

Assessing Personality Traits in a Large Scale Software Development Company: Exploratory Industrial Case Study

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Selected Company For The Assessment - HUAWEI Turkey Research and Development Center

- Large software development company with around 450 engineers,
- Operates in Turkey over 10 years,
- Appraised as CMMi-DEV Level 5,
- Agile transformation is emerged,
- High interest to improve organizational productivity by receiving more information about software team structures and personality characteristics of teams.

Human Factor in Software Development

- Intellectual abilities and programming experience of practitioners are not considered the only critical factors for a successful software development project.
- Critical emphasize on collaboration with agile and devops
- SD demands social and interpersonal abilities which are influenced by personality traits
- Acknowledging different personality traits in a team may bring many benefits such as;
 - Maximizing productivity,
 - Delivering in a timely and cost-effective manner,
 - Satisfying all stakeholders,
 - Preventing incompatibilities and team conflicts,
 - Forming a team more easily and effectively,
 - Improving team motivation.

Goal & Research Process

- How personality traits were distributed in teams, what would be the potential benefits of visualization of personality traits by radar charts and exploring personality traits by a context-based interactive assessment.
- 110 participants from 18 project teams attended voluntarily with their project team members
- Personality traits were visualized by team radar charts,
- Data were analyzed based on roles, age groups, experience levels of individuals and key performance indicators of project teams,
- Finally, we have performed validation interviews with team leaders and analyzed our preliminary findings with them.

The Big Five Inventory (BFI)

Personality trait is a steady characteristic of human behavior in a wide variety of situations.

- **Extroversion** trait is spotted by engagement with the external world.
- **Agreeableness** trait is related with showing altruistic concern as well as being gentle, helpful and trustful.
- **Conscientiousness** is the tendency to show self-discipline and aim for achievement against outside expectations.
- **Neuroticism** is the tendency to negative emotional experiences and they may show emotionally instable behaviors.
- **Openness to experience** evaluates the tendencies for creativity and curiosity.

<u>Big Five Dimensions</u>	<u>Facet (and correlated trait adjective)</u>
Extraversion vs. introversion	Gregariousness (sociable) Assertiveness (forceful) Activity (energetic) Excitement-seeking (adventurous) Positive emotions (enthusiastic) Warmth (outgoing)
Agreeableness vs. antagonism	Trust (forgiving) Straightforwardness (not demanding) Altruism (warm) Compliance (not stubborn) Modesty (not show-off) Tender-mindedness (sympathetic)
Conscientiousness vs. lack of direction	Competence (efficient) Order (organized) Dutifulness (not careless) Achievement striving (thorough) Self-discipline (not lazy) Deliberation (not impulsive)
Neuroticism vs. emotional stability	Anxiety (tense) Angry hostility (irritable) Depression (not contented) Self-consciousness (shy) Impulsiveness (moody) Vulnerability (not self-confident)
Openness vs. closedness to experience	Ideas (curious) Fantasy (imaginative) Aesthetics (artistic) Actions (wide interests) Feelings (excitable) Values (unconventional)

Interactive Assessment Approach

- It is the only example in the SE field and published on recognized journals,
- It uses contextual questions based on the familiar situations faced at software domain,
- Easy to implement systematic approach for a large-scale company,
- It has interactive game concepts.
- We have translated context cards to Turkish to get more accurate results, and transferred them to an online platform.

Interactive Assessment Approach – cont.

- Participants have answered 60 questions (e.g. 12 questions of each 5 dimensions of Big Five) by selecting one of the two options on each question simultaneously.
- Individual traits are turned into a percentage value by counting the number of answers selected to as the as the first choice,
- For example, if a subject were selected 9 questions as option one of 12 questions that designated agreeableness trait, the agreeableness percentage would be 75%.



