

# Predicting Most Productive Requirements Elicitation Teams using MBTI Personality Traits Model

M. Aqeel Iqbal, Asadullah Shah, Tehmina Karamat ullah Khan

**Abstract** –The social and collaborative nature of requirements elicitation process bases its core dependency on aptitude, attitudes, and personality characteristics of its participants. The participant’s personality characteristics are directly related with their personality traits, which can be categorized using different personality assessment models. The MBTI personality assessment model has been used successfully for the assessment of personality of software engineers since last few decades. In this article, the personality traits for requirements elicitation teams have been predicted using MBTI personality assessment model, on the basis of their industry demanded job descriptions/tasks and major soft skills. The article presents a complete personality prediction process using a systematic approach based on major soft skills mapping with job descriptions, personality attributes and personality traits. The obtained results show that extraversion and feeling personality traits are the most suitable personality traits for requirements analysts/engineers who are assigned the task of requirements elicitation. The obtained results are very much aligned with the already published scholar’s work for software engineer’s personality assessment and development team composition.

**Keywords** – Requirements Elicitation, RE Teams Personality, Requirements Analyst Personality, MBTI Personality Traits, Personality Traits, Personality traits Prediction

## I. INTRODUCTION

Requirements Elicitation is considered as one of the most important processes carried-out during requirements engineering phase. The requirements elicitation is first stage of requirements engineering process in which product requirements are gathered from its intended users by using different types of elicitation techniques. The requirements elicitation team is responsible to explore the sources of requirements and identify the product stakeholders [1]. The team is also responsible to select an appropriate elicitation technique and elicit the requirements, negotiate with users to resolve the requirements conflicts. At the end, the team notes the elicited requirements to make initial requirements notebook that will be later on converted into formal requirements specifications document.

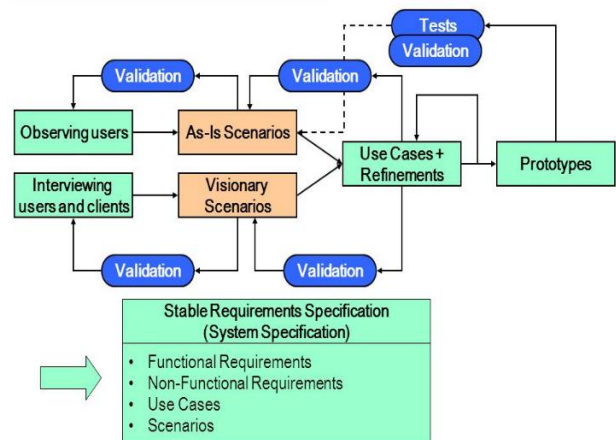
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Consider the figure-1, which represents the inner process of requirements elicitation along with all of its internal stages and tasks. The complete process of requirements elicitation is highlighted from left to right direction in the figure to show the sequence of activities carried-out. Initially the requirements elicitation team uses appropriate elicitation techniques like structured or unstructured interviews of users and clients to gather the requirements from the product users. Similarly, sometimes it becomes necessary to apply and active or passive observations based techniques to understand the user requirements. If analysts use observation based techniques to gather the requirements, then the user stated stories are transformed into As-Is-Scenarios to extract the use cases from them for further modeling of functional requirements.



**Figure-1: Requirements Elicitation Process**

However, if the analyst use interview based elicitation techniques, then the users descriptions are translated into analyst based visionary scenarios to extract the use cases from them for further modeling of functional requirements. In both cases, the obtained use cases are iteratively analyzed and mapped with system requirements to refine them to get concrete function requirements with precise scope. As-Is-Scenarios are then mapped with observations while Visionary Scenarios are mapped with interviewed contents to perform their cross validation. Similarly, the use-cases obtained are also validated with As-Is-Scenarios or Visionary Scenarios depending upon they were obtained from either observations or interviews.

