Personality Traits to Allocate Information Systems Student Teams

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Abstract

Team or group work has become the quasi-standard in teaching when it comes to alternatives for the traditional lecture. Since team work also causes problems like social loafing or dissatisfaction, we study the potential improvement of team work in a small Information Systems (IS) course through the usage of personality traits. Personality traits that describe humans in stereotypes and allow to understand behavior, have been studied in different areas of IS and other disciplines. The usage of characteristics to optimize teams have not yet been considered. We present the first application of personality traits in a small seminar at a German university. Teams with specific personality characteristics (neuroticism and conscientiousness) performed better than the control group. We further observed differences in terms of shared mental models in relation to the personality traits.

Keywords Personality traits, Big five model, Shared mental model, Team work, IS education

1   Introduction

Information systems (IS) teaching or education as one specialisation in our discipline develops and constantly challenges curricula and methods that are used in higher education to train students for careers in academia or practice. The recently launched platform *EDUglopedia*[1] visualises the large number of IS programs world-wide and aims at fostering collaboration and interchange between different countries, universities and programs. In the past, IS tried to achieve standardization in education across countries and related disciplines (Topi et al. 2017). Nevertheless, IS teaching often faces weaknesses such as a lack of practical orientation, a misfit between curricula and required knowledge and skills, or a lack of motivation for traditional lectures (Baiyere and Li 2016; Bell et al. 2013; Steiner et al. 2013). Further, team or group work has become the quasi-standard in teaching when it comes to alternatives for the traditional lecture (Nilson 2010, p. 156). In the IS discipline, this change has also been reasoned with the stronger alignment with industry (Caporale et al. 2013). However, we question how this generally successful teaching variant can be further improved with a focus on IS.

In this paper, we study the potential improvement of team work in a small IS course through the usage of personality traits. Personality traits that describe humans in stereotypes and allow to understand behaviour, have been studied in different areas of IS and other disciplines. For example, Uffen et al. (2012) studied the attitude towards IS security activities based on personality traits. In terms of team performance, other researchers also included personality traits to explain variations (Morgeson et al. 2005). However, the usage of characteristics to optimize teams have not yet been considered and motivates our research question (*RQ): How can personality traits in IS student team allocation help to improve team atmosphere and team results?*

We present the first application of personality traits in a small seminar on *Communication and Collaboration Systems* at one of the largest German universities. A number of 13 enrolled students enabled the experimental setting that would have not been viable in larger courses due to intensive care by the lecturers and individual performance assessment. Nevertheless, our preliminary results motivate the follow-up study in a larger context, which is necessary to validate our first results.

The reminder of this article is structured as follows. First, we will present related work on IS teaching and team work. Also, studies that investigate team dynamics and used personality traits are revisited and summarised to inform our study. After that, we describe how we set up the course and assessed the personality traits. The measures are explained in detail. The next section depicts the results, followed by the discussion. The article ends with a brief conclusion and next steps.

2   Related Work

2.1   IS Teaching and Team Work

The study of methods and cases how to educate and train IS students has been a specific focus of IS academia since many years. For example, IS curricula usually include the study of different application types that connect business processes or logics with computer systems. Enterprise Systems (ES) are a category of systems with a large (functional) range which results in a high complexity (Markus and Tanis 2000). Because of those complexities, ES classes implicate a challenging way of teaching. Furthermore, students must learn different types of knowledge and skills which include theoretical and practical backgrounds to become prepared for real world (Hustad and Olsen 2014). Another aspect often addressed in IS teaching research is the distance between teaching method or format and the practical context. With real world orientation, the distance between the two sides should be as small as possible (Hackney et al. 2007). The authors argue that, for example, case studies are a reliable solution for reducing the gap between teaching and practice. These cases allow students to apply their theoretical knowledge in real examples. In addition, they motivate students to discuss organisational impacts, social values, and ethical issues (Hackney et al. 2007).