Results - Descriptive Analysis of Assessment

- Overall distribution of personality traits of participants were observed as we have given specific ranges,
- On the **Agreeableness** trait 46% of population and the **Conscientiousness** trait 37% of population were at **VH and H ranges**,
- On the **Extroversion** dimension results were at **L and VL ranges** (41%),
- On the **Neuroticism** (33%) and **Openness** (33%) traits results were mostly in the **L and VL ranges**

Letter Grade	Range
Very High	100% - 70%
High	69% - 60%
Medium	59% - 41%
Low	40% - 31%
Very Low	30% - 0%

	Letter Grade Distribution				
	VH	H	M	L	VL
A.	28%	18%	45%	3%	2%
C.	12%	25%	42%	15%	3%
E.	0%	3%	53%	23%	18%
N.	1%	4%	64%	16%	12%
O.	0%	5%	58%	22%	11%

Results – Descriptive Analysis of Assessment – cont.

- Participants have shown higher levels on **Agreeableness** (avg. 61%) and **Conscientiousness** (avg. 54%) dimensions.
- **Extroversion** (avg. 39%) was relatively lower than the expected. This result contradicts with the hypotheses of a previous study that relates agile team performance to extroversion. This preliminary finding may result from the ongoing agile transition of the company or from having less interaction directly with customers.

	Descriptive Results			
	M	SD	Min	Max
A.	61%	15%	25%	92%
C.	54%	16%	17%	92%
E.	39%	12%	17%	67%
N.	44%	12%	17%	75%
O.	44%	12%	8%	67%

Results – Roles vs. Personality Traits

- QAE & CME had the highest levels in **Extroversion** trait, the process group highly interacts with many teams,
- Testers had the lowest at the **Extroversion** trait, adaptation of testers to a cross functional team structure,
- Project managers and test leaders possess high **Conscientiousness**, as expected since it supports their functions,
- Developer leads and project managers have showed highest levels of **Openness to experience** which is related with a detail oriented mindset and good communication and innovation skills.

Role	#	A. Age	A. Exp.	A.	C.	E.	N.	O.
PM	8	33,9	9,5	61%	66%	41%	45%	54%
Dev.	46	25,9	3	56%	52%	39%	43%	42%
Dev. Lead	6	30,3	8,7	67%	50%	44%	56%	54%
Tester	17	27,6	3,1	61%	50%	28%	40%	40%
Test. Lead	5	31	6,2	60%	65%	32%	42%	43%
SE	7	29,9	5,9	65%	62%	35%	48%	45%
QAE	13	27,8	4,3	72%	55%	54%	42%	45%
CME	8	27	2,4	69%	49%	48%	49%	48%

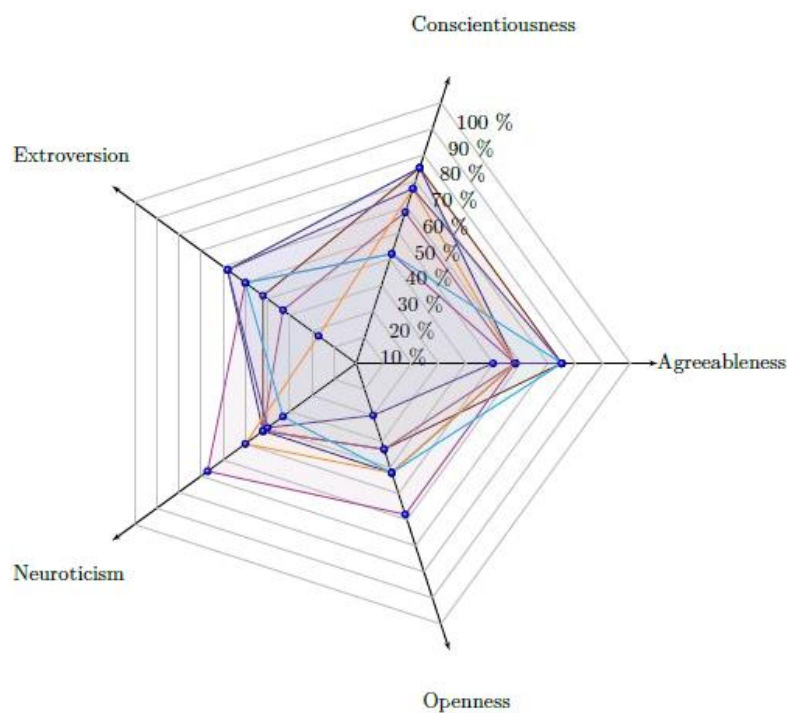
Results – Age & Experience vs Personality Traits