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Once the use cases have been finalized for initial iterations, the complicated candidate use-cases are prototyped to clarify their objectivity and functionality. Sometimes all internal scenarios of use-cases are prototyped but sometimes only selected internal scenarios are prototyped depending upon the criticality and complexity of use-cases. Prototypes are then tested and validated with As-Is-Scenarios, which also compensate for visionary scenarios. This process of requirements elicitation works iteratively with each successive iteration better finalizing the requirements than its predecessor iteration. During this iterative process of requirements elicitation, we get functional requirements, non-functional requirements, product use-cases and scenarios. The obtained functional requirements, non-functional requirements, use-cases and scenarios later on become the part of software requirements specifications document. The process of requirements elicitation is full of different kinds of human centered tasks and activities. The researchers and practitioners have developed many requirements elicitation techniques in order to cater the effective requirements elicitation process [2]. The requirements elicitation techniques are envisioned to provide a way and guidance for both the elicitor and other stakeholders in requirements elicitation process in order to avoid the “blank slate syndrome”. The requirements elicitation techniques can be categorized as traditional techniques, cognitive techniques, group techniques and contextual techniques with respect to their context of conduct [3].

The **traditional techniques** are those generic techniques, which remained in use in software engineering since its inception, even when the process of requirements elicitation was not well known. These techniques have been adopted in software engineering from other domains of engineering and social sciences. The most commonly used traditional techniques may include interviews, questionnaires, task analysis, domain analysis and introspection. The **cognitive techniques** include a series of techniques originally developed for knowledge gathering. These techniques aim to elicit requirements by representing and structuring the knowledge of stakeholders in terms of how they see both the problem and solutions domains. The most commonly used cognitive techniques may include card sorting, laddering and repertory grids. The **group techniques** aim to foster stakeholder agreement and buy-in, while exploiting team dynamics. They typically require various stakeholders working together in order to generate ideas and specifications for the target system. The most commonly used group techniques may include brainstorming, requirements workshop, focus groups and group meetings. The **contextual techniques** have been utilized for the requirement elicitation as an alternative to both traditional and cognitive techniques. These techniques focus on requirements gathered directly from the context in which the target system will eventually exist in real-life. The most

commonly used contextual techniques may include ethnography, observation, protocol analysis and prototyping.

**Myers-Briggs Type Indicator (MBTI)** is a self-report catalogue being designed to recognize the personality type of a person, his/her strengths, and aptitude preferences. The MBTI questionnaire was originally developed by Isabel Myers and her mother Katherine Briggs based on their research work with Carl Jung's theory of personality types [4]. The MBTI personality traits classification is based on recognition of four major groups of oppositely paired personalities. These four groups include Extrovert vs Introvert, Sensing vs. Intuition, Thinking vs. Feeling and Judging vs. Perceiving as is shown in figure-2.



**Figure-2: MBTI Personality Traits**

In this personality assessment scheme, each pair defines an aptitude orientation of a person towards his natural tendency of actions and response in daily life activities [5]. Hence, each pair of traits defines a scaled value of attitude orientation of a person like more extrovert or less extrovert. The attitude of being a less extrovert personality is refereeing to an introvert personality. Similarly remaining all pairs define a different set of personality attitudes and their inclination towards more or less value in the pair [4, 5]. If we look at the figure-2 given below, we can see that extrovert (E) vs introvert (I) personality traits pair refers to the aspect of “Where you get your energy”. In addition, the extrovert personality refers to aspect of “Talk it out” while its counterpart introvert refers to aspect of “Think it through” to get their energy. Similarly, the next personality traits pair is sensing (S) vs Intuition (N) that refers to the aspect of “How you take in information”. In addition, the sensing personality refers to “Specifics” while intuition personality refers to “Big picture” to take their information from different sources. Similarly, the next personality traits pair is thinking (T) vs feeling (F) that refers to the aspect of “How you make decisions”.