Considering the prevalence of team work in most job positions it has been argued for a stronger application of team work in university classes besides the above mentioned references (Sancho-Thomas et al. 2009). Albon and Jewels (2009) found that working in a team can enable more complex, innovative, and comprehensive solutions. A single person cannot offer the adaptability, productivity, and creativity a team can offer. There has been much research on team work and factors influencing

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[1] http://eduglopedia.org/about

the efficiency and acceptance. The team size, for example, plays an important role for the team progress and success (Schmidt et al. 2014). Coady and Berg (2016) found that smaller team sizes work more accurately at exercises, practical examples and responses. In contrast, larger teams develop a negative attitude towards speaking to the wider audience.

Empirical studies summarised by Nilson (2010, p. 156) show that for the dimensions (1) *productivity (learning)*, (2) *positive interpersonal relationships*, and (3) *psychological health* team work have a positive effect. Expectably, IS education followed the general tendency to include more team learning experience (Hardaway et al. 2016) or even propagated the use of team learning experience to solve problems like a gap between real life and theory (Doyle et al. 2015; Hustad and Olsen 2014).

2.2   Personality Traits in Team Work

Morgeson et al. (2005) state that, amongst others, personality traits of team members are important for the team performance. When individuals work in teams, problems can occur which would not occur when they work on their own. To explain more of these effects, Morgeson et al. (2005) examined social skills, personality traits and teamwork knowledge, which is the individual knowledge of how to behave in a team setting. Personality traits have already been proven to influence the organisational, social and psychological environment. These three environments can be summarised to contextual performance (Borman and Motowidlo 1993). Different researchers stated that conscientiousness, extraversion, agreeableness and emotional stability influence contextual performance in different ways (Hogan and Holland 2003; Hough 1992; Hurtz and Donovan 2000; Organ and Ryan 1995). Morgeson et al. (2005) analysed different teams in an organisation by means of questionnaires and interviews. Furthermore, employees had to answer a test which measured personality traits.

The Big Five Model (BFM; also known as Five Factor or OCEAN Model) has been used regularly – also in IS – to assess personality traits (Thoms et al. 1996; Uffen et al. 2012). The test measures five personality traits: openness, conscientiousness, extraversion, agreeableness and neuroticism (Thoms et al. 1996). For studies about team work, BFM has been used to find relations between characteristics and different (group) performance measures. Thoms et al. (1996), for example, measured the personality traits to examine how self-efficacy in self-managed work groups is influenced by different personality traits. They analysed work groups of a manufacturing organisation by measuring each employee's personality traits through a 60-items test. The results show that the personality characteristics are related to self-efficacy in self-managed work groups. The authors hypothesise that the BFM is also related to team performance.

Macht and Nembhard (2015) researched how personality traits assessed with BFM are related to communication intensity and how intensity influences team performance. Here, communication is interpreted as mediator helping to understand the dynamic of team performance. In this study, students worked in dyads and performed different tasks. They measured personality traits, individual and team-level communication metrics and individual and team performance outcomes. They found that personality traits influence communication. For example, conscientiousness is not related to communication. Students who are more open tend to use more words in a shorter time. Based on the literature this effect was not expected. Furthermore, groups which include neurotic students show an increased communication and a better performance (Macht and Nembhard 2015).

2.3   Shared Mental Model

The theory of (Shared) Mental Models (SMM) has its roots in cognitive science. A mental model is an individual, inner representation of knowledge and dates back to Johnson-Laird (1980). Mental models help to individually "draw inferences, make predictions, understand phenomena, decide which actions to take, and experience events vicariously" (Mathieu et al. 2000, p. 274). Sharing mental models among different people (e. g. in teams) means to have a similar way of structuring and processing of information or knowledge which foster to act jointly even in changing environments. In IS, the SMM has not yet got much attention, especially in the context of team performance. Schmidt et al. (2014) studied the performance of agile software development teams. Another study by Redlich et al. (2017) indicates that novel types of ICT can be used for the development of SMM in a virtual team. Hence, SMM have been studied both as means to increase team performance and as goal that can be reached by means of ICT. Still, to our knowledge there is no case that studied the application of SMM in a university class setting except for Albon and Jewels (2009). In their study, SMM are introduced as skill that needs to be taught in university classes to prepare for the later work life.

