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Success Factors and Inhibitors of Virtual Teams: Exploring the Influence of Personality on Team Preference, Motivation and Team Climate

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Abstract

This thesis investigates the influence of personality, preference for working in virtual teams, alone or in face-to-face teams on work motivation and team climate of individuals working in virtual teams. This study used mixed methods, by collecting experiences of virtual team members in regard to inhibitors and success factors of their team and data from personality and motivational scales. The results neither support the hypothesis that virtuality serves as a moderator, nor that team preference mediates the relationship between personality and work motivation. However, support was found for the hypothesis that personality and individual work motivation predict the overall team climate in virtual teams. Additionally, personality traits were found to influence work motivation. Qualitative results were analysed through a thematic analysis and identified a variety of success factors and inhibitors. The qualitative results could be linked to the influence of personality on virtual teams and other variables. Overall, this thesis was able to support and expand current research on virtual teams while giving a variety of practical and theoretical implications.

Keywords: virtual teams, personality, work motivation, team climate, team preference

Introduction

Today's shifting demographics and increasing globalisation requires organisations to focus on global, rather than local business. They have to be positioned to find talent wherever it is. The management of a geographically dispersed workforce, which is culturally diverse, is a key success factor for multinational organisations. Having a positive awareness towards a diverse workforce can increase the performance of the organisation and simultaneously its attractiveness to customers and prospective employees (Kapoor & Sherif, 2012).

One possibility for organisations to handle these challenges is through the utilisation of virtual teams. They can connect organisations globally, spanning spatial, temporal and cultural boundaries. Thus, organisations are able to source talent from virtually everywhere. The diverse technological advances and the enthusiasm organisations have for virtual teams explain the continuously rising demand: more than 60% of organisations currently work with virtual teams and more than 80% of organisations believe that these numbers will increase in the future (Gilson, Maynard, Young, Vartiainen, & Hakonen, 2015; Perry, 2008).

Research has picked up on the importance of this work arrangement, as shown by the search statistics on *EBSCOhost*. Here, the term 'virtual team' has been used in the title of publications 133 times until 1998, 2266 times until 2008 and 5273 times until 2018 (April) cumulatively. This indicates, that the number of publications, which use virtual teams as a main variable, has more than doubled over the past 10 years. However, if you take into account publications which do not focus on virtual teams as the main study variable, this number increases by a factor of almost one-hundred (490,621, as of April 2018).

There are unique challenges in utilising, leading and managing virtual teams, while maintaining the self-motivation of members, as well as their will to collaborate with their colleagues over long distances (Day & Burbach, 2015). These challenges include, but are not limited to, personality, skills and individual preferences, which cannot be neglected by organisations without sacrificing team performance or effectiveness (Gilson et al., 2015).

The purpose of this mixed method study is to gain an understanding of how personality affects work motivation and team climate, by looking at the roles of team preference and virtuality in virtual teams. The qualitative data will support the quantitative data by analysing the work experiences of individuals who are working in virtual teams and highlighting relevant connections.

Theory

Defining Virtual Teams

A virtual team is a geographically dispersed collection of individuals who work on accomplishing a mutual goal with a varying degree of interdependence and rely on *computer-mediated communication* (CMC) rather than *face-to-face communication* (FTF; Dulebohn & Hoch, 2017; Gibson & Cohen, 2003; Liao, 2017). Virtual teams are located on a continuum of virtuality, which reaches from everyday personal interactions to team members not meeting FTF at all (Kirkman & Mathieu, 2005). The use of CMC and web-mediated relationships between team members and supervisors has increased throughout the years (Ford, Piccolo, & Ford, 2017). Virtual teams have become an established strategy of interaction at the workplace, especially for globally operating multinational companies (Breuer, Hüffmeier, & Hertel, 2016; Gilson et al., 2015). Through virtual teams organisations can manage a workforce that is geographically dispersed and made up of different cultures and languages. The rise of virtual teams from a niche phenomenon to a routine workplace practice creates new demands and has practical implications for leadership, management and interactions of virtual teams (Breuer et al., 2016; Ford et al., 2017; Gilson et al., 2015).

Bell and Kozlowski (2002) describe characteristics that are unique to virtual teams within their typology, namely *Spatial Distance, Information, Data, and Personal Communication, Temporal Distribution, Boundary Spanning, Lifecycle* and *Member Roles*. These characteristics describe differences between conventional and virtual teams which are important for the understanding of this paper. The following section will summarise and highlight important aspects of this typology.

Spatial distance. One of the most fundamental features of virtual teams is that they can cross spatial boundaries. Members of conventional teams often work in close proximity to each other, while members of virtual teams are distributed through space. The distance between members itself is not as important as the effect that this distance can have on them. The effect is enhanced by the lower number of face-to-face interactions and the fact that most team communication occurs through CMC. This can be beneficial to the organisation as it saves time and resources, e.g. through reduced travel costs, but the demand of a project must be aligned with the CMC that is available to the team. Bell and Kozlowski (2002) suggest, that highly specialized knowledge is rarely available in a proximal location and that virtual teams therefore enable the organisation to access knowledge which is spatially distributed.

Information, data, and personal communication. In order to connect virtual team members who are distributed through space, technology is required, which enables the team to interact and communicate. As mentioned before, this technology should be aligned with the complexity of the tasks the team is working on. For less complex tasks a minimum of communication is normally sufficient, however, if tasks increase in complexity, so does the need for CMC which is able to satisfy this need. It is important to take the synchronicity of communication technology into account, a topic which will be discussed in detail within the section on technology.

Temporal distribution. This characteristic is unique to virtual teams and describes how members of virtual teams can be spread across temporal borders, e.g. time zones. Members of a virtual team can be distributed across different locations without being temporally distributed, e.g. if they are located in the same country, but in different cities. However, some virtual teams are spread across multiple time zones, making collaboration more complex (Bell & Kozlowski, 2002; Hoch & Kozlowski, 2014). When a team is distributed across time it is crucial to align the technology for communication with the degree of temporal distribution to accommodate the needs of the team. Similarly to the previous characteristic, temporal distribution becomes a more critical topic the more complex tasks are, as workflow arrangements require more coordination and organisation, affecting the ability of the team to operate effectively (Bell & Kozlowski, 2002).

Boundary spanning. Virtual teams cross a multitude of boundaries, such as the above noted time and space. However, as virtual teams cross spatial and temporal boundaries they are also more likely to be challenged with other boundaries which can be related to cultural values, tradition, language, but also to different value systems, such as individualism, uncertainty avoidance or power distance, as described by Hofstede (1984). These impose more challenges on the team as individuals differ in their need for communication, making the overall team communication more demanding and less effective. Bell and Kozlowski (2002) emphasize that these boundaries become less permeable with higher task complexity, as complex tasks require established processes and stable relationships in the team.

Lifecycle. Team memberships in virtual teams tend to be more dynamic than in conventional teams. There is a higher turnover of members, making the average tenure of individuals in the team shorter (Bell & Kozlowski, 2002). This poses a challenge to members, as they have to adjust their processes and behaviours to different colleagues more often.

Depending on the task complexity, the need for cohesion and collaboration differs, or might not be required at all. If the task requires a highly interdependent team however, team cohesion becomes more important, increasing the role of team building and bonding between members (Bell & Kozlowski, 2002).

Member roles. Members in virtual teams often hold multiple roles, which can lead to conflicts due to role ambiguity. In teams with lower task complexity, team roles can be more interchangeable, however, in highly complex teams, roles should be clearly distributed and defined. This way, any ambiguity and conflicts between members in regard to the tasks they perform, and which role they have, can be avoided.

The typology brought forward by Bell and Kozlowski (2002) gives an overview of the complexity of virtual teams and the various challenges they face. Today, an increasing number of employees are part of virtual teams, without classifying themselves as such. Here, the indication of whether or not you are part of a virtual team depends on the understanding of the definition. Many employees today work remotely (e.g. home office) or have times during which they travel for work and communicate with their colleagues via computer, phone or other CMC meanwhile. This can meet the definition of a virtual team, although it is only temporary. However, the term 'virtual team' is often understood as a formal assignment at work, which is why many employees might indicate that they are not part of a virtual team, although they work in one regularly.

Virtuality and Technology

When looking at virtual team research and the typology described above, both virtuality and technology are closely related. This section gives an overview and definition of what virtuality encompasses first and then sums up relevant research related to technology in virtual teams and highlights their connections.

Over the past years, virtuality has been included into virtual team literature and is now, together with geographic dispersion and the use of technology, one of the main constructs that define virtual teams (Gilson et al., 2015). Interestingly, both geographic dispersion and the use of technology are taken into consideration when operationalising virtuality, however, virtuality is regarded as a separate construct.

Depending on the study, virtuality is conceptualised in a variety of ways: as a continuum that defines virtual teams by measuring how high the percentage of CMC is (Rapp, Ahearne, Mathieu, & Rapp, 2010); how often team members meet face-to-face (Kirkman,

Rosen, Tesluk, & Gibson, 2004); how much the team relies on virtual tools; the ability of the used technology to carry media-rich information or the synchronicity of communication (Kirkman & Mathieu, 2005). This shows, that there is no single measure or item that conceptualises virtuality, but that it is measured in a variety of ways or as a composite throughout research. This indicates the lack of agreement in research regarding the construct, making it difficult to understand which place virtuality takes in the broader framework of virtual teams (Dulebohn & Hoch, 2017; Gilson et al., 2015).

In order to understand how virtuality affects virtual teams and how important its role is, we will first look at *Media Richness Theory* (Daft & Lengel, 1986). Media Richness Theory suggests that communication media varies in the degree of cues they can transmit, how timely the feedback is and how natural their expression is. Media richness can therefore be placed on a continuum, in which face-to-face interactions are the richest and text-based messages (e.g. letters, chats, SMS) are low on media richness. The theory proposes, that task performance is highest when the requirements of a task and the ability of the media to provide the richness of information are aligned (Weimann, Pollock, Scott, & Brown, 2013).

This finding suggests, that a virtual team that meets face-to-face every week (low virtuality) has different technological needs than a team that does not meet face-to-face at all (high virtuality). Different types of technology facilitate different degrees of virtuality, e.g. CMC is the poorest tools for communication in regard to media-richness, as users are only able to convey text based messages to each other, this restricts the use of contextual and social cues. Video conferencing on the other hand enables users to use both visual and verbal cues, creating a media-rich basis (González-Navarro, Orengo, Zornoza, Ripoll, & Peiró, 2010). Consequently, depending on the nature of the project a virtual team is working on, it is essential to align the technology with the requirements of the team, as it can improve effectiveness, satisfaction and team performance (Weimann et al., 2013).

First research on this was done by Cooke and Szumal (1994), who developed a typology for group interaction styles (GIS), which can be used to describe the outcomes of different degrees of virtuality in virtual teams. GIS describe how members of a team interact with each other and how they approach goals they want to achieve. Here, the *constructive style* describes cooperation and mutual support in a team; the *aggressive style* a competitive and persuasive mindset between team members; the *passive style*, describes teams which show conforming and dependent behavior. Potter and Balthazard (2002a, 2002b) were able to show, that teams

working through CMC develop a passive interaction style and have less constructive and aggressive styles than face-to-face teams, by applying the typology set forward by Cooke and Szumal (1994). This shows that virtuality can effect the outcomes of a virtual team and especially how team members interact with each other, which makes it vital to understand how virtuality can moderate virtual team interactions and outcomes.

