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ORIGINAL ARTICLE

The effects of personality type tests on the innovation process

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ABSTRACT

Technological progress has produced a greater need for multidisciplinary teams. In contrast to previous studies, which target professional differences, this case study explores the effect of different personality types and awareness of them. During a three-week Summer School, a multidisciplinary team was presented with multiple challenges including public speaking, design and prototyping. The personality test facilitated clearer communication about team roles and their importance. It was found that, while certain personalities may prefer certain tasks, they are not necessarily the best-suited for these tasks. The most important personality differences were found to be in the introvert/extravert and the judging/perceiving distinctions.

Keywords: Innovation; communication; personality types.

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INTRODUCTION

Increasing complexity brought about with technological progress creates a need for multidisciplinary teams with increasingly heterogeneous personality types. Incorporating personal factors in the workflow becomes more important in order to increase efficiency, and to improve the innovation process. Conventionally, teams are formed based on factors such as experience and mentality (Knockaert, Ucbasaran, Wright, & Clarysse, 2011). Although this method creates a good basis for a healthy professional environment for the team, it overlooks the area of personal communication which centres around the team members' personalities. The less attention this area receives, the longer it takes for a multidisciplinary team to form necessary channels for effective communication (Ivancevich, Matteson & Konopaske, 2002, pp. 67-81). In innovation teams, effective communication is of high importance, especially if this team has to perform under pressure and to deliver results in a short time (Vera & Crossan, 2005).

Multidisciplinary teams, by definition, start from different standpoints in terms of interests, backgrounds, experiences and so on. Numerous benefits have been reported by companies and institutions in diversifying teams that work on complex projects with a lot of deliverables (Alves, Marques, Saur & Marques, 2007; Van Den Beukel & Molleman, 2002). Although under the emerging field of diversity and inclusion it is more common to work with or in multidisciplinary teams than ever before (Li, She & Yang, 2018), our understanding of the dynamics in such teams relies on old methods which take mostly professional differences into account.

The innovation process is intensive, immersive and non-linear (Wilson & Doz, 2011; Kline, 1985). During this process a team is tested on their skills, experience and adaptability. The internal coordination of the team becomes especially important if there are deliverables that require certain personality traits that realistically not every member of a team possesses, pointing out why it is possibly advantageous to know the different personalities of group members at an early stage. In a joint program between CERN and Delft University of Technology, a multidisciplinary student team of four people set out to discover potential applications for cutting-edge technologies that could have a societal impact. In this paper, the importance of determining the different personality types in multidisciplinary teams is discussed. This discussion is based on the effects the different personalities within the team had on the decision-making abilities and on the overall performance in terms of innovation.

THEORETICAL BACKGROUND

Personality types are defined as people with resembling intra-individual organisations of their experience and behaviour (J.B. Asendorpf, 2002). However, it has been pointed out through history several

times that variable-centred approaches such as using personality types to define personalities can miss important personality aspects (Stern, 1911; Allport, 1937; Block, 1971). That is why research into more person-based methods is increasing. An example of this more novel approach includes models based on intra-individual Q-sort ratings; an approach described in detail by Block & Block (1980). This person-centred technique is considered more detailed at an individual level, but as these are fewer general approaches, personality types are still favoured in terms of analysis. Though the use of personality types is slowly falling in disrepair, it is also still the most widely documented approach when it comes down to using personality in innovation research (Block, 1995).

Defining personality types is non-trivial and often differently defined throughout literature. Most common is to identify a set of personality traits, by which to evaluate a person to be able to assess their personality, as suggested by Wiggins & Pincus (1992). Although other conceptual units have been suggested, such as motives, intentions, beliefs, styles, and structures, the trait model remains dominant (Funder, 1991; Tellegen, 1991). Often used trait models are referred to as the Big Five personality domains (John & Srivasta, 1999). This framework implies that most individual differences in human personality can be divided into five broad domains. These domains being extraversion, agreeableness, conscientiousness, emotional stability and openness to experience. Several questionnaires based on the interpretations of these domains have been developed over history, such as the well-established and widely used 44-item Big-Five Inventory (Benet-Martinez & John, 1998), or the 240-item NEO Personality Inventory Revised (NEO-PI-R) by Costa & McCrae (1992), amongst others.

These models to assess personality types are purely theoretical and difficult and hard to implement universally. For that purpose, personality type indicators are developed to assess personality types based on the theory that has been created by e.g. NEO-PI trait models. A well-known example of such an indicator is the Myers-Briggs Type Indicator (Myers & McCaulley, 1985), based on the theory of psychological types described by Jung (1923). This type indicator defines 16 different personality types, based on how a person scored on four different domains. These domains concern the favourite world (extraversion or introversion), information (sensing or intuition), decisions (thinking or feeling) and structure (judging or perceiving).