3   Course and Setting

Using the results of prior studies that analysed teaching methods and team dynamics, and informed the knowledge about IS teaching and student team work, we used the IS course on *Communication and Collaboration Systems* (CCS) as experimental setting for the study of personality traits. We innovatively included the assessment of the students' personality assessed with the BFM to achieve better learning and tested whether personality traits have an influence on SMM. We chose this seminar with a low number of 13 students as experimental class because we wanted to observe the behaviour and performance individually. The studied seminar was held in the winter term from 2016-10 to 2017-03. The students were of similar age. Gender distribution was eleven women and two men.

The bachelor program in which the CCS course is offered, combines the disciplines computer sciences and applied cognitive sciences with further influence by business administration, communications and information systems. Students are well equipped with psychological theories about team dynamics, personality traits and empirical research methods. The bachelor program taught at one of the largest German universities is accredited by ASIIN[2], an association for program accreditation in the fields of computer science, engineering, and natural sciences. The contents in CCS range from foundational theories to specific information systems, their classifications and implementation strategies.

The course was split into lectures and team work experience with a case study. A lecture by (senior) faculty "serves certain purposes very well" and is still a valid way to impart scientific theories and knowledge (Nilson 2010, p. 141). Lectures allow us to guarantee an academic level and a selective and pedagogically informed knowledge transfer. They were designed as two half-day sessions focusing on internal and external usage of CCS and were supplemented with current topics (e.g. AR/VR, cloud computing). With the blocked format, we avoided interruptions and otherwise necessary repetitions.

Following Hackney et al. (2007), we value the students' own experience during the case study very high. In the case study, students should derive and analyse requirements from textual material, determine criteria for the selection of a CCS product or provider, respectively, and lastly, suggest an implementation strategy for the given case company.

4   Method and Measures

The overall aim of this study is to investigate personality traits in IS teaching, particularly in team work. We initially followed Morgeson et al. (2005) indicating that personality traits influence team performance. Still, our purpose is not to explain certain performance with different personalities. Instead, we actively decided which students work together based on their personality self-assessment.
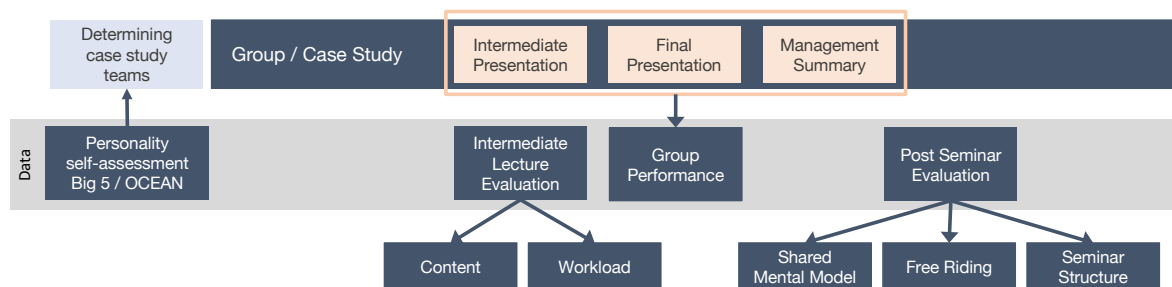

Figure 1. Study Overview and Data Sources

The remainder of this section describes how we assessed the personality traits, at what points these traits were used, and how we measured the effect on group performance. Figure 1 provides an overview about the different data sources (grey area) and the corresponding case study parts.

4.1   Personality Self-Assessment with Big Five / OCEAN

In the first session on administrative and organisational issues, the students were briefed about the lecturers' aim of studying and evaluating the experimental setting including a self-assessment of personality traits. We used the *Short 15-item Big Five Inventory* to assess the personality traits with 5-point Likert scale (Lang et al. 2011). Though more detailed assessment tools range from 40 to 240

items we had to ponder benefit versus effort and students' acceptance. Further, Gosling et al. (2003) compared short with long instruments and concluded that even a 10-item measure (e. g. TIPI) is acceptable.