According to González-Navarro et al. (2010) the functioning of a virtual team can largely depend on the use of technology. Team interaction of virtual teams, which rely on CMC, can be hindered by a lack of non-verbal and social cues. Schaubroeck and Yu (2017) explain, that team outcomes can vary, depending on the degree of virtuality. Their research found, that team members have to take on more responsibility in managing team processes, the higher the degree of virtuality. Both studies (González-Navarro et al., 2010; Schaubroeck & Yu, 2017) stress, that there are generally more challenges in communication within a computer-mediated environment in comparison to face-to-face environments, which makes the choice and importance of technology in virtual teams ever so important. Both studies indicate, that team outcomes are affected depending on the degree of virtuality.

Communication technologies can be put into categories of synchronised and asynchronised communication, and also whether or not the users are in the same place or in different places (Bullen & Bennett, 1991; McGrath & Hollingshead, 1994). An example here is the use of telephone and e-mail. Both of them are used by people who are in different locations, whereas, telephone is synchronous while e-mail is not. When members of a team are dispersed temporally there are generally less opportunities for synchronous communication, as both team members need to be available at the same time (Cummings, Espinosa, & Pickering, 2009). Bell and Kozlowski (2002) describe that asynchronous communication is effective when working on less complex tasks. However, if tasks get more complex, so does the demand on the communication. Consequently, complex projects where tasks require higher coordination or team members are interdependent, synchronous and media-rich communication become essential.

Using advanced analytical techniques based on *Human Resource Information Systems* (HRIS, Zafar, 2013), enables human resources departments of multinational companies to get intelligent business insights, predict future needs, and support decision-making processes on operational and strategic levels (Kapoor & Sherif, 2012). The management of geographically dispersed and culturally diverse employees can be supported by using HRIS insights to

identify needs of specific teams or individuals and adjust their management accordingly.

HRIS can include structural support elements which help to facilitate connectivity between team members by decreasing the perception of distance between colleagues. Structural support systems can further help leaders in managing and decision-making as they offer information on individual members or projects (Hoch & Kozlowski, 2014). The access to more idiosyncratic employee information can help managers in building trust relationships and decrease the feeling of anonymity that employees might experience when working in high virtuality environments. One way of aligning technology with the requirements of a virtual team to improve effectiveness, satisfaction and team performance is through the use of applications that encompass variables that help to manage idiosyncrasies, e.g. by incorporating psychological and individual skill data (Alsharo, Gregg, & Ramirez, 2017).

Dulebohn and Hoch (2017), propose virtuality as a key moderator variable in virtual teams, which influences team processes on cognitive, affective, behavioural and motivational level. Further, Schaubroeck and Yu (2017) emphasize how different levels of virtuality can impact core dimensions like skill differentiation, temporal stability, and authority differentiation in virtual teams. Based on these two studies in particular, as well as the research mentioned in this section, this thesis investigates the role of virtuality as a moderator on virtual team outcomes. This study proposes, that individual outcomes of virtual team members are moderated by the degree of virtuality. The following passages will give an overview of relevant variables in virtual teams and discuss their importance in relation to current research and this study.

Personality, Team Preference and Work Motivation

The role of personality and work motivation in teams has been a topic for team research since the 90s and has shown the positive impact personality and motivation can have on team performance (Hoch & Dulebohn, 2017). A large part of this research focused on co-located teams who interact face-to-face. This section will highlight and summarise findings in regard to personality and motivation and their interaction in virtual teams. As this study utilises the Five Factor Model (FFM), according to Costa and McCrae (1992), their taxonomy of personality traits will be summarised in short.

Extraversion describes a broad group of traits such as sociability, being active and experiencing positive emotions. Individuals high on extraversion actively seek new opportunities and excitement. *Openness to Experience* represents individuals who are

intellectually curious and willing to explore new ideas and who have unconventional values, question authority and are behaviourally flexible. *Agreeableness* describes the tendency to be sympathetic, trusting and cooperative. Highly agreeable individuals tend to help others more often and are more forgiving. *Conscientiousness* is a dimension which describes well-organised, self-disciplined and strong-willed individuals who are reliable and deliberate. They actively plan, organise and execute tasks. *Neuroticism* represents individuals who are not psychologically adjusted, are often fearful, sad, distrustful and have difficulties in managing stress (Costa & McCrae, 1992).

An interesting topic in research is how different personalities compose a team and how this so called *team personality composition* affects motivation, team climate or effectiveness (Halfhill, Sundstrom, Lahner, Calderone, & Nielsen, 2005; Hoch & Dulebohn, 2017). The construct of team personality composition describes personality traits in a team which are assumed to influence processes and performance (Halfhill et al., 2005). It focuses on personality at a group level, by examining how team members cooperate with each other and work towards a goal. The construct can explain how members' personality influences each other and how to effectively compose a team. An example here are the benefits of having multiple extraverts in a team. They can influence their co-workers through their positive and ambitious attitude towards work and increase interactions within a team. As extraverts tend to be dominant, they can also cause conflicts and tensions in a team. As a result, performance can decrease and the team has a lower overall ability to stay focused (Barry & Stewart, 1997; Hoch & Dulebohn, 2017).

Brown, Poole, and Rodgers (2004) argued, that personality traits can affect individual trust between team members, which affects their preference for working in a virtual team or not. By affecting the individuals' inclination to trusting other team members, personality influences how trustworthy members perceive their colleagues. This in return affects the willingness of members to collaborate with others and how productive the overall team is (Brown et al., 2004).

Related to this, de Vreede, de Vreede, Ashley, and Reiter-Palmon (2012) explored the influence of personality on technology transition of virtual teams. They utilised the Five Factor Model of personality to investigate how different personality types perceive the value of transitioning to a collaborative technology that is meant to support work in their team. Conscientiousness and openness to experience were among the personality traits that

correlated most strongly with the perceived value of transitioning to new technology. Individuals high on these traits were more likely to see the value of new technology for their work (de Vreede et al., 2012). The effects in the study were lower than the authors expected. This can be attributed to the fact that there were problems with the scale due to range restrictions as well as an inadequate selection of software technology examples the study was based on. Taking this into consideration, it is still beneficial for organisations to consider personality when implementing new software into virtual teams, since it can help to predict team members' acceptance and possible conflicts that might arise.

Culp and Smith (2001) were successfully able to answer the question as to which factors influence team performance by exploring the role of psychological types through the Myers Briggs Type Indicator (MBTI). The researchers' approach was descriptive by identifying the psychological type and explaining it to team members so they have a better understanding of their own personality and the personality of their fellow team members (Culp & Smith, 2001). This notably improved team performance, as members were more aware of their own preferences and idiosyncrasies and could act accordingly. To that end, the simple awareness of your own and the team personality composition helped to increase team performance.

Ciubuc, Dascalu, Trausan-Matu, and Marhan (2013) developed an approach that goes even further, by forming teams solely based on psychological traits, which they identified through the MBTI. They profiled potential team members and evaluated whether their profile is complementary to the MBTI profiles of the team. Based on this and other variables and heuristics, e.g. 'Not all team members should cover the same valence in any dimension (e.g. not all members introverts)' they selected members for student teams with promising results. This displays the possibilities of team forming by evaluating member personality.

The model brought forward by Ciubuc et al. (2013) lacks empirical verification and was aimed at student teams without previous experiences, therefore not taking into account professional expertise or other variables that are relevant in an organisation. In spite of their methodology not being empirically sound, it provides a working model for forming teams based on personality, which could be elaborated in future research projects.

Further, Luse, McElroy, Townsend, and Demarie (2013) found that, personality traits can predict the preference of individuals of working in a virtual team over working alone or face-to-face. For this they developed a tool to measure team preference on two subscales: (1) the preference to work in a virtual team over working alone (2) the preference to work in a

virtual team over working face-to-face. This scale will be referred to as *team preference*, the subscales as *Preference 1* (PREF1) and *Preference 2* (PREF2) respectively throughout the paper. Their results indicate that personality significantly improves the ability to predict the understanding of team preference. Examining team preference can improve the basis of a virtual team, as it focuses on the question whether individuals feel comfortable in a certain type of work arrangement or not. Their research can therefore be used to assess the fit of individuals prior to the forming of a virtual team.

Luse et al. (2013) stress, that future research should investigate how team preference is linked to outcomes in such work teams, consequently going beyond the initial preference. A possible question here is how team members' work motivation differs if they are placed in a virtual team contrary to their preference or according to it. How important work motivation is in virtual teams and which role it takes will be discussed in the following section.

Due to the nature of virtual teams, face-to-face interactions with colleagues are limited, which is why it is crucial to understand individual preferences and needs in regard to work processes and interactions. Satisfying these work related needs of individuals is essential in keeping them motivated, as work motivation influences the effectiveness of the team as a whole (Day & Burbach, 2015). The authors stress, that especially self-motivation is essential in virtual teams, as team members are often geographically separated from their team leader or other members and rely on themselves to be motivated at work. This links to the aforementioned team preference scale (Luse et al., 2013), as it can be used to assess the fit of individuals for virtual teams. However, more research is required in regard to effects this team preference has on work motivation, as not many researchers investigated the influence personality can have on motivation in virtual teams.

Krumm, Kanthak, Hartmann, and Hertel (2016) as well as Schulze and Krumm (2017) examined the knowledge, skills, abilities and other characteristics (KSAOs) that are needed for individuals participating in virtual teamwork. Within their review they outlined, six different KSAOs clusters that are relevant to virtual teamwork, including how to use a medium for communication; communicate effectively; create trust with colleagues; work with people from diverse cultural backgrounds; managing oneself and be constructive when handling conflicts. Apart from this wide variety of KSAOs, the authors noted, that personality should be considered when investigating virtual teams. They indicate, that personality can influence motivation in virtual teams directly and indirectly, e.g. openness to experience can increase

the motivation of team members to interact with colleagues from different cultural backgrounds in their team. Therefore, members who score low on openness might be less suited to work in diverse virtual teams. Krumm et al. (2016) and Schulze and Krumm (2017) stress, that the 'virtual team players' not only require their outlined KSAOs, but additionally need specific distal characteristics in form of personality traits or work experience. Although their research highlights the influence personality can have on work motivation, it did not investigate the direct effect personality might have on work motivation specifically.

Kirkman et al. (2004) investigated how virtuality moderates the relationship between motivation and team performance in virtual teams. Here, they looked at motivation on group level, specifically by using the construct of team empowerment, which consists of four dimensions: *potency*, the team's belief that it can work effectively; *meaningfulness*, members care in regard to their task is intrinsically motivated; *autonomy*, team members are free in making decisions; *impact*, the teams' tasks are contributing to the organisation significantly. Virtuality was measured by looking at the number of face-to-face interactions a team had. Their results indicate, that teams which are high on virtuality (do not meet face-to-face often) and have higher team empowerment are able to rely on their abilities and act quickly and decisively, therefore performing better. As the study was done on group level, it is unclear how individual differences influence motivation and the need for empowerment, especially regarding the differing degrees of virtuality.

This thesis utilises self-determination theory, developed by Deci and Ryan (2000), which distinguishes between different types of motivation: *intrinsic motivation*, doing a task because one finds it interesting or satisfying; *integrated regulation*, identifying with a task to an extent where it becomes part of oneself; *identified regulation*, doing a task because one identifies with its' value; *introjected regulation*, doing a task due to self-worth, e.g. out of guilt; *external regulation*, doing a task to receive a reward; *amotivation*, lacking the intention of doing a task or acting passively (Tremblay, Blanchard, Taylor, Pelletier, & Villeneuve, 2009).