In addition, the thinking personality refers to “Logical implications” while feeling personality refers to “Impact on people” to take make their decisions for different aspects of life. Similarly, the next personality traits pair is judging (J) vs perceiving (P) that refers to the aspect of “How do you organize your life”. In addition, the judging personality refers to “Joy of closure” while perceiving personality refers to “Joy of processing” to take organize their different aspects of life matters and tasks.

The four pairs of personality traits give rise to sixteen possible different personalities of humans and defines their unique aptitude towards daily life activities. These sixteen possible combinations of personality traits can be used to define a full set of habits, attitude and aptitude of persons [6, 7]. Each group of traits contains either extrovert or introvert, sensing or intuition, thinking or feeling and judging or perceiving traits. Figure shows that the ISTJ people are factual, practical, organized and steadfast. The ISFJ people are detailed, traditional, service minded and devoted. The INFJ people are committed, creative, determined and idealistic. Similarly, all other personality combinations have been highlighted with their personality characteristics, which distinguish them from other personalities. Hence, according to this personality traits model, each of these sixteen categories of human personalities have certain different attributes or characteristics, which makes them different from others [8, 9].

## II. RE JOB DESCRIPTIONS AND SOFT SKILLS RECOMMENDED BY INDUSTRY

Consider the table-1, which represents a comprehensive list of job descriptions for the post of requirements analyst/engineer. This list of job descriptions for analyst has been taken from Capretz et al. (2010) who dissected the different job portrayals for software engineers being advertised in famous newspapers, magazines and industry standard job portals [10]. This list includes 11 major job tasks that are supposed to be performed by requirements engineer during his work in software development projects. Each job description has been assigned a unique code to further process these tasks during statistical analysis of personality traits based on soft skills. For example, the first unique code J01 represents the job description of “Extensive liaison with clients”; J02 represents the job description of “Client’s existing systems analysis” up to code J11 that represents job description of “Maintaining updated status of knowledge about industry practices”. In this table, the job descriptions have been placed randomly from J01 to J11 without any criticality or prioritization. Hence job description with code J01 is not necessarily high priority or critical than job description with code J11. Similarly, all other job descriptions ranging from J01 to J11 have been placed in this table just randomly without any priority criteria or industry ranking.

**Table-1: “Job Descriptions” for Requirements Analyst/Engineer [10]**

S#	Job/Task Descriptions	Assigned Code
01	Extensive liaison with clients	J01
02	Client’s existing systems analysis	J02
03	Client’s requirements translation into project briefs	J03
04	Potential solutions identification and assessment	J04
05	Proposing logical and innovative system solutions for users	J05
06	Suggesting proposals for system modifications/replacements	J06
07	Working on system/software feasibility reports	J07
08	Working with developers and users to build an acceptable product	J08
09	Supervising new system development	J09
10	Keeping work aligned with planned deadlines	J10
11	Maintaining updated status of knowledge about industry practices	J11

Consider the table-2, which represents a comprehensive list of major soft skills being desired in software engineers by software industry during different stages of software development life cycle. This list of soft skills required by software industry has been taken from article authored by Capretz et al. (2010) who dissected the different job portrayals for software engineers being advertised in famous newspapers, magazines and industry standard job portals [10].

**Table-2: Major “Soft Skills” Required in Software Engineers [10]**

S#	Soft Skill Description	Assigned Code
01	Communication Skill	S01
02	Interpersonal Skills	S02
03	Analytical & Problem-Solving Skills	S03
04	Open and Adaptable to Changes	S04
05	Organizational Skills	S05
06	Team Player Skills	S06
07	Ability to Work Independently	S07
08	Active Listener Skills	S08
09	Innovative Mind	S09
10	Pay through and Acute Attention to Details	S10
11	Fast Learner Skills	S11

In this table, there are 11 major desired soft skills for software engineers as per software industry advertisements on different job portals and highlighted by authors of different software requirements engineering books. Each soft skill has been assigned a unique code for its further use during statistical analysis of these soft skills and personality traits. For example, the soft skill of “Communication Skill” has been assigned a code of S01. Similarly, the soft skill of “Interpersonal Skills” has been assigned a code of S02. Similarly, all other soft skills have been assigned unique codes ranging from S01 up-to S11. It should be noted that in this table, the soft skills have been listed down randomly without any ranking or priority based criteria. Hence the soft skill with code S01 is not necessarily a high priority or more critical than S02 or S03 etc.