Based on the data, we created three teams. Table 1 shows the mean (and SD) of each item in every group. Team 1-N was composed out of students with a high value in neuroticism. An isolation of neuroticism was selected due to the findings of Macht and Nembhard (2015) which showed better performance for these. They also found a distinctiveness for conscientiousness. Hence, for Team 3-C, we chose students with higher values for conscientiousness to study whether this characteristic has implications for SMM and our performance measures. Due to the low number of students enrolled in the course, the last team served as a control group without any special characteristic (Team 2). Besides the personality traits the students were comparable e.g. in terms of age and number of semester.

Mean (SD)	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Team 1-N	4.17 (0.43)	3.83 (0.43)	2.92 (0.69)	4.33 (0.47)	**4.17** (0.64)
Team 2	3.67 (0.85)	4.13 (0.18)	3.33 (0.53)	4.40 (0.49)	3.13 (0.51)
Team 3-C	3.25 (0.50)	**4.58** (0.17)	3.58 (0.57)	4.33 (0.47)	2.33 (0.47)

Table 1. Team Allocation with Personality Traits

4.2 Mid-term and Post Seminar Evaluations

A mid-term evaluation is mandatory for all courses at this university. The evaluation should provide structured feedback which shall be discussed with students in class and implemented directly if necessary. The questionnaire mostly focuses on workload, provision of material, and course content (fit, redundancy, difficulty etc.) with 5-point Likert scales. The survey was paper-based to increase the response and completion rate and conducted in the session of intermediate group presentations. In the last Q&A session before the exam we asked the students to fill another survey assessing questions related to the experimental group setting (e.g. regarding team size, free-riding and group performance). Questions about the SMM and backup behaviour were adapted from Schmidt et al. (2014), who included a pair-wise assessment of SMM in their study. These questions were asked twice: once with a focus on the beginning of the seminar and a second time with a focus on the end of the seminar. Thus, a direct comparison and analysis of a changed level of shared mental models were possible. All questions in this survey were asked on a 7-point Likert scale of agreement.

4.3 Group Performance

The groups had to solve the accompanying case study. The required deliverables were described upfront: The intermediate presentation should cover the task of developing a list of criteria and select an CCS based on an intense market research. In the final presentations, the full case study needed to be covered including an implementation strategy for the case company. The final presentation was evaluated by two lecturers based on the topics addressed, layout, speech and the quality of responses. Lastly, the students had to deliver a management summary comprising the most important points.

5 Results

The mid-term evaluation testified a general contentment. Four students evaluated the course as "very good", nine as "good". They mostly agreed that they perceived a learning effect so far. The level of required expertise was judged as good by half of students, the other half expressed a high level of expertise though not too high. Three quarters saw an improvement of expertise. All students rated the level of difficulty as suitable. Students mentioned the case study with practice orientation as beneficiary. On the other hand, they saw criticism and weaknesses in the high effort required for the case study and in the uncertainty about case study solving.

We broke down the answers about team work into the different teams and calculated the averages to identify differences among the teams (Table 2). All teams answered to like working in groups, still one member of Team 2 did not agree. A similar unanimity is observable for the contentment about the team size though the agreement is stronger in Team 1-N (neuroticism high). Team 3-C (conscientiousness high) had the lowest agreement. Regarding the lecturers' allocation of teams, the control group shows the highest acceptance but the other teams agreed as well on the statement.