The literature shows, that motivation in virtual teams is crucial, especially when investigating team performance, effectiveness or even when looking at the KSAOs that are required for the ideal virtual team member. However, the influence that personality can have on individual work motivation has not been examined so far. These findings suggest that personality and virtuality can affect work motivation in virtual teams. Subsequently, it is

important to look at the effects individual work motivation can have on the team as a whole by examining the construct of team climate.

Team Climate

Various definitions of team climate have been put forward by researchers. A majority of these definitions can be viewed from two different angles: the *cognitive schema approach* and the *shared perceptions approach* (Anderson & West, 1998). These approaches differ in the way they conceptualise climate: the cognitive approach focuses on climate as a representation of the individuals' perception of their team and the latter focuses on the group level, summarising the perception of multiple team members. Anderson and West (1998) emphasize that the two approaches are not mutually exclusive, but compatible with another. This paper will focus on the cognitive schema approach, as team climate is collected on an individual level, hence, the perceptions of individuals and not those of the group are being analysed. Further, team climate is defined according to James and Sells (1981), as an 'individuals' cognitive representations of proximal environments [...] expressed in terms of psychological meaning and significance to the individual' (p.276). In this context, the proximal work environment is the permanent or semi-permanent team to which participants belong or identify with (Anderson & West, 1998).

The innovative capability of a team and subsequently its performance can benefit from team climate or be impeded by it. To measure this capability this study utilises the Team Climate Inventory by Anderson and West (1998), which is based on the four-factor theory of innovation. The authors argue, that innovation is an outcome of four different team behaviours which are consistent throughout the literature. A swift description of the four factors, which are *vision*, *participative safety*, *task orientation* and *support for innovation* is given below.

Vision. This particular factor describes the idea of a valued outcome or higher order goal, which team members are committed to, therefore representing a motivating force at work. Vision encompasses behaviours where team members focus on clear and realistic goals, which enables them to develop realistic and goal-appropriate methods due to their understanding of what should and can be achieved (Anderson & West, 1998; Kivimaki & Elovainio, 1999).

Participative safety. This factor describes a working environment that is interpersonally non-threatening and in which team members are actively involved in the decision-making process. West (1990) proposes that, the more a member is engaged, interacts,

or influences the decision-making process, the higher will be the personal investment in the outcome. This means, the members of a team feel that they are able to introduce their own ideas and solutions to the group, while not being judged for their contribution, therefore receiving trust and support (Anderson & West, 1998).

Task orientation. This factor describes that team members are concerned with a high standard of work and the quality of their task performance. High task orientation is characterised through a work environment which enables team members and leaders to evaluate each other, give feedback and support new ideas which can improve the quality of work. It also indicates that there are control systems in place which monitor performance and quality of work in a constructive way (Anderson & West, 1998; Kivimaki & Elovainio, 1999; West, 1990).

Support for innovation. This factor is split into articulated and enacted support. Articulated support is found in policy statements or spread in a company through 'word of mouth', however a necessary condition for innovation is that support is also enacted, meaning that innovatory behaviour is actively supported through the company (Anderson & West, 1998). This support encompasses the availability of resources, support from superiors or the reward of good contributions. An example for this could be the presence of an idea programme to which employees can contribute ideas and each successful contribution, which is implemented, comes with a reward for the employee.

Team climate is closely linked to the effectiveness and innovative capability of a team, making it an important measure for performance. However, few research has been done on the effects individual work motivation and personality can have on team climate. By tackling this question, this study aims to examine how team climate in virtual teams can be predicted through individual personality traits and work motivation, by taking into account virtuality and team preference.

Management and Leadership in Virtual Teams

What has become clear throughout the past sections is that managing virtual teams is profoundly more difficult than managing co-located face-to face teams. One reason being the nature of virtual teams and the characteristics they consist of. This was described in the definition of virtual teams. Demands on management, which are related to the previously presented typology will be discussed in this section by focusing on the typology of Bell and Kozlowski (2002) and its relevance to the management of virtual teams.

When teams are temporally distributed it is beneficial if they are connected through synchronous CMC, as leaders are able to perform management functions more efficiently because they can react in real-time. No time delay in communication means that leaders have the opportunity to identify problems more quickly, and can take immediate action. If teams are distributed across different time zones synchronous communication is not guaranteed everytime, in this case the team might need to revert to asynchronous CMC. Information that leaders receive can be delayed, which also delays their response. Hence, performance management and monitoring of the team is difficult and requires leaders to be proactive and anticipate problems or conflicts before they actually happen (Bell & Kozlowski, 2002). Traditional hierarchical leadership models (e.g. transformational or transactional leadership) might not be able to handle this kind of requirements, as they rely on a single leader to make decisions on behalf of the team and are not equipped to work without the availability of said leader (Avolio, Sosik, Kahai, & Baker, 2014; Huang, Kahai, & Jestic, 2010).

One possibility to counteract this detriment is the implementation of structural support elements, which help team members to manage themselves (Hoch & Kozlowski, 2014). Some of these elements were described in the section on virtuality and technology. They can vary in nature and consist of reward, communication or information systems. If a problem occurs team members can follow the guidelines that were set beforehand through structural support elements, until the leader is able to react. Replacing or supplementing hierarchical leadership through structural support approaches can help compensate, increase or neutralize effects that hierarchical leadership has on employee behaviour. Here, the higher the degree of virtuality in the team was, the more the positive effect on team performance increased (Hoch & Kozlowski, 2014).

Some authors go even further by suggesting, that traditional hierarchical models should be fully replaced when leading virtual teams. Instead, concepts of emerging and shared leadership could act as facilitators for team effectiveness and functioning in virtual teams (Gilson et al., 2015; Hoch & Dulebohn, 2017; Hoch & Kozlowski, 2014; Liao, 2017).

Balthazard, Waldman, and Warren (2009) investigated the role personality has on predicting emergent leadership in a sample of MBA students. Not only were they able to confirm the positive effects emergent leadership has on team performance, but they also found that emerging leaders can be predicted by looking at the personality traits extraversion, conscientiousness, agreeableness and emotional stability. These findings are especially

relevant to this thesis, as they link personality of virtual team members to their success and positive influence on team performance.

As described in the boundary spanning dimension, team member interactions extend over a variety of cultures, departments or even countries, thus overcoming not only organisational boundaries, but also geographical and cultural ones. In consequence, it is difficult for leaders to apply a one-fits-all leadership strategy. A culturally diverse team can show significant differences when looking at individualism, power distance or uncertainty avoidance (Hofstede, 1984), which is why it is important to adjust the leadership style to each individual within the team.

Hypotheses & Research Question

Based on the above described background on virtual teams and the various factors influencing them, I propose a research model that is illustrated in *Figure 1*. The model shows the proposed relationship between personality, work motivation and team climate as well as team preference as the mediator and the moderation effect through virtuality. Directed hypotheses are displayed through arrows. The research model displays a multitude of relationships between variables and therefore sums up various hypotheses. To avoid confusion the hypotheses will be split up into concise parts explaining the relationships.

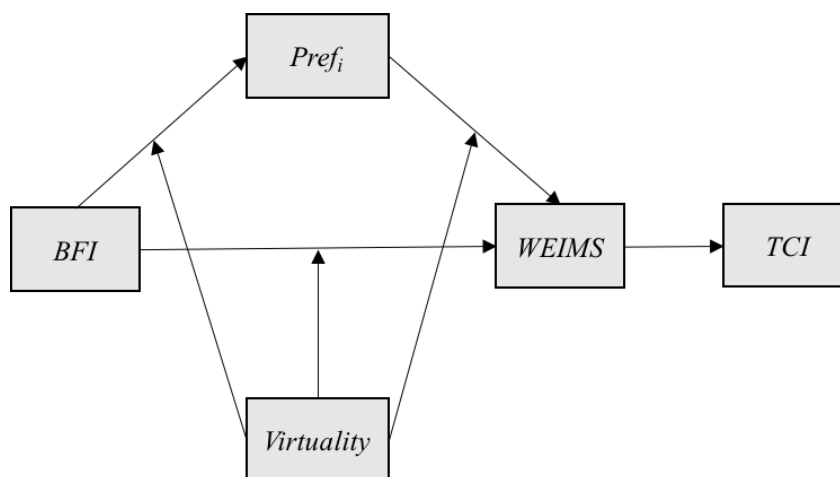


Figure 1. Research model, illustrated in an entity-relationship diagram. BFI = the five personality traits; $Pref_i$ = the two mediators Preference 1 and 2; Virtuality = amount of team communication that occurs computer-mediated; WEIMS = overall motivational score; TCI = team climate score.

Due to the influential role of personality on team effectiveness, productivity and on other outcomes (e.g. Culp & Smith, 2001; Halfhill et al., 2005; Hoch & Dulebohn, 2017), I propose that an individual's personality in a virtual team will influence work motivation.

H1: In virtual teams, personality traits will have an influence on work motivation.

As investigated by Luse et al. (2013), personality can predict team preference. Further, the relationship between personality and work motivation will be mediated through team preference. As suggested by the authors, this study will investigate whether team preference can influence outcomes in virtual teams, by examining whether there is a mediation effect of personality through team preference on work motivation. Therefore, I not only expect that personality traits will influence the team preference, as described by the authors, but that this preference will indirectly influence individuals' work motivation.

H2a: The preference of working in virtual teams, working face-to-face or working alone is influenced by the personality type.

H2b: The relationship between personality and work motivation will be mediated through team preference.

Going further, the relationship between personality and work motivation as well as the indirect effect of team preference on work motivation will be moderated by the degree of virtuality within the team. As described in the section on virtuality and technology, the degree of virtuality can impact interactions and outcomes of the team (Gilson et al., 2015; Kirkman et al., 2004; Potter & Balthazard, 2002a). This study therefore hypothesizes, that team preference and work motivation, depending on the personality of the team member, is moderated by virtuality. This means that individuals are expected to differ in their level of work motivation and team preference, depending on the degree of virtuality.

H3: In virtual teams, the relationship between personality, team preference and work motivation is moderated through the amount of virtuality.

Last, the overall work motivation of members in a virtual team will directly influence the team climate, lower work motivation will therefore result in lower team climate and vice versa.

H4: In virtual teams, personality and individual work motivation will predict the overall team climate.

As this paper stresses the need to research virtual teams on an individual level by looking at individual differences and preferences, it is important to include the experiences of

individuals as well. Therefore, another research question will examine success factors and inhibitors in virtual teams through open questions, giving participants a voice. Their experiences will be analysed in regard to the previous literature and the variables which are being examined in the quantitative part of the study.

RQ: What are perceived success factors and inhibitors of individuals working in virtual teams?

