

# The Links Between Behavioral Markers of Performance, Personality and Communication

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## ABSTRACT

In this study, we related team members' personality traits to team process behaviour, especially communication and team performance. We video registered 17 operator teams (N=90) in a Simulator Centre of a Hungarian Nuclear Power Plant. The analyses focused on personality traits related to Big Five factors and scales, communication pattern used under team process and the team performance based on overall evaluation and behaviour markers of 'soft' and 'hard' skills. Our results revealed that observable behaviour markers of team performance have strong relationship with the certain personality traits, and team related communication utterances.

## Author Keywords

Big Five factor model of personality, team performance, task relevant hard and team relevant soft skills, team-oriented communication.

## ACM Classification Keywords

H.5.3 Group and Organization Interfaces: Synchronous interaction

## INTRODUCTION

Numerous organisations tend to require effective professional teamwork in a high risk environment because expert teams have deep professional knowledge and are supposed to have fewer personal problems and conflicts between the members. In professional teams the personnel is strongly motivated to perform successfully and to maintain high standards of safety, so it can be assumed that they are all aware of the basic standards of professional proficiency. The strong professional cultures have its own positive and detrimental aspects: strong motivation to do

well their tasks, strong pride in their profession, training that stresses the need for perfection, sense of personal invulnerability, maintaining high individual standards, continual performance evaluation, pushing the limits of performance – “press-on”, invulnerability to fatigue and other frailties. We were motivated by all these above-mentioned characteristics to further examine the personality of the operator team members of the Nuclear Power Plant sector in details. Little is known about how personality traits predict work behaviour. In general psychologists analysing the personality traits predict the future behaviour in the workplace and rarely take into account those moderators that can influence prediction validity. Moderators can be for example the autonomy of the work situation. Testing the moderator role of the autonomy on personality-performance relations revealed positive relations between both Extroversion and Agreeableness and the performance criteria when the autonomy was high. Negative relations are found between Agreeableness and the criterion of job performance when autonomy is low. Otherwise Barrick, Mount [3] investigated the moderating role of autonomy on the relationship between the Big Five personality dimensions and supervisor ratings of job performance. Results indicate that the Conscientiousness and Extraversion factors are greater for managers in jobs with high autonomy compared with those in jobs with low autonomy. These results indicate that personality-contextual performance correlations vary across situations with different expectations for performance.

Despite the renaissance of teamwork, relatively little is known about how the individual contributes to the team intra-group processes and outcomes. The dominant way of thinking about the team is the *input-process-output model* [3]. The *inputs* can be divided into three categories: 1) individual-level factor (e.g., team member attributes, personality, skills), 2) group-level factors (e.g., structure and size) and 3) environmental-level factors (e.g., task characteristics, level of the autonomy). *Intragroup process* refers to interactions that take place among the team members and include interaction patters such as conflict, efforts toward leadership and those communication patters that differentiate teams from each other. Team *output* refers

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to team outcomes associated with productivity, performance, as well as capability of team members to continue the work cooperatively. Based on this theoretical framework, our study focuses on the team-members' personality (input) and their relationship with the teams' communication patterns (team-process) and the whole team performance based on experts' overall evaluation and behavioural markers of hard and soft skills (output).

## METHOD

The data collection was based on 17 operator teams (N=90) interactions analysis in the Simulator Centre of Paks Nuclear Power Plant (NPP). The NPP Simulator Centre is a very realistic, high fidelity tool that is widely used in training and examinations creating the required level of face-validity, to be relevant for real life situations. The Paks Nuclear Power Plant's operator teams consist of four professional fields requiring the interaction of six members: Unit shift supervisor (USS), Reactor operator (ROP), Turbine operator (TOP), Field operator (FOP), Unit Electrician (UE), and Shift leader (SL).

## Personality Measurement

The interest in identifying personality predictors of job performance has led researchers to use the Five Factor Personality Model (Big Five) as an important conceptual tool. In our research the NEO-PI-R personality Questionnaire by Costa and McCrae [4] was used. Each team member (N=96) was asked to fulfil the NEO-PI-R personality questionnaire some days prior to the scenario. The questionnaire based on Five Factor Personality Model measures major domains of personality:

- Neuroticism (N): the tendency to experience nervousness, tension, anxiety, emotional instability, hostility and sadness.
- Extraversion (E): an energetic approach to the external world, including sociability, assertiveness and positive emotionality.
- Openness to experience (O): describes the breadth, depth, originality and complexity of an individual's mental and experiential life.
- Agreeableness (A): the quality of one's interpersonal interactions along a continuum from compassion and altruism to antagonism.
- Conscientiousness (C): persistence, organization, and motivation in goal-directed behaviours, and socially prescribed impulse control.

NEO-PI-R personality Questionnaire measures the five major domains of personality, as well as the six scales that define each domain.

The predictive power of the model within the employment context has often been demonstrated [1,2,6,7].

## Team Communication Measurement

Together with the instructors we chose a simulator scenario that every team had to perform. The mean duration of the

scenario is about 35 minutes. A video recording was made of the operators' activity during the selected scenario. At the beginning of the simulation study, the instructor informed the teams about this, but they did not know exactly which of the programmed scenarios would be videotaped. The role of instructors was to coordinate technically the team operation throughout the scenario and to evaluate the performance at the end of the scenario.