- An increasing trend was observed in **Neuroticism** levels as the age and the years of experience increases. Taking more responsibilities as the experience level increases may bring negative emotional states such as anger and anxiety.
- An increasing trend was observed on the **Openness to experience** as the experience level increases.
- A significant increase at the sample means was observed at **Conscientiousness** personality trait for the group of ages 35+ compared to the group of ages 30-34.

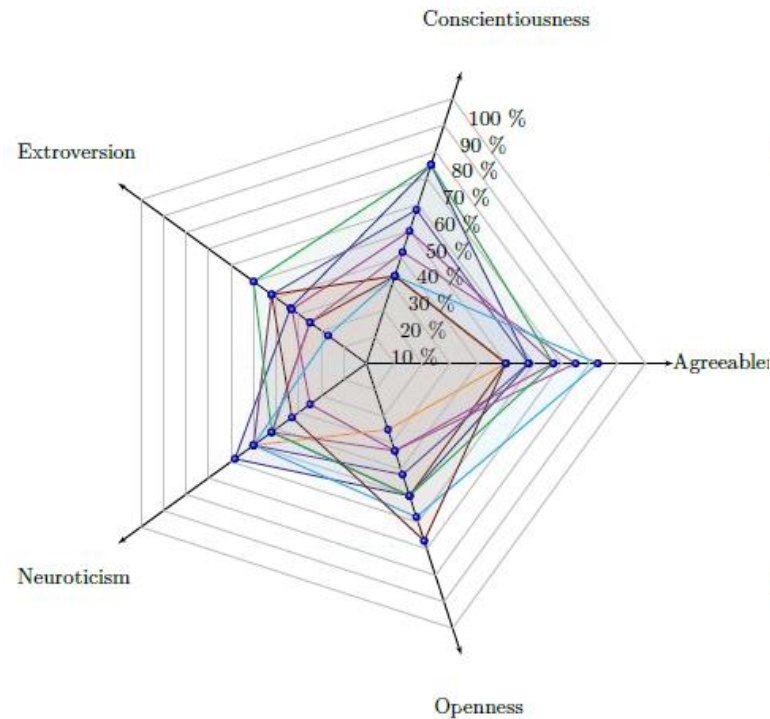
	Age Group				Exp. Level			
	20-24	25-29	30-34	35+	0 to 2	2 to 4	5 to 9	10+
A.	59%	61%	62%	64%	56%	63%	64%	63%
C.	52%	55%	52%	75%	54%	54%	54%	58%
E.	38%	43%	35%	39%	39%	43%	36%	40%
N.	42%	46%	43%	56%	43%	45%	43%	51%
O.	39%	44%	48%	47%	39%	45%	47%	51%
#	24	48	35	3	30	37	36	7