Method

Procedure

The questionnaire was created and distributed through Lund University's survey platform *Sunet* and was first pretested on a small sample of $n = 20$ participants. This initial sample was sourced through *Ortelius AB* and consisted out of their employees. This way the survey could be tested in a working environment to minimise risks in validity and reliability of the study. After incorporating feedback from this sample population, the survey was published on the research platform *Prolific Academic* ('Prolific', www.prolific.ac). Prolific provides a platform for researchers to find participants for studies. They offer a participant pool with around 41.000 people who are mostly from the UK or US. All participants undergo demographic screenings, which can be used to select the right participants for a study. All participants receive micropayments for studies they partake in, the amount of money they receive is calculated based on the time of their participation. In comparison to comparable platforms, e.g. Amazon Mechanical Turk, Prolific advertises an academic sample as well as high data quality with low drop-out rates and honest replies. For this study participants were rewarded based on the minimum wage in the UK, which is where Prolific is based. As the survey took around 10 to 15 minutes, participants received £1.00 as a reward for taking part in the study. Participants were informed of the purpose of the study and were made aware of the possibility to opt-out of the questionnaire at any point in time. Additionally, participations was guaranteed to be fully anonymous, no metadata or any data that can be used to identify individuals was collected.

The pre-screening option of Prolific was utilised. This way the study was only sent out to the right target population. The pre-screening posed two difficulties. First, Prolific did not offer a pre-screening that specifically identified virtual teams, as it is a niche area of research which is not required by many of the researchers using Prolific. Although it is possible to

create a custom pre-screening this was not feasible for this study, which brings us to the second difficulty.

As already described in the theory, there is currently no standardised measure for virtual teams. Additionally, the existing measures are comprised of multiple items, which are not suitable for the Prolific screening as it requires time and resources and can only be done with one item at a time. Three points are essential for the measure: it has to be in line with previous research, include a virtuality aspect, and must already exist within the pre-screening possibilities of Prolific. Here, two items existed in Prolific, one focused on whether or not employees work remotely and the other one concentrated on the use of technology (e.g. software) at work. To make sure that participants understood the concept of a virtual team and have current or previous work experience, a short informational text was added to the questionnaire. A definition of a virtual team was given in this paragraph together with a choice question at the end. Participants could then indicate to what extent they match the given definition and whether they are currently working, or had in the past worked, in a virtual team.

Due to the risk of selecting participants for the survey who are not part of a virtual team, participants were excluded based on two criteria. Firstly, participants were excluded if they indicated that they did not match the given virtual team criteria. Secondly, all participants that indicated they were part of a virtual team, but did not meet the specifications as indicated in the data (e.g. did not communicate with their colleagues computer-mediated at all) were also excluded.

Measures

Demographics and work details. Apart from collecting demographic details on gender identity, age and education, questions focused on demographics which related to the work environment of participants. This included questions on whether participants have leadership responsibilities, how often they meet other team members face-to-face and to which extent they interact with them by using CMC. These last two items focus on capturing the extent of virtuality in the participants' work environment, as suggested by Kirkman et al. (2004), Rapp et al. (2010) and Gilson et al. (2015).

Big Five Inventory (BFI). This 44-item inventory by John and Srivastava (1999) is a short questionnaire, measuring the prototypical components of the Big Five and has similarities to the NEO-PI-R by Costa and MacCrae (1992), the lexical facets of Saucier and

Ostendorf (1999) and the California Psychological Inventory Big Five facets of Soto and P. John (2009). This short inventory allows a time saving data collection, as there is no need for more differentiated measures of individual facets. Further, the short scales show good psychometric properties, with Cronbach's alpha between .75 and .90 and test-retest reliability from .80 to .90 (John, Naumann, & Soto, 2008). The items are presented as descriptions of oneself which need to be rated on a 5-point Likert scale from *disagree strongly* to *agree strongly*, e.g. 'I see myself as someone who is talkative'. To score the BFI, any reverse coded items need to be recoded, afterwards the mean score for each scale is calculated.

Team Climate Inventory (TCI). The 14-item short version of the TCI (Kivimaki & Elovainio, 1999) is based on the 38-item TCI by Anderson and West (1998). The TCI is increasingly used to identify areas for improvement in team functioning, and for evaluating whether teams are able to improve these areas, making it an interesting tool to explore the functioning of virtual teams and identify possible problematic areas. This short version was mainly chosen to achieve efficient time management for the overall survey. As it provides sufficient reliability with the Cronbach's alpha values of the subscales at $\alpha = .73$ to $.80$. The four subscales are *participative safety* (4 items, $\alpha = .80$) and *support for innovation* (5 items, $\alpha = .73$) which are both rated on a 5-point Likert scale with 1 = *strongly disagree* to 5 = *strongly agree*. *Task orientation* (3 items, $\alpha = .77$) is rated on a 5-point Likert scale from 1 = *to a very little extent* to 5 = *to a very great extent* and *vision* (3 items, $\alpha = .77$) is rated on a 5-point Likert scale as well, but with differing labels, 1 = *not at all* to 5 = *completely*.

Work Extrinsic and Intrinsic Motivation Scale (WEIMS). This 18-item questionnaire measures work motivation based on *Self-Determination Theory* (SDT; Deci & Ryan, 2000), as elaborated in the theory section on work motivation. The results of Tremblay et al. (2009) show that the WEIMS is able to predict positive and negative organisational criteria, making it an ideal tool to be used in an organisational context. The WEIMS has 6 subscales, which are intrinsic motivation, integrated, identified, introjected and external regulation and amotivation. Cronbach's alpha for the subscales reach from $\alpha = .64$ to $.83$, considering that each subscale consists of only three items, this gives adequate reliability (Tremblay et al., 2009). Participants rate statements about why they do their work, e.g. 'Because this is the type of work I chose to do to attain a certain lifestyle' on a 7-point Likert scale from *does not correspond at all* to *corresponds exactly*. The authors further suggest that the results of the WEIMS should be coupled with personal characteristics and self-reports

when interpreting results, which ties in with the use of the questionnaire within this study.

Team preference. Luse et al. (2013) investigated why people want to work in virtual teams. For this, they developed a measure which is based on a scale for preference of group work by Shaw, Duffy, and Stark (2000). Originally, this scale only measured the preference for working alone versus working in groups. Luse et al. (2013) modified it, to encompass the preference for working alone versus working in a virtual team. Additionally, they included four items based on the existing literature by Shaw et al. (2000), which measure the preference for working in a virtual team versus working in a face-to-face team. As this scale is the only tool that has not been widely used throughout research, its reliability has been examined closely. Luse et al. (2013) calculated reliability rates with the lowest value being $\alpha = .82$ as well as a confirmatory factor analysis, which revealed an excellent fit of the model. This also showed the existence of two separate dimensions of preference for working in virtual teams. In total, the measure consists of eight items which are rated on a 7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*. An example item is "When I have a choice, I would rather work in virtual teams than by myself". In the following analysis the whole measure will be referred to as *team preference*, this includes both PREF1 and PREF2.

Open questions. This part at the end of the questionnaire collected data on success factors and inhibitors of work in virtual teams. Here, participants were asked to describe a situation of their virtual team in which they either struggled/failed or succeeded. They were asked to critically reflect on a current or past situation/project in regard to the functioning of their virtual team.

Data Analysis

The reliability of all scales and subscales was examined through Cronbach's alpha levels. Table 2 displays the results for the TCI and WEIMS subscales in the top part of the table. The remaining scales are shown in the bottom part. The TCI subscales ranged between $\alpha = .75$ to $.89$. The Cronbach's alpha of the WEIMS subscales ranged between $.69$ to $.85$, only the subscale for external regulation indicated a value below $.70$. Due to the small amount of items (three) in the scale, this is to be expected and does not pose a risk to the internal reliability of the scale, especially considering that the test is a widely used and reliable way of measuring work motivation. The BFI showed similar reliabilities with an overall value of $\alpha = .77$ and the subscales ranging from $.77$ to $.86$, the lowest scale being neuroticism.

The research model, which is displayed in Figure 1, warranted analysis through a

moderated mediation analysis as described by Hayes (2017) and Field (2017). This was done by utilizing the PROCESS plugin (v3.0) for SPSS which was developed by Hayes (2017).

The statistical model for calculation is displayed in Figure 2. Within the model X stands for the five subscales of the BFI, Y for overall motivation through the WEIMS score and M_i the mediators, which in this model are two: PREF1 and PREF2. The strength of the mediation, as well as the direct effect of X on Y are moderated by the degree of virtuality W . The model illustrates the conditional effect of X on Y through $M_i = (a_{1i} + a_{3i}W)(b_{1i} + b_{3i}W)$ and the direct effect of X on $Y = c'$, as well as the interaction effects between X and W on M_i and the interaction of M_i and W on Y .

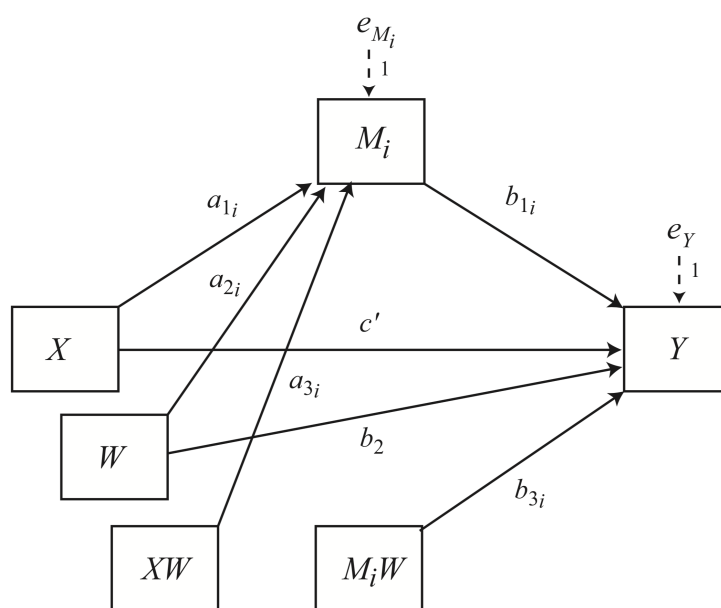


Figure 2. Statistical model of the research model of Figure 1, according to Hayes (2017) X = predictor, Y = outcome variable, M_i = mediators, W = moderator

The most reasonable way of analysis was to enter each subscale one at a time as predictor, while controlling for the correlation with the remaining scales as covariates, as described by Hayes (2017). The model was calculated by using Model 59 of PROCESS, the statistical model of which is displayed in Figure 2, and a 95% confidence interval with 10,000 bootstrapping samples for each stage.

H4 warranted analysis through a regression analysis, therefore the dataset was assessed in regards to whether it meets the necessary assumptions. The model was tested for heteroscedasticity by analysing the plots of standardised predicted values against standardised residuals, showing that homoscedasticity has been met. Additionally, multicollinearity was

assessed confirming that collinearity was not a problem for the model. The normality of residuals was tested through histograms and normal probability plots, which did not show any deviations from normality. Further, the assumption of independent errors has been met, which is indicated through the Durbin-Watson test showing a value of 1.86.

The open questions will be analysed through *Thematic Analysis* (Braun & Clarke, 2006). *Interpretative Phenomenological Analysis* (IPA; Smith, Flowers, & Larkin, 2009) and *Grounded Theory* (Strauss & Corbin, 1990) are limited through theories, e.g. phenomenological epistemology in the case of IPA. Furthermore, Grounded Theory is often used as a guideline on how to code data instead of its original use as a methodology for theory development. Thematic Analysis provides more flexibility, as it is not bound to a specific theoretical framework and can thereby be utilised in different ways, in this case as a realistic method to report the reality of participants. Braun and Clarke (2006) describe that data is not coded in an 'epistemological vacuum' (p. 12), meaning that the researcher is always driven by a theoretical or analytical interest while coding. In comparison to other methods of qualitative analysis, it is common to refer to the 'emerging of themes from the data', which gives a passive connotation to the work of the researcher. Thematic Analysis however describes the role of the researcher as actively identifying patterns in the text and creating links between them. This recognizes that the researcher actively decides which part of the data to discard or use to support their argument (Braun & Clarke, 2006). It is important to acknowledge this fact as it can skew the analysis if the theoretical framework or methodology does not fit with the researchers goal.