	T 1-N	T 2	T 3-C	All
By means of the team contract, we discussed different ideas of working together and set the common goals.	2.5	4.8	4.5	4
My contributions have been acknowledged by my team.	6.5	6.2	6	6.23
I felt that the work load was not fairly shared within the team.	2.25	4.6	4.5	3.85
The collaboration was sometimes difficult so that the progress was not as good as I had preferred personally.	3.25	3.2	5.75	4
There were group members who have worked much less than me.	2	4.8	4.25	3.77
We had greater coordination issues in the team.	1.5	2.2	4	2.54
In my perception, my group was better than the other groups.	3.75	4.8	4.75	4.46
We have redistributed and completed tasks in the team if a team member could not complete them.	6	5.2	5.25	5.46
We have made suggestions in the team about how the tasks of everybody could be approached.	6	4.8	5.5	5.38
We helped accomplish a task when needed in the team.	6	5.8	4.75	5.54

Table 2. Statements and Values of Post-Seminar Evaluation by Team (Excerpt)

Interestingly, all members of Team 3-C replied that the progress was not as fast as they have personally wished. In this context, we specifically asked whether the students think that a team member have worked much less in comparison to their own contribution. Team 1-N does not show this behaviour. But in Team 3-C and Team 2, at least half of the members confirmed the impression. Team 3-C also had some greater coordination issues according to two members. The perceived performance of the own group differs between the teams. Team 1-N is indecisive while Team 3-C agrees to have performed better than the other groups. Team 2 is also rather convinced to have performed better.

Regarding backup behaviour (last three rows in Table 2), the teams showed different patterns. Team 1-N answered to have redistributed tasks whenever necessary whereas Team 3-C has a weaker agreement to the statement. Team 1-N made suggestions how to approach tasks whereas Team 3-C and Team 2 agreed to the statement at a lower level only. Also, Team 3-C answered to have helped team members accomplish a task when needed but with weaker agreement than the other teams.

	Importance of course		Tasks		Collaboration		Good presentation		All areas	
	Begin	End	Begin	End	Begin	End	Begin	End	Begin	End
Team 1 – N	5.25	5.25	4.5	5.5	6	6	5.5	5.5	21.25	22.25
Team 2	4.6	5	5.4	6	5.8	6.2	5	5.6	20.8	22.8
Team 3-C	5.25	5.5	4	5.75	4.75	5	6	6.25	20	22.5
All teams	5	5.23	4.69	5.77	5.54	5.77	5.46	5.77	20.69	22.54

Table 3. Values for Shared Mental Models by Area and Teams before and after the Seminar

Asking for different SMMs, we wanted to evaluate whether the teams differ and whether the level of a common model could be improved during the course. Specifically, we asked for the importance of the course, for an understanding of the task, of working in teams and of a good presentation. The SMMs improved during the course with differences between areas and teams. Table 3 depicts the averages split into the four areas (headlines), into the begin and the end of the seminar (sub-headlines) and into each team (rows). The higher the number the stronger the SMM. The last two columns sum up the previous values. Looking at these sums, Team 1-N answered to have the strongest SMMs at the beginning, whereas Team 2 developed the strongest SMMs over time. Team 3-C started with the lowest value but had the highest improvement during the course. The data also shows that teams have different areas with high SMM. For instance, Team 1-N provided higher values for the aspect of collaboration. Team 3-C is best in the aspect of a good presentation.

6   Discussion

According to the mid-term evaluation, the students welcomed the structure and answered to perceive a high learning effect. The survey at the end of the course repeated this expression with strong agreement on a well-chosen mixture of teaching formats. Like proposed by other studies (Hackney et al. 2007; Hustad and Olsen 2014), we included a case study in the seminar that allowed the students to practically apply some of the lecture contents. Also, Doyle et al. (2015) specifically recommended a 'learning by doing' environment. Macht and Nembhard (2015) and Thoms et al. (1996) included personality as a measure or mediator of team performance. But such characteristics have not yet been used to allocate teams and try to create an environment that fosters the learning success. Surprisingly, the students in this small sample answered mostly to like the allocation of teams though we expected them to reject this approach. The complexity and required effort in teams with members you have not worked with before is higher (Langer et al. 2008). Still, Team 3-C showed the lowest agreement value. This might be related to a tendency of contentious people to believe in other people's lack of contentiousness but requires further empirical validation.