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Similarly, all other soft skills ranging from S01 to S11 have been placed in this table just randomly without any priority criteria or industry ranking.

### III. MAPPING JOB DESCRIPTIONS WITH SOFT SKILLS AND PERSONALITY TRAITS

Consider the table-3, in which industry demanded soft skills have been mapped on industry demanded job descriptions for requirements engineer/analyst. In this table, the columns represent the different soft skills ranging from S01 up-to S11 while rows represent the job descriptions ranging from J01 up-to J11. The each job description has been analyzed critically and the relevant soft skills have been mapped on it to see about which skills are required to perform that job description. For example, the table shows that soft skills of S01 and S02 are required in requirements engineers to perform their job task of J01 successfully. Similarly, the soft skills of S03, S08 and S10 are required in requirements engineers to perform their job task of J02. Similarly, all other job descriptions ranging from J01 up-to J11 have been critically analyzed and the soft skills ranging from S01 up-to S11 have been mapped on them to find the most relevant soft skills required by each job description.

**Table-3: Mapping “Soft Skills” with “Job Descriptions” for Requirements Analyst**

JDs	Recommended “Soft Skills” for Requirements Analysts By Software Industry										
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
J01	Y	Y	-	-	-	-	-	-	-	-	-
J02	-	-	Y	-	-	-	-	Y	-	Y	-
J03	Y	Y	-	-	-	-	-	-	-	-	-
J04	-	-	-	-	-	-	-	-	Y	Y	-
J05	-	-	Y	-	-	-	-	-	Y	Y	-
J06	Y	-	-	Y	-	-	-	-	-	-	Y
J07	Y	-	-	-	-	-	-	-	-	-	-
J08	Y	Y	-	Y	-	Y	-	Y	-	-	-
J09	-	Y	-	-	Y	-	-	-	-	-	-
J10	-	-	-	Y	Y	-	Y	-	-	-	-
J11	-	-	-	Y	Y	-	-	-	-	-	-
	5	4	2	4	3	1	1	2	2	3	1

The last row of this table shows the total count/frequency of appearance of each soft skill in performing all these 11 job descriptions by requirements engineers. According to this table, the soft skill of S01 is required to perform five different job tasks of requirements engineer out of total 11 job tasks. Similarly, the soft skill of S02 is required to perform four different job tasks of requirements engineer out of total 11 job tasks. Similarly, all other soft skills ranging from S01 up-to S11 have been analyzed and mapped on different job tasks ranging from J01 up-to J11 and in the last row the total count/frequency of appearance of each soft skill in these 11 job tasks have been shown.

Consider the table-4, which initially describes the personality characteristics for each of above soft skills ranging from S01 up to S11 and later on, it maps these characteristics on MBTI personality traits [11, 12, 13]. For example, the soft skill of S01 demonstrates the personality characteristics of “Social and Talkative”. It means that a persona having these characteristics of being social and talkative would have soft skill of S01. Similarly, the soft

skill of S02 demonstrates the personality characteristics of “Social and Talkative”. It means that a persona having these characteristics of being social and talkative would have soft skill of S02. Similarly, all soft skills ranging from S01 up to S11 have been mapped on their relevant personality characteristics.