There are two levels on which a Thematic Analysis can occur, on a semantic or on a latent level. On the semantic level the analysis is primarily done descriptively by looking at the surface meanings of data. These descriptions are then interpreted in an attempt to select the most significant ones and interpret their implications in relation to previous research on the topic. On the latent level the analysis starts to examine underlying ideas and assumptions. Here, the development of themes involves interpretative work and the analysis itself is theorised. This Thematic Analysis will be done on a semantic level, which is suitable for the data set, since it contains short descriptions of problematic situations, experiences and topics within virtual teams, which are not expected to hold latent content.

Table 1

Phases of the Thematic Analysis of Qualitative Data According to Braun and Clarke (2006)

<i>Phase</i>	<i>Process Description</i>
1. Familiarisation with Data	Reading and re-reading data, writing down initial ideas
2. Code Generation	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code
3. Search for themes	Collating codes into potential themes, gathering all data relevant to each potential theme
4. Review of themes	Checking the themes in relation to the coded extracts and the entire data set
5. Defining and naming themes	Refine the specifics of each theme, generating clear definitions and names for each theme

This analysis uses a theoretical approach, meaning that patterns are identified deductively in a top-down approach, instead of inductively or bottom up. There is a specific analytic focus when looking at the data, as it was collected with a research question in mind. The results are meant to be linked to the quantitative data on personality, motivation and team climate, therefore the analysis focuses more on certain aspects of the data, instead of a more general description.

The thematic analysis will be carried out according to the five phases put forward by Braun and Clarke (2006). An overview of each phase with a description of the procedure for each step is displayed in Table 1. As described by the authors, the phases should not be seen as strictly separate, as the analytical process can be cyclical and go back and forth between different phases during analysis.

Results

Sample

Participants for the pretest of the survey were sourced through Ortelius AB and were current employees. The pretest was done with $n = 20$ participants. Due to changes that were done to the survey after the pretest their data was not incorporated into the analysis later on.

The main data collection on Prolific Academic yielded $n = 194$ participants in total. In total, 22 participants were excluded from the analysis based on these criteria. This left a sample of $n = 172$ with an age of $M = 34.88$, $SD = 9.95$, thereof 92 identified female and 80 male. 59.1% of participants indicated that they were from the United Kingdom, the remaining participants were from various other countries throughout Europe, Asia and the Americas.

The sample consisted mostly of academics with 5 holding less than a high school diploma, 43 a high school degree or equivalent, 64 a bachelors degree, 50 a masters degree, 6 a doctorate and 6 other types of professional degrees. 23 participants indicated that they are currently students, 128 (74.4%) were working full-time and 44 (25.6%) part-time.

37.4% of the sample work as part of a small group of up to ten members and 15.2% of a group of more than ten members most of their working hours. 46.8% work partly in a group and partly on their own during working hours. All participants indicated that they use technology (e.g. software for communication) at work at least two or three times a week, but more than 65% indicated that they make use of technology more than once a day.

Correlation Analysis

The relationship of the main study variables were analysed by calculating Pearson's correlations, which are displayed in Table 2, together with the mean and standard deviation for each variable.

The table is split into a top and bottom part. The top part shows the subscales of the TCI and WEIMS and their means, standard deviations and intercorrelations, the bottom the remaining main study variables. The results indicate that there is a moderate positive relationship between TCI and WEIMS scales, as displayed in the top part of the table.

Bi-variate correlation analysis between the personality traits, as identified through the BFI and the preference for working alone or in a virtual team (PREF1) and face-to-face or in a virtual team (PREF2) showed a correlation of $r = .21, p < .05$ between Extraversion and PREF1, indicating that higher values on Extraversion lead to a preference of working in a virtual team over working alone.

Further, neuroticism was negatively correlated to PREF1 with $r = -.22, p < .05$, indicating that higher values on neuroticism lead to a preference of working alone over working in a virtual team. Neuroticism also correlated negatively ($r = -.23, p < .05$) to PREF2, indicating that higher values on neuroticism lead to a preference of working face-to-face over working in a virtual team.

Additionally, conscientiousness is correlated to PREF2 with $r = .23, p < .05$, indicating that higher values of conscientiousness increased the preference of working in virtual teams over working face-to-face.

Table 2

Means, Standard Deviations, Cronbach's Alphas, and Bivariate Correlations of the TCI and WEIMS subscales

Measure	M	SD	α	1	2	3	4	5	6	7	8	9
1. VI	15.83	2.64	.80									
2. TO	10.70	2.48	.75	.50**								
3. PS	15.14	3.22	.84	.51**	.57**							
4. SI	10.75	2.75	.89	.51**	.58**	.67**						
5. IM	14.42	4.10	.82	.26**	.26**	.28**	.39**					
6. INTEG	13.55	4.31	.84	.37**	.33**	.31**	.43**	.65**				
7. IDENT	13.92	3.88	.73	.32**	.24**	.27**	.43**	.67**	.69**			
8. INTRO	13.41	4.56	.85	.27**	.24**	.32**	.38**	.65**	.64**	.69**		
9. EXT	16.22	3.14	.69	.31**	.16*	.27**	.10	.05	.15*	.18*	.18*	
10. AMO	8.51	4.12	.79	-.36**	-.23**	-.23**	-.11	-.07	.02	-.02	.08	-.05
1. WEIMS	12.89	23.47	.87									
2. TCI	52.42	9.08	.91	.42**								
3. EXT	3.10	.80	.86	.28**	.18*							
4. AGR	3.80	.58	.75	.40**	.32**	.16*						
5. CON	3.83	.66	.85	.21**	.32**	.10	.41**					
6. NEU	2.83	.73	.81	-.10	-.24**	-.43**	-.19*	-.25**				
7. OPN	3.50	.59	.77	.33**	.19*	.22**	.18*	.09	.08			
8. PREF1	4.05	1.27	.85	.19*	.29**	.21**	.01	.00	-.22**	.06		
9. PREF2	4.76	1.17	.77	.00	.27**	.00	-.00	.23**	-.23**	-.02	.41**	

Note. Based on $n = 172$ participants, VI = Vision, TO = Task Orientation, PS = Participative Safety, SI = Support for Innovation, IM = Intrinsic Motivation, IN = Integrated Regulation, ID = Identified Regulation, INT = Introjected Regulation, EXT = External Regulation, AMO = Amotivation, WEIMS = Work Extrinsic and Intrinsic Motivation Scale, TCI = Team Climate Inventory, EXT = Extraversion, AGR = Agreeableness, CON = Conscientiousness, NEU = Neuroticism, OPN = Openness, PREF1 = preference for working in a VT over alone, PREF2 = preference for working in a VT over FTF

** $p < .001$. * $p < .05$.

Moderated Mediation Analysis

The results of the moderated mediation analysis of Figure 2 are displayed in full in Table 3. Both extraversion and agreeableness show a direct effect on work motivation with $t(11,160) = 2.15, p = .03$ and $t(11,160) = 3.99, p < .01$ respectively. Conscientiousness, neuroticism and openness do not show a significant effect on work motivation in this model.

There was an effect of conscientiousness on the preference of working in virtual teams over face-to-face teams (PREF2), $t(7,164) = 2.68, p = .01$, indicating that higher levels of conscientiousness increase the preference to work in a virtual team instead of face-to-face. Additionally, an effect of neuroticism on the preference of working in virtual teams over working alone (PREF1), $t(7,164) = -2.14, p = .03$, and on the preference of working in virtual teams over face-to-face (PREF2), $t(7,164) = -2.75, p = .01$ was found, indicating that higher

levels of neuroticism increase both the preference to work alone and the preference to work face-to-face when given the choice between them and working in a virtual team. In the model personality explained a significant amount of variance in virtual team preference over

Table 3

Results of the Moderated Mediation Analysis Showing the Results for Individual Paths and the Conditional Indirect Effect at Specific Levels of the Moderator

		Path results			Conditional indirect effect					
		B	SE	t	Bootstrapping			95% CI		
		B	SE	t		B	SE	LL	UL	
EXT	EXT → PREF1	.22	.14	1.55	PREF1	low	.76	.97	-.64	3.17
	EXT → PREF2	-.12	.12	-.94		mean	.68	.66	-.42	2.15
	PREF1 → WEIMS	3.24	1.43	2.25*		high	.59	.99	-1.35	2.82
	PREF2 → WEIMS	-1.26	1.69	-.75	PREF2	low	.01	.52	-.77	1.43
	EXT → WEIMS	5.02	2.34	2.15*		mean	.20	.41	-.33	1.29
						high	.39	.79	-.60	2.52
AGR	AGR → PREF1	-.07	.18	-.40	PREF1	low	-.15	1.12	-2.61	2.23
	AGR → PREF2	-.27	.16	-1.66		mean	-.26	.74	-1.96	1.12
	PREF1 → WEIMS	3.38	1.43	2.30*		high	-.33	1.19	-3.23	1.68
	PREF2 → WEIMS	-1.09	1.70	-.64	PREF2	low	-.01	.81	-1.59	1.96
	AGR → WEIMS	12.34	3.10	3.99**		mean	.42	.64	-.60	1.98
						high	.87	1.23	-1.19	3.67
CON	CON → PREF1	-.11	.16	-.67	PREF1	low	-.52	.93	-2.89	.97
	CON → PREF2	.39	.14	2.68*		mean	-.32	.70	-1.90	.92
	PREF1 → WEIMS	3.31	1.43	2.31*		high	-.21	1.05	-2.70	1.72
	PREF2 → WEIMS	-1.23	1.69	-.73	PREF2	low	-.01	.84	-2.00	1.70
	CON → WEIMS	2.49	2.76	.90		mean	-.63	.90	-2.95	.69
						high	-1.21	1.78	-5.71	1.20
NEU	NEU → PREF1	-0.33	0.15	-2.14*	PREF1	low	-1.14	1.11	-3.51	.87
	NEU → PREF2	-0.37	0.14	-2.75*		mean	-1.06	.79	-2.82	.17
	PREF1 → WEIMS	3.30	1.43	2.31*		high	-1.01	1.16	-3.75	.83
	PREF2 → WEIMS	-1.22	1.69	-.72	PREF2	low	.05	1.01	-1.91	2.34
	NEU → WEIMS	1.97	2.58	.76		mean	.56	.76	-.74	2.32
						high	.91	1.31	-1.39	3.86
OPN	OPN → PREF1	.07	.18	.39	PREF1	low	-.42	1.14	-2.97	1.89
	OPN → PREF2	.01	.16	.08		mean	.38	.62	-.70	1.81
	PREF1 → WEIMS	3.35	1.43	2.34*		high	.84	1.05	-.78	3.35
	PREF2 → WEIMS	-1.23	1.69	-.73	PREF2	low	.02	.72	-1.34	1.72
	OPN → WEIMS	.07	.18	.39		mean	-.04	.32	-.75	.66
						high	-.16	.70	-1.66	1.37

Note. Path for bootstrapping: BFI → PREF1/PREF2 → WEIMS, moderated through the degree of virtuality. Levels of the moderator: low = -33.14, middle = 6.86, high = 26.86

** $p < .001$. * $p < .05$.

face-to-face teams with $R^2 = .11$, $p < .05$, as well as preference for virtual teamwork over working alone with $R^2 = .07$, $p < .05$. H2b can not be supported, as no indirect effect of the BFI subscales on work motivation for any of the two preferences could be found. This is

related to H3, for which also no support could be found. The bootstrapping results, which are displayed in Table 3, show that there is no moderation effect of virtuality on any of the relationships.