The impact of these personality types on workplaces, and especially on innovation cannot be underestimated, as den Hartog (2020) already clearly states. Here the impact of different personality traits in innovation teams was studied and it was concluded that team personality does play a role for innovation. Next to team innovation decreasing over time for teams with low heterogeneity in agreeableness, it was found that especially team variance in conscientiousness is negatively associated with team innovation. Though not all research does come to the exact same uniform conclusion, as the investigation performed by Yesil & Sozbilir (2013) shows. Their research resulted into the conclusion that the effect of personality types on innovation is mainly due to the openness for experience of the group members in question, and states that other main personality traits have much less impact when compared. With none of the performed research providing a conclusive answer on the impact of personality types, this work will provide an extra piece to aid in completing the puzzle.

METHOD AND DATA

The research presented in this work has been carried out during the CERN IdeaSquare Summer School of the Delft University of Technology. During this three-week summer school students from different disciplines worked together in teams of four, with the goal of turning a novel scientific technology into an application by the end of the three weeks. On the first day, all participants were asked to take the sixteen personalities test based on the Myers-Briggs Type Indicator with the aim to know the personality types composition of the group. Each personality type will be linked to an individual. For the convenience of the reader and anonymity of the participants, the subjects will be further addressed by A, B, C and D. As already mentioned, the teams are multidisciplinary, A studies Nanobiology, B studies Architecture, C studies Aerospace Engineering and D studies Electrical Engineering, all of them are students at the Delft University of Technology.

The assumption made beforehand is that having a group with diversification in terms of personality traits is beneficial for innovation. By knowing the group's personality composition beforehand, the effect of this composition can be assessed and compared with references. The four personality types obtained from the 16 personalities test are depicted in Table 1.

Tab. 1. Personality types obtained from the 16 personalities test.

Personal letter	Personality Type	Role	Strategy
A	*INTP-T (Logician)*	*Analyst*	Constant Improvement
B	*ENTJ-A (Commander)*	*Analyst*	People Mastery
C	*INFJ-T (Advocate)*	*Diplomat*	Constant Improvement
D	*ENFP-T (Campaigner)*	*Diplomat*	Social Engagement

This assessment is performed based on the group work performed during the course of the Summer School programme. As this programme consisted of different tasks ranging from public speaking, design, prototyping, amongst others, task division was not easy. Care always has to be taken to assign the best person for the task, not the one who wants it the most. From the personalities test,

it becomes clearer who would want what task the most naturally. Having more information, and in an attempt to achieve a more efficient innovation process, the team discussed the different characters of each member and made agreements regarding team relations and structure, taking into account the fact that some are more enthusiastic than others. By keeping track of why exactly this person was chosen, an assessment could be made on how this person turned out to carry out the assigned tasks. Comparing the reasons why the specific person was chosen over the others, with the person's performance and what was expected from this personality type in mind, allows analysis into the choices made beforehand by this multidisciplinary team. By also switching up team roles during the three-week period, the possibility to assess the performance of different personalities concerning certain tasks arose.

RESULTS

During the different tasks, various patterns of behaviour emerged. These were mainly centred around the differences that are encountered related to the four domains of the Myers-Briggs Type Indicator. For each of these domains, the team showed significant variation, resulting in a team with very diverse personalities. As the team consisted of both introvert (A and C) and extravert (B and D) personalities, the discussion is started with this domain. Over the course of the project, as expected, the extravert members B and D often answered those questions posed to the group as a whole. As several more formal presentations in front of peers, coaches and other visitors were set-up during the project, the team decided to rotate which members presented. This not only allowed for assessing differences in presenting style but resulted in better team dynamics in the end as well. Against expectations the introverts, with the necessary preparation, presented in an equally good manner as the extraverts. A possible explanation for the improvement in team dynamics is that by presenting, every member of the team had to improve their grasp and understanding of the project, as this is necessary to confidently present in front of a group.

The influence of intro/extraversion creates other effects as well. One example of this is the various calls and email contacts that had to be established with experts from potential markets, which were in most cases conducted by the extraverts. In this context, this approach proved much more effective to obtain important information in a limited time span. As the extraverts were able to use their communicative skills, the other team members could focus on other tasks which they were more comfortable doing. This kept the team members motivated and made the process more efficient. When comparing these two approaches concerning intro/extraversion, it is concluded that it is beneficial to include the introverts in the information transferring process to the outside world, as this increases every team member's confidence in the content they are transferring. On the other hand, it is considered beneficial to task extraverts with the information gathering that is involved in the team's project.