**Table-4: Relating “Soft Skills” with “MBTI Traits”**

Soft Skills	Related Personality Characteristics	Related MBTI Trait
S01	Sociable, Talkative	Extraversion
S02	Sociable, Talkative	Feeling
S03	Solution Oriented, Analytical	Thinking
S04	Enquiring, Curious, Willing to Learn	Perceiving
S05	Organized, Responsible, Business like	Judging
S06	Helpful, Unselfish, Cooperative	Feeling
S07	Imaginative, Intelligent, Analytical	Intuition
S08	Sociable, Interactive	Feeling
S09	Creative, Inventive, Innovative	Intuition
S10	Analytical, Investigative	Sensing
S11	Curious, Willing to Learn	Perceiving

After mapping these soft skills on their relevant personality characteristics, the remapping of these personality characteristics have been performed to find out their relevant MBTI personality traits. For example, the soft skill S01 is initially mapped to its relevant personality characteristics of being social and talkative and then these personality characteristics have been mapped to MBTI traits to conclude that extraversion personality contains these characteristics. The table shows that S01 is related to Extraversion, S02 is related to Feeling, S03 is related to Thinking, S04 is related to Perceiving, S05 is related to Judging, S06 is related to Feeling, S07 is related to Intuition, S08 is related to Feeling, S09 is related to Intuition, S10 is related to Sensing and S11 is related to Perceiving.

### IV. PREDICTING SUITABLE PERSONALITIES FOR REQUIREMENTS ENGINEERING TEAMS

Consider the table-5, which shows the total frequency distribution and ranking of personality traits for requirements engineer. From the table it can be seen that, soft skill S01 appeared in five different job descriptions for requirements engineer while it relates to extraversion personality trait. Similarly, the soft skills S02 and S04 appeared in four different job descriptions for requirements engineer while they relate to feeling and perceiving personalities. Similarly, all soft skills ranging from S01 up to S11 have been placed in a descending order from left to right along with their related personality trait. In the second part of this table, total frequency of appearance of each personality traits have been calculated by taking union of same personality traits occurring through different soft skills. These personality traits have been placed in this lower part of table from left to right in a descending order. Hence, extraversion personality trait has been found with maximum frequency of appearance of 6/11 for requirements engineer. Similarly, the feeling personality trait has been found with next lowest frequency of appearance of 5/11.

**Table-5: Ranking of Personality Traits for Requirements Analyst**

Frequency Distribution Assessment of Personality Traits					
Frequency Distribution of Soft Skills & Their Personality Traits	S1 = 5	S2 = 4 S4 = 4	S5 = 3 S10 = 3	S3 = 2 S8 = 2 S9 = 2	S6 = 1 S7 = 1 S11 = 1
	E	F, P	J, S	T, F, I	F, I, P
Ranking of Personality Traits					
Accumulated Frequency Based Ranking of Personality Traits	Highest Trait	Intermediate Traits			Lowest Trait
	E (6/11)	F (5/11)	P (4/11)	J (3/11) S (3/11) I (3/11)	T (2/11)

Similarly, all other traits have been placed in a descending order from left to right for requirements engineer. It can be seen from this table-5 that extraversion and feeling personality traits are the most dominating and appropriate personality traits for job of requirements engineer as compared to other traits. Hence, the companies should try to hire those software engineers for task of requirements engineering who have personality traits of extraversion and feeling as most dominating traits. Persons with these traits have better potential to perform system analysis and requirements gathering tasks. It has also been highlighted by many other researchers who have worked on personality aspects of software engineers according to software development tasks [14, 15].

## V. CONCLUSION

The requirements elicitation process involves the most frequent collaborations and cross-sectional interactions among requirements elicitation team members and product stakeholders, during their information sharing conversations. The collaborative nature of this process defines its primary dependency on the personality traits of its participants. If we use the personality assessment models at an early stage of requirements elicitation process to select the most suitable productive software engineers as elicitation team members, it can contribute positively for improvement of requirements elicitation process. This article attempts to devise a method for prediction of personality traits of requirements elicitation team members using MBTI personality assessment tool through a systematic approach. The results obtained show that extraversion and feeling personalities are most suitable personalities to perform requirements elicitation task during requirements engineering phase. These results are very much in accordance with already obtained results by research community involved in the assessment of personality factors and traits for software engineers. The alignment of obtained results justifies the originality and authenticity of personality prediction method used in this article for assessment of personality traits of software engineering roles. The used personality prediction method can be integrated in requirements elicitation tools to

nominate the most suitable requirements elicitation team members at early stages of requirements engineering phase.