Regression Analysis

As described in the data analysis section, the assumptions for regression analysis were tested and met. Here, multicollinearity was assessed, showing the average variance inflation factor (VIF) value for Model 4 at 1.05. Hence a stepwise multiple regression with the TCI overall score as dependent variable and the BFI and WEIMS subscales as predictor variables was calculated, the results of which are shown in Table 4. The regression analysis yielded a significant model which predicted team climate through integrated regulation, amotivation, neuroticism and external regulation, as displayed in Table 4. For the fourth model, extraversion, agreeableness, conscientiousness, openness, intrinsic motivation, identified regulation and introjected regulation were excluded from the model, as they did not contribute to it significantly.

Table 4
Stepwise Multiple Regression Analysis with TCI as the outcome variable

	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	<i>SE</i>	<i>b</i>	<i>B</i>	<i>SE</i>	<i>b</i>	<i>B</i>	<i>SE</i>	<i>b</i>	<i>B</i>	<i>SE</i>	<i>b</i>
CONST	39.86	2.06		45.17	2.29		51.53	3.20		43.97	4.62	
INTEG	.93	.15	.44	.94	.14	.45	.91	.14	.43	.87	.14	.41
AMO				-.64	.14	-.29	-.60	.14	-.27	-.59	.14	-.27
NEUR							-2.23	.80	-.18	-1.83	.81	-.15
EXT										.43	.19	.15

Note. CONST = Constant, INTEG = Integrated Regulation, AMO = Amotivation, NEUR = Neuroticism
EXT = External Regulation

Model 1: $R^2 = .193$, *Model 2:* $\Delta R^2 = .178$, *Model 3:* $\Delta R^2 = .310$

Model 4: $F(1,167) = 20.58$, $p < .001$; $\Delta R^2 = .330$

The model is significant with $R^2 = .33$ and $p < .001$, indicating that these four variables account for 33% of variance in team climate. The adjusted $R^2 = .314$ is .016 lower, indicating that if the model were derived from the population it would account for 1.6% less variance.

An ANOVA confirms that the model significantly improves the ability to predict team climate with $F(4,167) = 20.58$, $p = .001$. The regression equation to predict TCI shows the negative relationship of amotivation and neuroticism and a positive one for integrated regulation and external regulation: $TCI = 43.97 + (.87 * INTEG) + (-.59 * AMO) + (-1.83 * NEUR) + (.43 * EXT)$. All variables are significant predictors with $t_{integ}(167) = 6.40$, $p = .001$;

$t_{amo}(167) = -4.20, p = .001$; $t_{neur}(167) = -2.25, p = .03$ and $t_{ext}(167) = 2.24, p = .03$. The b -values and their significance are reported in Table 4.

The sum of these test statistics indicate, that the overall model is likely to be representative of the population values.

Thematic Analysis

The thematic analysis was conducted according to the five phases described in Table 1. During Phase 1 some issues with the qualitative data arose, as participants described concrete work tasks or successes, i.e.:

"We managed to streamline the processes for delivering into a central warehouse to cut it down from 7 days to 2."

Although this describes a success which was accomplished in a virtual team, it does not offer any content for analysis and had to be excluded. Further data had to be excluded due to bad language skills, mistakes in sentence structure or spelling that made the meaning ambiguous.

The qualitative data set had $n = 143$ valid cases for the question on success factors (SF) and $n = 139$ for inhibitors (IF). On average participants wrote $M_{IF} = 229.51, SD_{IF} = 143.72$ and $M_{SF} = 189.49, SD_{SF} = 81.01$ characters when answering the questions.

Within the second phase a cyclical process of code generation started, this process went back and forth between familiarisation with the data and the creation of initial codes. These were revised or removed the further the analysis proceeded. In total 47 unique codes were created for inhibiting factors of virtual teams, encompassing 282 data points and 71 codes for success factors, encompassing 298 data points.

All codes were collated into potential themes during phase three, then all the data that corresponded to the theme was gathered and reviewed again. During this process the themes were revised depending on the cases they contained. Any cases that were ambiguously coded were re-coded and moved to their corresponding theme. This review also marks the beginning of phase four, during which all themes were checked in relation to the codes they contain and in relation to the entire dataset and other themes. This was meant to decrease overlaps between themes and clarify their definition and name.

As displayed in Table 5 the unique codes were grouped into eight themes for inhibitors and ten for success factors. The table also shows the total number of cases that were analysed for each question and the number of unique cases that are enclosed by a theme. The themes

Table 5

Themes identified in the qualitative analysis with the numbers of codes they encompass

Inhibitors (139 cases)	<i>n</i>	Success Factors (143 cases)	<i>n</i>
Difficulties with communication	65	Open communication	60
Delayed or insufficient sharing of information or task progress	57	Task division, dependency, accountability	54
Lack of organisation and coordination	35	Higher efficiency through virtual teams	51
Social loafing and lack of motivation	34	Sharing information and task progress	45
Leadership	27	Personality	29
Geographical separation from colleagues	27	Utilisation of meetings	19
Technical problems	23	Organisation and Coordination	15
Personal or cultural problems	14	Defining team roles and skills	10
		Miscellaneous	9
		Leadership	6
Total: <i>n</i> = 580	282		298

Note. The *n* in the headline describes how many cases (participants) the analysis is based on. The number for each theme describes how many codes the theme encompasses. The total number at the bottom of the table is the sum of all data points in the overall dataset.

with their formulated meaning (code) are displayed in detail in Table 6 for success factors and Table 7 for inhibitors, both of which are located in the appendix. The two tables also display the number of cases that correspond to a specific code. This gives full transparency into what each theme stands for and which meanings it includes.

Themes. This section describes the themes that were identified in the thematic analysis. Each theme includes a prototypical statement that participants gave and which is representative for the theme as a whole. All statements have been corrected for grammar and spelling mistakes without changing their meaning. Inhibitors will be described first and then success factors.

Inhibitors.

Difficulties with communication. This theme sums up general communication problems participants mentioned. A large amount of participants indicated that this is not due to a lack of communication per se. Instead, participants remarked that communication occurs regularly, but that there is a lack of mutual understanding. They attributed this to the fact that communication through CMC can be interpreted ambiguously or is less creative, especially when using text-based means of communication, which is shown by the following statement:

"Sometimes when writing an email [...] this brainstorm was not possible and to explain my line of thought was not possible and confusing."

This is related to another common inhibitor mentioned, which is the difficulty of getting a

point across during virtual meetings. Participants reported, that during video or phone conferences it is often harder to follow up on questions or clarify them. Additionally team members might not feel comfortable to ask for clarifications or have a different interpretation of what was said in a meeting, and will therefore communicate less, which was also named as an inhibitor:

"There are mostly online meetings, where some people don't talk at all. There is no individual communication between members of the team. This leads to misunderstandings."

Delayed or insufficient sharing of information or task progress. Participants reported that their teams' effectiveness was significantly impacted when other members did not share project relevant information or their task progress in a timely manner. Virtual teams who were high on virtuality and geographical dispersion were indicated to be especially impacted by this behavior, as demonstrated here:

"The timezones can also be a difficulty as it causes a delay, i.e. I report an issue at 1PM GMT and the Chinese team will not be at work to look at it until 2AM GMT. If they then need further info from myself then again there is a delay - if we were working in a team that kept the same hours we would not experience this."

Participants emphasized that this affected their team when tasks were dependent on other members. Further, a significant impact was due to the delay in sharing task progress or information. This was not only attributed to colleagues being in different time zones, as it also occurred during regular CMC when colleagues did not reply immediately/on time.

Lack of organisation and coordination. This theme sums up various problems that participants indicated as related to a lack of organisation and coordination. One third of the cases were related to the team being dispersed across multiple time zones:

"I was working with people based in Australia. Due to the time difference it was very difficult to communicate via telephone or Skype, so most communication was via e-mail. Things would change in our work situation between e-mails so it was frustrating and difficult to get anything achieved." (participant located in the UK)

There is a significant difference to the previous theme, although they show similarities. The important factor of this theme is the lack of tools. They are supposed to support organisation

and coordination, as well as non-existent or ineffective control mechanisms which force the team and management to organise and coordinate their processes or anticipate team-specific circumstances (e.g. time zone differences).

Social loafing and lack of motivation. Participants shared examples of fellow team members not contributing to the overall progress. This social loafing was attributed to a variety of factors which included that members were not held accountable for their deliveries, there was a lack of leadership, colleagues in different locations had different priorities, or there was a general lack of work motivation.

"The most important problem is that usually 60-70% of the team has little or absolutely no interest in doing their tasks. Success is guaranteed, because I always do everything I can along with the reliable members of the team, but it's pretty hard for me to accept this unfairness."

Leadership. Participants revealed that a lack of, or bad leadership, influences the team directly and indirectly. Leadership can be related to a variety of themes that are described in this section, i.e. organisation and coordination. This theme encompasses statements of participants who specifically held their leader or manager responsible for inhibiting team effectiveness. This included a lack of accountability for tasks, the absence of task organisation as well as team members not having a mutual understanding of the project goals and expectations.

"One project failed because we had unclear objectives. The vision for the project was driven by only [the leader], who was relatively hands off and didn't check in with anyone else, so each of us worked individually with the result that our work didn't fit together well. The project eventually fell apart due to repeated delays and stalling over the lack of direction."

Individually many of these inhibitors were mentioned in other themes already, however, participants view leadership as a necessary facilitator for these themes. The absence of leadership therefore influences teams on different levels.

Geographical separation from colleagues. Participants described different circumstances in which being geographically separated from their team members acted as an inhibitor for team effectiveness. On multiple accounts participants reported that, in their perception, it is not possible to substitute face-to-face teams with virtual teams, i.e.:

"Most of my team is based in Mumbai, with a core expert team in London. We support a number of live systems for our financial services company. There are often high priority production incidents that need to be resolved quickly. Working onshore/offshore works fine for simpler or already known problems. But when a completely new/serious/difficult to solve problem occurs, it is invariably the London based experts who end up having to fix it. There is no substitute for having experienced staff, all sitting near each other, able to bounce ideas and work together."

Further inhibitors that participants reported were the scarcity of immediate availability of colleagues in virtual teams in comparison to face-to-face teams. This can lead to a decrease in efficiency as members need to wait longer for replies or relevant information.

Technical problems. Participants reported numerous technical problems which were related to software or hardware components not functioning as they should, which is demonstrated in this quote:

"Our online platform failed and we had server outages for one week, which drastically reduced our effectiveness and wasted a lot of time while we fixed it."

Also, some participants described that technologies could not be used to their full potential as colleagues did not have enough know-how in order to work efficiently. In parts, technology was used for the wrong purpose, i.e. there were too many people on a Skype call, making it difficult for members to understand who was talking.

Personal or cultural problems. The least mentioned theme by participants encloses all statements that were related to personal or cultural problems and preferences. Here, individuals indicated that they felt they were unable to operate effectively in their team as colleagues felt distant, they were lacking the voice of another person or their facial expression when interacting with them as stated here:

"You can't sense the real reaction of a person behind a screen. Words can be harsh, but seeing the persons face in real life can ease or help a situation a lot more."