As it is difficult to assess the influence intuition and sensing have, because there are no differences on this domain in this particular team, the discussion directly moves on to the domain of decision making. Here a distinction is made between thought based, and feeling based decision making. By taking the personality test early on, every team member was aware that half of the team relied more on thought, and the other half on feeling. These differences were mainly noticeable in the early stages of the project, where feeling based members came up with a wider range of ideas than thought based people, though the difference in ideas mainly included unfeasible propositions. Knowing beforehand the type every team member was classified in helped within this process by combining the creativity of feeling based thinkers, with the realism and analytical viewpoint of the thought-based team members. Overall, when looking at this personality domain, similar trends as outlined previously with introversion and extraversion are seen, which makes for the conclusion that this personality domain is mainly over-ruled by the others. Though, it is assessed to be beneficial to have a mix of people that decide based on feeling and on thinking in an innovative team, as they complement each other when it comes to effective brainstorming in the early stages of innovation.

The last effect to be discussed is the importance of combining personalities that prefer judging and those who prefer perceiving. Both sides of the spectrum turned out to have their important influence on the outcome of the project. As the goal was to innovate, the role of the perceivers was important to impose more new and creative ideas on the team. It was also important to push the rest of the team to be open to completely new viewpoints on the problem. During the first half of the Summer school, this implied that several direction changes were implemented based on numerous new ideas. If these were not suggested by the perceivers A and D, they were actively promoted by them. The team members actively recognized their effect in the ideation part of the innovation process. Though judging personalities are also needed to keep track of the timeline and make sure decisions are made at the right time. They acknowledge the fact that a consensus has to be attained at some point. Related to the strict schedule of the Summer school programme, B and C also proved their importance as judgers by keeping the entire process on the rails, guiding it towards an innovative, complete result by the end of the three weeks. An example of this equilibrium in personalities that was found by knowing the team's personalities is the pharmaceutical application A and D brought to the table only two days before the internal deadline. This was one of many ideas brought up by A and D, but the combined effort under control of B allowed for

a swift analysis and a final consensus before the deadline. This pharmaceutical application became the final application, and it was due to the combination of both personality traits this solution was made possible in the end. From the beginning onward, B and C were tasked with keeping track of the goals, as it was recognized that their judging personalities would make them better suited to impose restrictions on the rest of the team. On the other hand, A and D were made aware that their personalities risked valuing things like ideation over strict deadlines, again pointing out why both sides of the spectrum should be included in an innovation team.

DISCUSSION AND CONCLUSIONS

Multidisciplinary teams start, by default, on a different plane. However inconclusive or vague the personality test might be, the real value in taking and using it came from the fact that it created a comfortable environment for the team members to openly discuss their strengths, weaknesses and needs from the beginning. Enabling the emergence of familiarity to a certain degree, creating a base for the initial group dynamics before an in-depth familiarization could take place.

Having figured out exactly what every personality invoked with each person led to a fruitful discussion about whether the person who wanted to do the task the most was actually the most suitable person for the job. Often enough, this was not necessarily the case. Every personality has its own way of tackling problems. Some might not like a task as much but turn out to be better at it if they are given the confidence of the group. An introvert might not find it as easy to speak in front of a crowd, but with the necessary preparation, can become a very good and talented presenter.

With a good base and knowing the personalities and expectations of each team member a smoother process was also achieved. Not only did the team experience less friction than other teams but also achieved remarkable results by finding a potential application for their technology including validation from the principal researcher of this technology. Additionally, the team's prototype and poster were showcased at IdeaSquare, a privilege not granted to all teams. These all support the hypothesis that a relatively better result was achieved. Due to the division of tasks based on the personalities, the process was more efficient since team members had the opportunity to focus on a task they liked or did not have to handle a task which was out of their comfort zone or area of expertise. These factors did not only contribute to a more efficient process with regards to time but also generated a positive environment in the workplace, a factor known to positively affect the results (Seppälä, 2015), leading to better team dynamics, where fruitful discussion took place without affecting team members' personally.

In the end, the importance of combining introvert and extravert personalities in a team, as well as judging and perceiving personalities, has been pointed out. The differences between thought and feeling based decision making turned out to be negligible when compared to the introvert/extravert differences.

Lastly, the effect of intuitive and sensing personalities has not been discussed in detail as not enough information was present. This, along with the small sample size, is one of the limitations of this study. These can be attributed to the fact that, during the Summer School, most of the attention is focused on the end products rather than the process itself. This might be helped by outside observation, or by the inclusion of people who are solely focused on the research aspect.

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