From the given answers, we draw a picture about the groups' working atmosphere. The perception of unfairly shared work and the belief that other team members have worked much less in Team 2 is noticeable in comparison to especially Team 1-N. At least in terms of atmosphere, the control group seems to have had major issues. Hence, we see a behaviour of social loafing or free riding in Team 2 more than in the other groups. Regarding backup behaviour in the group, Team 2 shows also relatively lower values than Team 1-N. However, they answered to not have had major coordination issues. Besides all that, Team 2 was most confident about their better performance in comparison to other groups. But Team 2 overestimated its performance. Instead, Team 3-C performed best and were right in their perception of being better than the other teams. Still, they also had major coordination issues. Team 1-N is different. Neither do they see an uncooperative free-riding behaviour nor do they feel an unfair work distribution. Team 1-N is most happy about the team size and likes the team allocation. This might be related to issues neurotic people face in larger random groups e.g. being not asked to join teams or treated like outsiders. Team 1-N also shows a stronger backup behaviour than the other two groups. The shared mental models were quantitatively better in Team 1-N.

With all due caution about causality – especially with a small sample – we see indications that the personality traits affect the way teams work. This is no IS-specific finding but is observed in an IS course. We argue that IS has a high heterogeneity of students' backgrounds and interests or jobs, respectively. Hence, the application of personality traits in class might be particularly beneficiary for IS. Should lecturers, therefore, care for balanced teams in terms of personality traits or is it pedagogically demanded to create groups with specific characteristics? Remembering the demand for practice orientation in IS classes (Makkonen and Skaniakos 2016), it is unlikely to have real situations in which teams are built with personality traits to either amplify one characteristic or arrange a balanced team. More likely, people must get along with others they do not know before and who have random personalities. Hence, it seems reasonable to keep the practice of allocating teams (instead of letting students chose) but with random student selection. However, from a pedagogical point of view, the goal should be a high learning success. If random team selection promotes more problems in the team, this might be realistic and could strengthen the students' awareness of team dynamics but it also hinders learning in terms of achieving a better solution in a productive environment. Thus, it can be valuable to create teams that match in personality. In Team 1-N we see less problems, higher satisfaction, and second-best group presentations. Still, we cannot withhold the fact that Team 1-N was less successful in the written exam. We must further include the observations of Team 3-C. The group is divided for many questions we asked in the survey and indicates major problems with the team work. But in the end, Team 3-C delivers the best group performance.

Our approach of including personality traits requires effort by lecturers but provides also benefits and insights. We propose that other IS teachers consider personality traits in the team allocation. If team work should be close to practice balanced teams might be useful. Still, our selective allocation also yielded benefits as Team 1-N was pleased about the team atmosphere, and Team 3-C performed best.

7   Conclusion

In this paper, we demonstrated the innovative usage of personality traits in IS student team work. We have built our concept on a broad base of previous works that studied team dynamics and shared mental models (SMM) from the IS discipline and others. Our first results inform research on IS teaching and education as it provides and empirically evaluates a way to improve the team learning experience for IS courses. It also yields implications for team allocations in IS practice which could

make more use of personality traits. However, at this point it is not possible to recommend either to care for balanced teams or intentionally sort for certain characteristics. This short paper of research in progress could not yet harvest further potential implication: Since there are more characteristics that we have not yet tested for group performance, there is still further research needed to make general suggestions. Furthermore, the sample does not represent a typical distribution of IS courses since it includes more females than males. We pursue a follow-up study in a larger context which aims at validating and extending our results.

So far, we found students accept the team allocation. Further, our case showed that both teams with specific personality characteristics performed better than the control group in terms of group performance. We observed differences in terms of SMM in relation to the personality traits. For example, the team with higher values for neuroticism had the best SMM in the beginning. In contrast, the conscientious team started with the lowest SMM which is also mirrored in the larger issues they had during the team work. We see this research as a starting point for a discussion on personality traits in the context of IS education and also IS practice. Further studies can build on our investigation and involve a higher number of students. They may observe further personality characteristics and their impact on cooperation among IS students.

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