Participants reported that these unfulfilled individual preferences led them to work inefficiently and show decreased motivation at work.

Success factors.

Open communication. Participants shared how active and frequent communication with other team members was essential for their virtual team. When communicating with others, members tend to be honest and direct about their opinions and ideas. They actively and regularly interact with their colleagues in order to share information, update each other on their task progress or discuss difficulties. The environment in which this happens is non-threatening and others are not being judged for what they have to say. This enables an open communication between all members of the team which can lead to a clear understanding of task and project goals, therefore enhancing the creative process. An example that illustrates this type of open communication is:

"[...] the team was from the UK and Ireland, language and time zones were not a barrier. The project team worked well together and utilised technology such as OneNote, Skype or screen sharing, this made collaboration far easier. Communication occurred in greater detail than in local project teams."

Task division, dependency, accountability. Participants reported how tasks are separated within the team, whether they are dependent on the work of other team members and if they can be held accountable for the tasks they are assigned to. Teams were especially successful when having a clear division of their tasks, where individual team members can be held accountable if their task is not completed in time. An example:

"When objectives were clearly laid out and a framework of task allocation was introduced. This meant that there was an ownership and responsibility for each task, and people were more accountable for their actions."

This accountability was stressed multiple times, as it reduces social loafing. Another success factor was to minimize the dependency of tasks within the team, participants indicated that this increases efficiency, as team members do not rely on the input of others or are being delayed in their work (e.g. if a team member is in a different time zone). As this is often not possible within projects the accountability of each task should be emphasized and delays anticipated when planning the project.

Higher efficiency through virtual teams. Participants talked about how virtual teams increase the efficiency throughout their team, which is partly due to the nature of virtual teams itself. In large parts this can be attributed to CMC which saves time and resources as team

members do not need to travel for meetings. Therefore the biggest success factor for virtual teams is that they can quickly bridge long distances to other members in order to solve conflicts or problems.

"We can communicate anytime, during nights etc., so it's not limited to 9-5 work time. We don't waste time on meeting face-to-face - it's more efficient I think"

This does not only save time, resources and money, but also supports a dynamic work environment as team members are not bound to regular working hours in order to finish their tasks.

Sharing information and task progress. This theme encompasses the description of participants and that of team communication which is aimed at updating other team members about the status of individual tasks or other information that are essential to the functioning of a project.

"[...] all levels of expectations were met, that were agreed [on] in a video conference, and the task went through smoothly, with everyone communicating appropriately and informing others of their actions."

This shows that team members share their task progress on an individual or group level regularly, in particular if other team members depend on the outcome of said task. Participants expressed, that this can be supported by a structured progress through the leader, or through the initiative of individual team members.

Personality. Participants described various types of success factors that can be attributed to personality traits or related behaviours of team members that are beneficial to the team as a whole. This includes an openness to new ideas members have in regard to tasks, but also openness to individual feedback regarding the execution of a task or individual behaviour. Additional factors included honesty, authenticity, enthusiasm for their work, as well as trusting other team members. Participants indicated that a good mix of personality is essential to a well functioning team, and that some members might perform better in a virtual setting, compared to a face-to-face team, which is illustrated by the following statement:

"Different members in the group are perhaps quieter than others and so being in a virtual team works for them and they are much more forthcoming with their ideas. It helps them explain and express themselves, therefore we have more ideas on board [...]"

Utilisation of meetings. This theme sums up the reports of participants of how and when meetings (both virtual and face-to-face) are being utilised by successful virtual teams and how they support communication, information sharing and effectiveness. A majority of participants indicated that they were successful by having regular online meetings (e.g. through phone or video conferences), which can be scheduled daily or weekly. In these meetings the members update each other on their individual task progress, problems they ran into, or other issues. This way all members stay up-to-date and can help each other solve problems. This behaviour is demonstrated through the following statement:

We had a meeting via Skype around twice a week. It was a research group between different universities, all of us are lecturers, we got a success when we received a research grant from the government, we worked together only via Skype and e-mail."

Face-to-face meetings were only mentioned as a contributor to successful teams when the team was not able to resolve a conflict or problem through other means of communication.

Organisation and coordination. Participants described how reliant teams are on basic processes in regard to organizing and coordinating the activities and tasks of a virtual team. Participants' depiction of this theme emphasizes, that virtual teams have different organisational demands, which can be illustrated via the example of teams who have members in various time zones. Here, coordination is essential, as there might only be a small overlap in time where members can communicate during working hours. Furthermore, if tasks depend on each other, members anticipate by when to finish a task, so another team member in a different time zone can start working on it. If this is done successfully, the team will be able to work constantly, as mentioned here:

"When everything was going according the plan we were really efficient because one could work when the others were asleep." (the team was located in different time zones)

Defining team roles and skills. Participants expressed the necessity of clear definitions and delineations of roles in a team on two levels. First, responsibilities and tasks related to the functioning of the team itself and second, responsibilities and tasks related to the skills needed to complete a task successfully. They stressed the importance of merging people not only based on their skill, but also based on other characteristics that are vital to the success of the

team. Furthermore, participants indicated, that the need for clear team roles increases with the complexity of a project.

Leadership. Shows how the team leader or management can take control and influence the success of their virtual team. The indicated success factors were related to the manager supporting organisation and coordination, which ultimately contributed to the success of the team. This was especially important when the team members were not actively engaging in open communication, e.g.:

"Leadership was effective in keeping everyone informed and creating a plan to fix the problem."

Discussion

The purpose of this thesis was to address the influence of personality on work motivation in virtual teams, while taking into account team preference and virtuality. Research has put a focus on various variables like leadership or technology as predictors of virtual team outcomes (e.g. effectiveness or performance), little attention has been directed towards individual characteristics of team members and how well their personality aligns with the concept of virtual teams. The thesis at hand tackled this gap in research by investigating the relationship between these variables more closely. Consequently, this study makes various practical contributions to current research and gives implications which can be utilised by organisations, e.g. by incorporating them into practical software solutions for the management of virtual teams. The results and their implications for current researchers as well as practitioners will be discussed and critically evaluated in the following.

Although the proposed research model cannot be supported as a whole, it did find significant results in the quantitative part, by showing how team climate can be predicted through individual work motivation and personality. Additionally, the qualitative analysis identified a set of inhibitors and success factors which support the quantitative results and answer the research question, as they are able to back the results with pragmatic work place experiences.

Quantitative Analysis

The results showed that individuals who are more agreeable and extraverted, show higher work motivation and are likely to experience less conflicts in virtual teams. These findings give partly support to the first hypotheses. Consequently, they are confronted with

fewer problems and are able to collaborate with their team members more effectively. Thus the overall work motivation is increased. Team members who score higher on extraversion are likely to communicate and interact with their colleagues more often. Here, participants indicated, that one success factor for their virtual team was the sharing of information and task progress. The increased interaction through higher levels of extraversion might support this theme, as it facilitates the sharing of information within the team. Both agreeableness and extraversion can be seen as predictors for work motivation, as they facilitate behaviours that are beneficial for the team. Support for this assumption comes from Gil de Zúñiga, Diehl, Huber, and Liu (2017), who found, that agreeableness and extraversion are positive predictors of different types of CMC usage, explicitly social media use. This makes the assumption of the effect existing in a professional work environment likely. The results of this thesis can be incorporated into the management of virtual teams, particularly in their forming phase, as the selection of team members based on personality criteria can prove beneficial for the overall work motivation of the team and in consequence for team climate as well. First realisations of similar applications have been demonstrated by André, Baldoquín, and Acuña (2011) and Infante Abreu, André Ampuero, Rosete Suárez, and Rampersaud (2014).

Personality traits were only able to explain a small amount of variance in regard to team preference, therefore part one of the second hypothesis could only be supported in parts. However, the results obtained in this study differ to the ones of Luse et al. (2013), who found openness to be a significant predictor of the preference of working in virtual teams over face-to-face. In this study, conscientiousness and neuroticism showed an effect on team preference. The fact that individuals who score high on neuroticism have a preference towards working alone can be attributed to the traits' relation to mistrustful behaviour and a difficulty in managing stress (Brouwer, van Schaik, van Erp, & Korteling, 2013; Jonassaint et al., 2009) and is supported by Luse et al. (2013). However, the preference towards working in a face-to-face team instead of a virtual team contradicts this, as a virtual team offers the possibility to work with others, while having fewer social interactions. A possible reason for this effect is, that the trust in other team members in a virtual team is even lower, than in a face-to-face team. Considering the nature of the neuroticism trait, it is therefore possible, that between the two teams, a conventional team might offer a better environment to manage stress and facilitate trust in team members. An explanation here is, that neurotic individuals interact with their team members face-to-face rather than being confronted with the uncertainty that

comes with CMC. Support for this comes from Korukonda (2007) who found that neuroticism is linked to the fear of complex technology and computer anxiety, which would make a virtual team an unfitting working environment.

The absence of a mediation effect through team preference on work motivation is surprising, as team preference can be partly explained through personality and team preference has an influence on work motivation. When controlling for interaction effects and correlations, the assumption, that an indirect effect of personality through team preference on work motivation exists, could however not be sustained, therefore no support could be given to the second part of the second hypothesis. Around 50% of participants indicated, that they work partly in a group and partly on their own. It is possible, that work motivation was not measured in regard to their virtual team, but that participants related it to their work in general. Consequently, the measure might not reflect work motivation in their virtual team specifically, therefore it might not be possible to rely on the results of the analysis, as the required reliability of the outcome variable is uncertain.

The third hypothesis could also not be supported. The insignificance of the moderation through virtuality can be attributed to the nature of its single-item measure, which was based on Rapp et al. (2010) and does not include further variables that can be summarised through virtuality, e.g. the amount of face-to-face meetings a team has (Kirkman et al., 2004). It is reasonable to assume, that this does not encompass the whole construct of virtuality. Consequently, the measure might not have been sufficient for explaining moderation effects within the research model. The study was developed with the assumption in mind, that teams, which have a high degree of virtuality, have fewer face-to-face interactions and that this can affect work motivation. However, with the used scale, participants who indicated that they interact mostly computer-mediated, can still meet their team face-to-face on a regular basis.

The results can therefore be interpreted in one of two ways, either virtuality does not affect the relationship between personality, team preference and work motivation, or the used measure does not capture the aspect of virtuality which is relevant to said relationship. Looking at the previous literature on virtuality as a moderator in virtual teams however (Dulebohn & Hoch, 2017; Schaubroeck & Yu, 2017), the latter may be the case.

Support can be given to the fourth and last hypothesis, as both work motivation and personality were able to predict team climate. Here, integrated regulation, amotivation and external regulation, together with neuroticism were able to predict team climate. This shows,

that especially individual work motivation has an influence on team climate, as three subscales are included within the model. Similar results were shown by Zhu, Gardner, and Chen (2018), however, in their model motivation is applied as a moderator variable. The positive effect of integrated and external regulation shows that individuals who either identify with their task to the point where it becomes a part of their sense of self, or are doing a task solely for a reward, contribute to the team climate positively. However, individuals who show amotivation, therefore lacking the intent to act or are acting passively, or rate high on neuroticism, do not contribute to team climate positively. These findings are supported through the thematic analysis, which found that participants indicated personality to be influential on their virtual teams. Here, participants mentioned that effectiveness decreased when colleagues were withdrawn or solitary, indicating amotivation or neurotic traits. However, enthusiastic and authentic colleagues, who can be linked to integrated regulation, were mentioned to be beneficial for the success of the team.