Results – Radar Charts

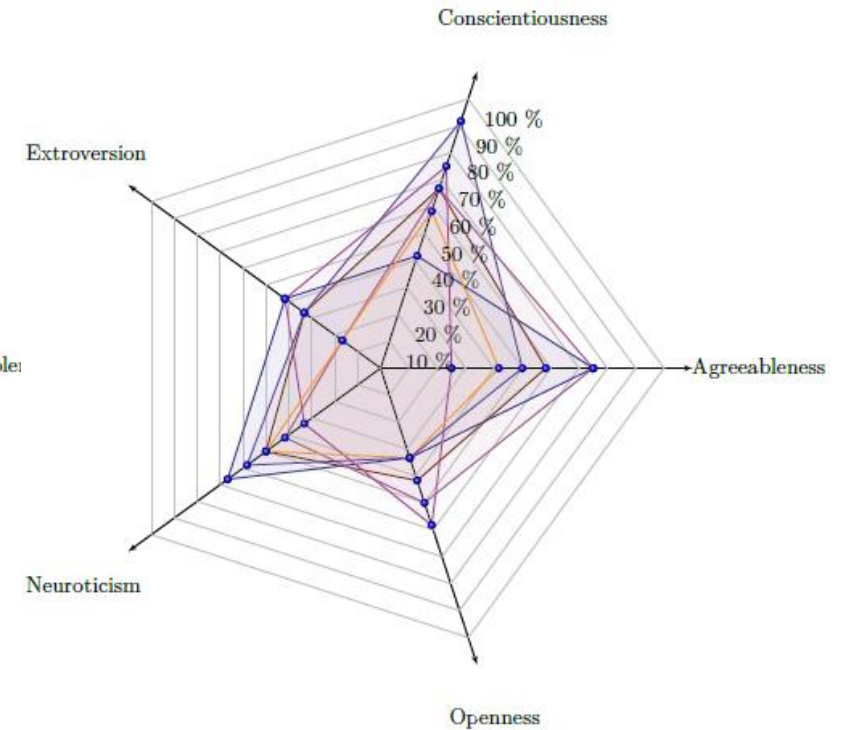
- Calculated percentages of the personality traits were plotted for each person in each team.
- We were able to see personality trait distributions visually,