All the recorded conversations of the operators were transcribed in chronological order, identifying the operators' verbal utterances by two independent expert raters. This study only focuses on the communication utterances that are likely to be related to non-technical, team-oriented communication in the team and the major influence on the team atmosphere stemming from the individual personality. The major team-oriented communication dimensions were the following:

- **Relation (R):** The principle features of team work in high risk environment are the relation-related utterances, maintenance of contact, relationship, and vigilance in sentences, like *"Hold the line please!"*, naming the addressee, etc.
- **Politeness (P):** The speaker gives a command, information, question or affirmation formulated politely, including formulates such as *"thank you"*, *"Would you so kind..."*, *"Do it, please"*. This communication form determines the team atmosphere, and indicates the mutual respect among team members.
- **Motivation (M):** Encouragement, formulated as reinforcement, completed with motivation, stimulation. For example *"It's perfect, just go on!"*
- **First person plural (We):** The speaker uses first person plural, expressed frequently in the form of *"we, our, us, let's"*.
- **Affection (A):** Words describing emotions, someone's emotional status, indicating astonishment, exasperation, frustration, excitement, relieve happiness or contentment. For example *"I regret it"*, *"I'm quite happy"* or laughing.
- **Thinking, cognitive (T):** Words indicating cognitive process. For example *"I think..."*, *"Attention!"*, *"If... than..."*, *"Check it!"*. These utterances may suggest problem-solving mechanism and can increase especially in facing with technical troubles. It shows how the teams are willing to endeavour the problem-solving mechanism.

## Performance Indicators

The performance measurements were based on two kinds of evaluations. After every scenario, the team as a unit performance was evaluated by instructors applying a 3-point Likert scale (1: poor; 2: average; 3: high). Furthermore, the instructors were asked to evaluate each individual's skills according to task-relevant 'hard' skills (professional knowledge, problem-solving, comply with standards) and team-relevant 'soft' skills (communication, cooperation, impulsive control) using a 4-point Likert scale (1: weak, 2: acceptable, 3: good, 4: excellent). These

categories reflect every day used terminology in the organization and these skills are at the behaviour level directly observable.

### Ethical Statement

The research has been authorised by the Management of Hungarian Nuclear Power Plant. All the research participants were informed about the research including the purpose of each measurement.

### RESULTS

We found significant relation between some specific team-oriented communication dimensions and personality. A positive Pearson correlations has been revealed between politeness and Extroversion (E) ( $r=0.34$ ,  $p<0,00$ ), Openness to experience (O) ( $r=0,26$ ,  $p<0,05$ ) and Agreeableness (A) ( $r=-0,31$ ,  $p<0,00$ ), also a negative relation has been found between relation related communication dimension and Agreeableness (A) ( $r=-0,40$ ,  $p<0,00$ ). These types of communication utterances were more frequent where the team members are more sociable, assertive, active (Extroversion) and open to different feelings or fantasies (Openness to experience) but less straightforward, altruist or compliant (Agreeableness). Communication utterances related to problem-solving (Thinking) have a negative correlation with the Agreeableness (A) ( $r=-0,31$ ,  $p<0,00$ ) personality factor, too. This finding underlines Juhász's [5] preview study in which the Cognitive Performance Factor had a strong negative correlation with the Agreeableness (A) personality factor.

The analyses related to behaviour markers of 'soft' and 'hard' skills proved to have significant relation to personality trait. Specifically, we found significant positive Pearson correlations between professional knowledge and Neuroticism (N) ( $r=0,29$ ,  $p<0,05$ ), problem solving and Conscientiousness (C) ( $r=0,23$ ,  $p<0,05$ ), cooperation and Neuroticism (N) ( $r=0,28$ ,  $p<0,05$ ) personality factors.

Team-performance as an output of the team process is directly influenced by Extroversion (E) and Conscientiousness (C) personality factors. Regression results for testing Team performance and the Big Five personality factors and scales show that Assertiveness ( $\beta=0,248$ ,  $p<0,05$ ) and one of the scale of Assertiveness, the Activity ( $\beta=0,252$ ,  $p<0,05$ ) Conscientiousness(C) ( $\beta=0,290$ ,  $p<0,05$ ) and two of the scales of Conscientiousness factor, Order ( $\beta=0,332$ ,  $p<0,005$ ) and Achievement striving ( $\beta=0,298$ ,  $p<0,05$ ) personality scales play a significant role in Team performance.

### CONCLUSION

Our study reveals that relationship-oriented communication utterances were significantly related to Extroversion (E) and Openness to experience (O) personality factors. Taking into account the characteristics of these factors this result

would have been expected. Even though, we found negative relation between relationship-oriented communication and Agreeableness (A) personality factor. Related findings were found in the Barrick, Mount [2] study, in which the predictive validity of Agreeableness (A) was investigated introducing autonomy as a moderator variable. The validity of Agreeableness (A) was also higher in high-autonomy jobs compared with low-autonomy ones, but the correlation was negative. These findings suggest that the degree of the job autonomy influences the validity of personality dimensions. It means that in NPP operator teams, where members work in high autonomy, so-called strong situation, some aspects of their personality traits are not permit to be evolved. During the team-process the hidden observable behaviour markers have got remarkable relationship with the personality traits. In conclusion, the professional knowledge and coordination behaviour markers show the most frequent relation with Neuroticism (N) and Conscientiousness (C) personality factors. It seems that these personality traits influence more the observable team behaviours. The stable role of Conscientiousness (C) in the work setting has been reinforced by Piedmont's [7] results, where the Neuroticism (N) has a good influence on professional knowledge, communication and cooperation in teamwork.

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