Qualitative Analysis

The identified themes in the thematic analysis can be linked to a variety of characteristics from the typology brought forward by Bell and Kozlowski (2002). This does not only support previous research, but it emphasizes the representativeness of the sample, as participants reported difficulties and successes which are consistent with the virtual team typology. An example here is the member roles' characteristic, which is reflected in the theme on defining team roles and skills. Consistent with the literature (Bell & Kozlowski, 2002; Hoch & Kozlowski, 2014), participants indicated, that the importance of the theme increases with task complexity.

The results of the thematic analysis show that some themes appear in both questions and others are unique to either success factors or inhibitors, i.e. within both questions communication was identified as the most mentioned theme. This overlap exists in different themes, e.g. difficulties with communication vs. open communication; lack of organisation and coordination vs. organisation and coordination; delayed or insufficient sharing of information or task progress vs. sharing information and task progress.

Themes, which only appear as inhibitors, can partly be considered a basic need for virtual teams, i.e. technical problems and a lack of technical knowledge. They are essential to the functioning of the team, however, they are not mentioned to be an explicit success factor for teams. These results indicate, that instead of focusing efforts on satisfying the basic needs

of the team, organisations spend resources on aspects that are not necessarily representative of the teams actual needs. Here, the focus should lie on supporting coordination, organisation and sharing information proactively. This is another finding, which can be useful for practitioners, as it can be implemented into a software application, which helps virtual teams get organised.

Another example from the dataset is the topic of leadership, a concept which has been among the most studied ones in virtual team research, e.g. by investigating transformative or transactional leadership styles in virtual teams with performance or effectiveness as outcome variable (Gilson et al., 2015). However, few participants in this study indicated that leadership is crucial for their teams success, making leadership the least mentioned theme.

Instead, the results show, that virtual teams have a need for management over leadership. Inhibiting factors related to leadership emphasized the need for a manager who helps the team to organise and coordinate the tasks and creates transparency in regard to the goals the team should achieve. When participants talked about inhibitors concerning leadership, they talked about management that failed to facilitate the organisational needs for the team, hindering the overall effectiveness. These results demonstrate, that instead of focusing on specific leadership styles in virtual teams, researchers and organisations should investigate effective management techniques and technological or organisational supports. Thus, creating a baseline related to organisation and coordination that virtual teams have to follow. This could be done through the implementation of clear-cut software solutions that support virtual teams and their members in organising and coordinating tasks, e.g. by requiring members to share their task progress or enabling members to share their ideas and feedback on a regular basis.

Limitations

A major limitation for this research was the lack of a measure to capture the virtuality concept. There are different items and scales that researchers use to classify teams as virtual, but there is no consistency throughout the literature, making it hard to find common ground for a research project. The lack of a standardised measure put the reliability at risk as it made the pre-screening for participants difficult. Although, the screening of participants as well as the exclusion criteria were set, based on past research and different literature reviews, there was still a big amount of uncertainty on whether the criteria were thorough enough and succeeded in capturing the right concept.

The problems with the virtuality measure also affected the moderation analysis. It is unclear whether this resulted in methodological problems with the virtuality construct or

whether there is no effect on work motivation.

Another limitation appears in regard to the use of the TCI. As the thesis focused on the individual level, whole teams were not examined, only individuals who work within teams. Thus, TCI scores only reflected an individuals' impression of the team climate, making it very subjective. Anderson and West (1998) recommend to use the TCI on group level, to ensure reliability, as one rating does not necessarily reflect the team's rating.

Additionally, the data collected on the qualitative questions of the questionnaire was partly generalised and lacked depth. One reason could be that participants blame failures in projects on broad descriptions like 'poor communication', instead of mentioning skill, intelligence or other factors which they might be responsible for themselves. This reduces the depth and detail the data provides, however, it is a limitation that is hard to account for, as it is related to the reflective ability of the participant. Furthermore, as the questions on success factors and inhibitors were located directly next to each other, many participants tried to fit one example into both questions. This led to far-fetched examples and situations. Splitting the two questions over two pages and urging participants to use unique examples of experiences or situations for each question would generate more data, producing more detailed results.

Practical Implications and Future Research

As mentioned in the discussion, one of the major implications, especially for practitioners, is to use the results for the development of a software application which can support virtual teams. Such an application could take the form of structural support elements, as described by Bell and Kozlowski (2002) and Hoch and Kozlowski (2014). A solution like this incorporates organisational elements, which help virtual teams to organise and distribute their tasks and define their roles with clear responsibilities. Additionally, it could include elements as described by André et al. (2011), which can help managers in forming virtual teams based on personality. The data requirement of such an application would pose challenges in regard to data privacy, security and abuse of data, as it would collect personal data of employees, i.e. personality profiles, work motivation, and individual preferences. If handled correctly, such an application would be able to support managers and virtual teams alike by increasing individual work motivation as well as the overall effectiveness of the team.

Future research should focus on developing a standardised measure for virtual teams. Based on past research it should clearly demarcate how a virtual team is defined. As virtual teams can be described through a variety of variables such as geographical dispersion, amount

of communication that occurs computer-mediated or others, it should ideally be a composite measure that encompasses different dimensions of virtual teams and then calculates a 'virtuality value' on a continuum. This measure would require a clear 'cut-off', that differentiates virtual teams from regular face-to-face teams that use CMC in most of their work. Hence, a definite classification of teams on a virtual continuum in order to identify and compare them, would be in place. A composite measure would create a good overall conceptualisation of the construct, but might lack depth as it reduces different dimensions of virtual teams to one. However, the possibility to classify all teams through one measure and therefore being able to compare them using one tool might outweigh this negative aspect. Ideally, another study should expand the current one by including a different virtuality measure and by focusing on virtual teams on group level. Investigating personality and team climate on the group level would shift the focus from a cognitive schema approach to a shared perceptions approach on team climate and how team personality composition influences this climate. Instead of looking at individual preferences and their outcome on motivation, this could be an interesting approach to evaluate whole virtual teams and how their personality composition impacts their performance. This would increase the reliability of the TCI, virtuality measure and the researchers' ability to generalise the results as they would not be dependent on the opinion of one individual of the team.

Conclusion

The present study contributes to previous research on personality, team preference, work motivation and team climate in virtual teams. The implications of globalisation and continuing technological advances make virtual teams an aspect of the work environment which will increase in complexity in the future. The demands virtual teams put on organisations worldwide will continue to grow, making the organisation and management of virtual teams a challenge. This study discussed the role of virtuality as a moderator in virtual teams, the effect of personality on work motivation through team preference and whether work motivation and personality are able to predict team climate. Furthermore, it gave qualitative insights into experiences of virtual team members, analysing which factors help them succeed, or inhibit, their work. Additionally, this study gives methodological implications for future research, which can help to develop a composite virtuality construct. The thesis helps to enhance knowledge across virtual team research by giving theoretical and practical implications, which can be addressed in future research projects or integrated into practical applications.

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Appendix

Table 6
Success Factors in Virtual Teams and Their Associated Meaning

Themes	Formulated meanings	<i>n</i>	
Open communication	Open communication	25	
	Communication via video conferencing	15	
	Communication via e-mails	11	
	Communication via online platforms	5	
	Communication via messengers	2	
	Communication via phone	2	
Task division dependency and accountability	Collaborative tasks	16	
	Individual tasks	16	
	Support from colleagues who are in a different location	8	
	Task division in complex projects	5	
	Task division in general	3	
	Having tasks which are independent from other team members	3	
	Being accountable for your tasks	2	
	Receiving a reward for individual contribution	1	
	Higher efficiency through virtual teams	Higher efficiency through virtual teams	24
		Saving time through online meetings	9
Save time and resources through CMC		7	
Not bound to regular working hours		5	
Constant progress due to team members in various time zones		4	
More cost effective than FTF teams		2	
Sharing information and progress of tasks	Actively sharing information with the team	20	
	Have the same understanding of a project	17	
	Sharing the task progress with team members	8	
Personality	Openness to new ideas	9	
	Enthusiasm	4	
	Openness to feedback	4	
	Trust in team members	3	
	Good mix of personalities	2	
	Honesty	2	
	Virtual team enhances creativity	1	
	Authenticity	1	
	Team members tend to be less shy	1	
	Bridge long distances	1	
	Understanding how team members in other cultures think	1	
	Utilisation of meetings	Regular online meetings	10
		Mix of virtual and face-to-face meetings	3
		No face-to-face meetings at all	3
Regular face-to-face meetings		2	
Motivation through regular online meetings		1	
Organisation and Coordination	Organisation & Coordination	14	
	Enough time for planning	1	
Defining team roles and skills	Merging the skills of the team	6	
	Clearly defined team roles	4	
Miscellaneous	Identifying mistakes/problems early on in the project	2	
	Be transparent about expectations for a project	1	
	Evaluating each other's work	1	
	Realistic goal planning	1	
	Feedback from colleagues who are in a different location	1	
	Knowing where to make changes	1	
	Monitoring performance through software	1	
	Monitoring progress through regular meetings	1	
	Leadership	Leader takes control	5
Team members as leaders		1	

Note. Themes and their formulated meanings (codes) are sorted by frequency. High frequency being at the top of the table and low frequency at the bottom. Within the formulated meaning of a theme the meanings are sorted from high (top) to low (bottom) occurrence in the data.

Table 7
Inhibitors in Virtual Teams and Their Associated Meaning

Themes	Formulated meanings	<i>n</i>
Difficulties with communication	Difficulties with communication in general	21
	Lack of mutual understanding	20
	Difficulties with e-mail	10
	Difficulties with video conferences	7
	Hard to get a point across	4
	Difficulties with phone	2
	Lack of communication during online meetings	1
Insufficient sharing of information or task progress	Delay in communication	20
	Lack of information sharing	17
	Individual tasks are dependent on other members	10
	Task progress is not transparent	8
	No understanding of problems through team members in a different location	1
Lack of organisation and coordination	virtual teams are not suited for complex problems	1
	Lack of organisation & coordination in general	23
	Difficulties due to different time zones	12
Social loafing and lack of motivation	Social loafing	14
	Lack of motivation	7
	No accountability for tasks	6
	Colleagues at different locations have different task priorities	5
Leadership	Lack of cooperation	1
	Lack of leadership	19
	Dynamic memberships disrupt progress	4
Geographical separation from colleagues	Team roles not defined	4
	Decreased efficiency due to team members not being physically present	8
	Lack of availability of colleagues	8
	Conflicts can only be identified through face-to-face interaction	6
	No regular working hours due to time zone differences impact the personal life	2
	Not enough face-to-face meetings	2
Technical problems	Difficulties in solving conflicts via CMC	1
	Technical difficulties in general	21
Personal or cultural problems	Lack of technical knowledge	2
	Team members feel distant	5
	Lack of facial expressions	2
	Lack of voice expressions	2
	Cultural differences	2
	No understanding of the personality of team members	1
	Not knowing team members personally	1
CMC hinders creativity	1	
Unwillingness to learn new things	1	

Note. Themes and their formulated meanings (codes) are sorted by frequency. High frequency being at the top of the table and low frequency at the bottom. Within the formulated meaning of a theme the meanings are sorted from high (top) to low (bottom) occurrence in the data.

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