Team B

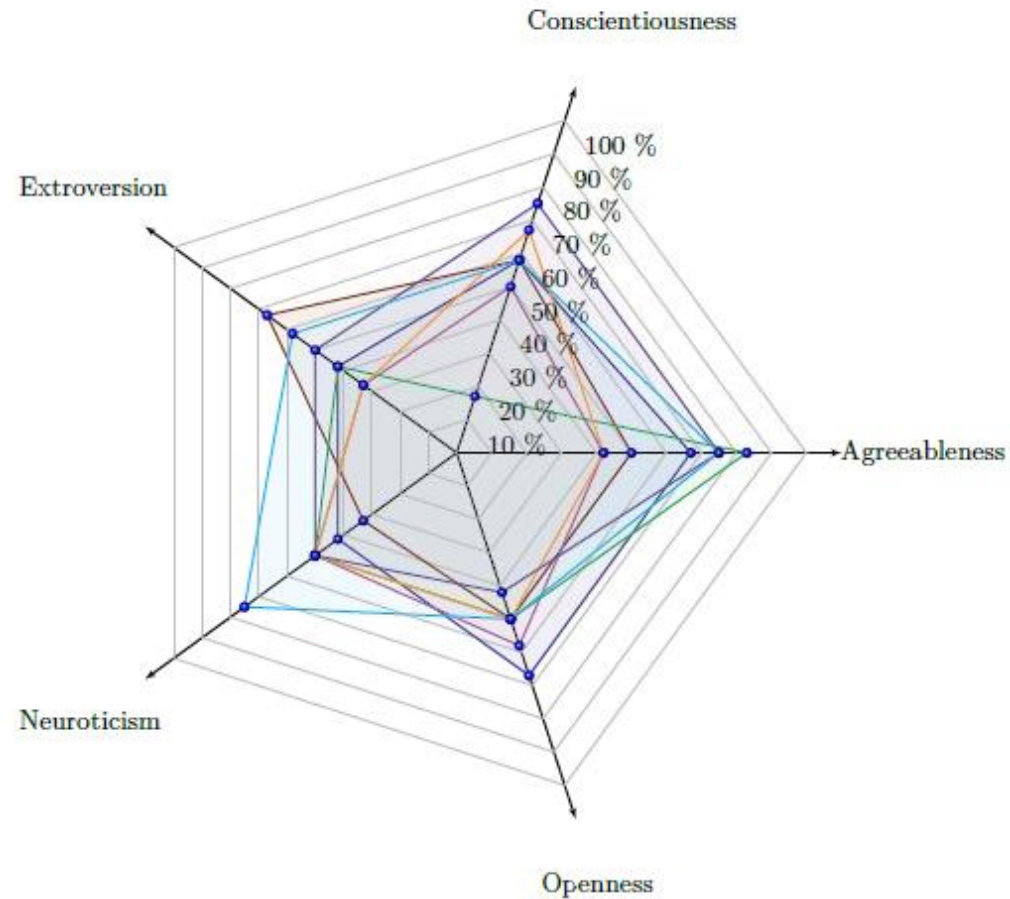


Team G

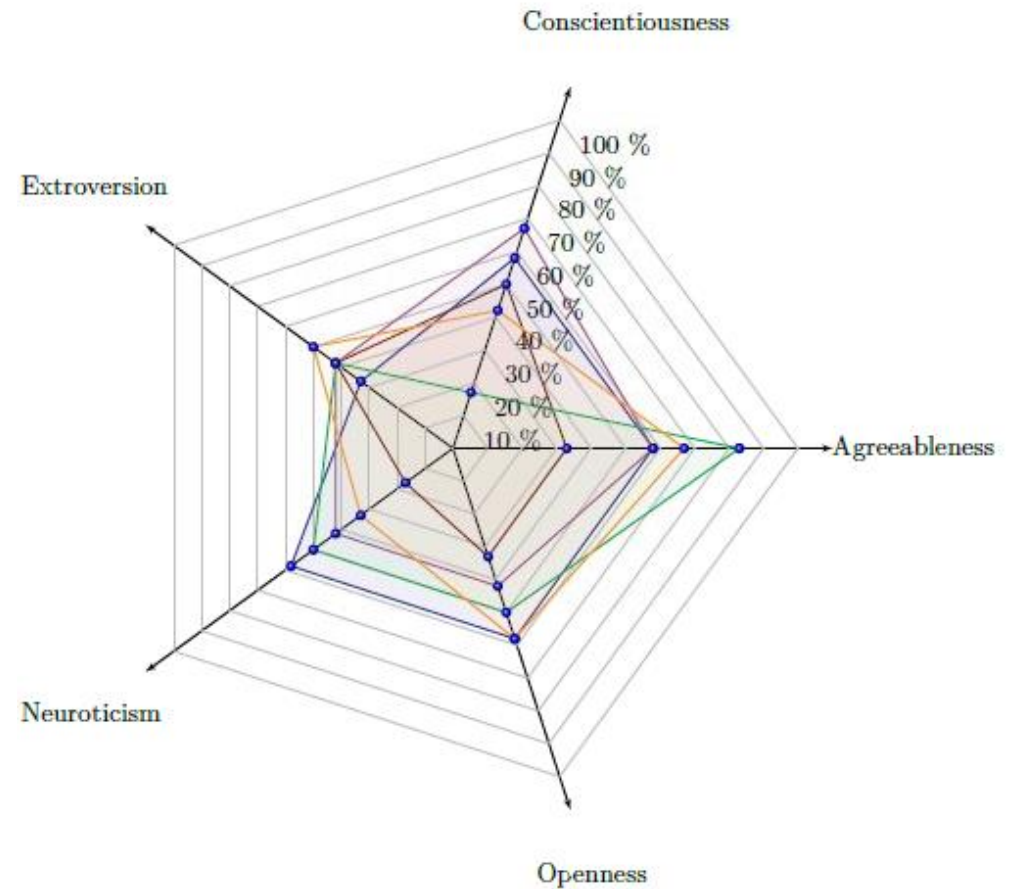


Team P

Results – Radar Charts – cont.



Team N



Team M

Results – Team Attributes

- Team attributes are also considered, such as development methodology, team size, iteration length, complexity and technology that have been developed and frequently used agile practices in software development.
- We selected five software teams based on availability of metrics and team sizes (5 to 9).