## REFERENCES

- Lane, S., O'Raghallaigh, P., & Sammon, D. (2016). Requirements gathering: the journey. *Journal of Decision System*, 25 (sup1), 302-312.
- Wong, L. R., Mauricio, D. S., & Rodriguez, G. D. (2017). A Systematic Literature Review about Software Requirements Elicitation. *Journal of Engineering Science and Technology*, 12(2), 296-317.
- Niknafs, A., & Berry, D. (2017). The impact of domain knowledge on the effectiveness of requirements engineering activities. *Empirical Software Engineering*, 22(1), 80-133.
- Yilmaz, M., O'Connor, R. V., Colomo-Palacios, R., & Clarke, P. (2017). An examination of personality traits and how they impact on software development teams. *Info and Software Techn.*, 86, 101-122.
- Cruz, S., da Silva, F. Q., & Capretz, L. F. (2015). Forty years of research on personality in software engineering: A mapping study. *Computers in Human Behavior*, 46, 94-113.
- Barroso, A. S., Madureira, J. S., Melo, F. S., Souza, T. D., Soares, M. S., & do Nascimento, R. P. (2016, April). An evaluation of influence of human personality in software development: An experience report. In *Telematics and Information Systems (EATIS)*, 2016 8th Euro American Conference on (pp. 1-6). IEEE.
- Kosti, M. V., Feldt, R., & Angelis, L. (2016). Archetypal personalities of software engineers and their work preferences: a new perspective for empirical studies. *Empirical Software Engineering*, 21(4), 1509-1532.
- Ribaud, V., & Saliou, P. (2015, September). Relating ICT competencies with personality types. In *European Conference on Software Process Improvement* (pp. 295-302). Springer, Cham.
- Calefato, F., Lanubile, F., & Novielli, N. (2017, May). A preliminary analysis on the effects of propensity to trust in distributed software development. In *Proceedings of the 12th International Conference on Global Software Engineering* (pp. 56-60). IEEE Press.
- Capretz, L. F., & Ahmed, F. (2010). Making Sense of Software Development and Personality Types. *IEEE IT Professional Magazine*, 12(1), 6.
- Smith, E. K., Bird, C., & Zimmermann, T. (2016, May). Beliefs, practices, and personalities of software engineers: a survey in a large software company. In *Proceedings of the 9th International Workshop on Cooperative and Human Aspects of Software Engineering* (pp. 15-18). ACM.
- Soomro, A. B., Salleh, N., Mendes, E., Grundy, J., Burch, G., & Nordin, A. (2016). The effect of software engineers' personality traits on team climate and performance: A Systematic Literature Review. *Information and software technology*, 73, 52-65.
- Jia, J., Zhang, P., & Zhang, R. (2015, September). A comparative study of three personality assessment models in software engineering field. In *Software Engineering and Service Science (ICSESS)*, 2015 6th IEEE International Conference on (pp. 7-10). IEEE.
- Ming, T. M., Jabar, M. A., Wei, K. T., & Sidi, F. (2015, December). A preliminary study of personality traits and their influence on software piracy. In *Software Engineering Conference (MySEC)*, 2015 9th Malaysian (pp. 252-258). IEEE.
- Kanij, T., Merkel, R., & Grundy, J. (2015, May). An empirical investigation of personality traits of software testers. In *Proceedings of the Eighth International Workshop on Cooperative and Human Aspects of Software Engineering* (pp. 1-7). IEEE Press.

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