). Experiences in software engineering courses using psychometrics with RAMSET. *Proceedings of the Fifteenth Annual Conference on Innovation and Technology in Computer Science Education-ITiCSE 10*, 244. doi:10.1145/1822090.1822159.
- Tsoi H. R. (2011). Using Analytic Hierarchy Process (AHP) Method to Prioritise Human Resources in Substitution Problem. *International Journal of the Computer, The Internet and Management*, 9(1) 5-7.
- Watts S. H. (2008). The Software Quality Challenge. *CROSSTALK, The journal of Defense Software Engineering*, 21(6).
- Wi H., Oh S., Mun J., & Jung M. (2009). A team formation model based on knowledge and collaboration. *Expert Systems with Applications*, 36(5), 9121–9134. doi:10.1016/j.eswa.2008.12.031.