Following KPIs are collected from the last 5 sprints:

1. **Team velocity** (in terms of story points completed in an iteration),
 2. **Productivity** (number of user story points completed per person day effort),
 3. **Predictability** (compares the number of user stories completed with the number of committed user stories),
 4. **Workload deviation** (as the percentage deviation from the planned workload) and
 5. **Defect density** (in terms of defect count per user story point).
- All of the teams were using Scrum except team N; it was using iterative development life cycle.
 - All of them performed daily stand-up ceremonies, colocation, some of them used other agile practices such as planning poker for estimating and planning.
 - Teams B, G and P were working on new and complex technologies, instead of maintenance projects.
 - Team P was taking advantage of continuous integration (i.e. release automatic software builds, tests) to remove obstacles early.

Results – KPIs of Selected Teams vs Personality Traits

Team	#	A.	C.	E.	N.	O.	TV	Prod.	Pred.	WLD	DD
Team B	9	62%	48%	34%	44%	45%	26	0,19	56%	0%	0,47
Team G	7	65%	61%	44%	45%	43%	25	0,25	100%	11%	1,24
Team M	5	60%	47%	42%	40%	48%	26	0,24	NA	35%	1,86
Team N	7	62%	55%	46%	50%	52%	63	0,99	96%	0%	0,5
Team P	6	54%	67%	31%	50%	42%	7	0,03	36%	12%	5,61

Results – Validation Interviews

- Team Leaders were interviewed to understand how software practitioners perceived personality traits of their teams and individuals.

Tolerance to slow velocity & Extroversion;

- Results suggest that the *introverted* individuals were not taking proactive actions to slow velocities, they would expect a goal from their managers.
- Whereas *extrovert* practitioners were seen as relatively intolerant to slow project velocities.
- This was more significant on teams that do not have any contact with customer.

Tolerance to changing requirements

- Interviewees have stated that most of the teams showed intolerance to continuously changing requirements.
- This could be a result of observed high levels of *conscientiousness* as they prefer to follow standard procedures when encountered with problems.
- A team was tolerant to changing requirements, yet, they would not handle changes easily with using scrum in a situation when they work more closely with a customer rather than working on a R&D project.

Results – Validation Interviews – cont.

Thoughts on following standard procedure

- The *extroverted* seen to be in a team leader position and they are keen to contribute to the team social structure and improve process performances.
- Interviewees stated that practitioners who were found higher on the *extroversion* and *openness to experience* traits, give more input to process improvement and process selection.
- As the sample showed high levels of *conscientiousness* and low on *extroversion*, most of the teams were found to be more result-oriented and less interested in process improvement.
- Also, interviewees thought that Scrum methodology may not be convenient to employees that are more *introverted*.

Results – Thoughts On The Potential Benefits

- May help to add a member with a different personality character to a team that cannot list any improvement points confidently in their retrospection ceremonies, would subtly ignite the improvement focus.
- The interview participants stated that they have not encountered with visualization of software team personality traits.
- They have strongly agreed that revealing the personality structure of a software development team could be very beneficial.

Conclusion & Our Contribution

- This exploratory study presents interesting insights, and findings would be compared with further studies in different settings with more software teams.
- This study contributed to the understanding of personality traits of software practitioners and teams showed an exemplary successful use of a personality assessment.
- The preliminary findings of this study proposed that the sample population holds low levels of extroversion personality characteristics which might be the underlying reason of conflicts during the agile transformation.
- Higher introversion is observed most commonly in isolated teams that has less contact with customers. Since the company is planning to transit to agile methodologies, the low levels of extroversion may cause problems.

Future Work & Open Discussion

- As future work, we intend to complement our findings and the impact of personality traits with statistical analyses.
- We would like to explore effective methodology selection according to personality traits of the software development teams.
- An automated software development methodology selection tool based on personality traits could be built to suggest possible methodologies and practices to software management.
- Further studies to explore personality combinations that may work better and to validate our findings can be conducted.

Thank you.

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