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## Article

# Virtual teams are here to stay: How personality traits, virtuality and leader gender impact trust in the leader and team commitment

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# European Research on Management and Business Economics

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## Virtual teams are here to stay: How personality traits, virtuality and leader gender impact trust in the leader and team commitment



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### ABSTRACT

Teleworking has, today, become a necessity for many organizations, so effective virtual team management is critical. This study analyzes the influence of the personality traits of virtual team workers on team efficiency. To do so we examine the effects of subordinates' personalities on the trust they give the virtual team leader and the impact of this trust on commitment to the team. We also discuss how the team's degree of virtuality and the leader's gender influence the relationship between personality and trust. The findings showed that extroversion has a positive effect on trust felt in the leader, and that this trust has a positive effect on commitment felt toward the team. On the other hand, it was observed that neuroticism had a more negative effect on trust in more virtual environments. The leader's gender had no significant effect. The study offers advice for virtual team management and discusses its limitations and future research directions.

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### 1. Introduction

The dramatic societal changes wrought by the COVID-19 pandemic have caused the use of virtual teams to increase exponentially in companies of all sizes and in all sectors. Statista (2020) recently reported that the number of employees in the U.S. who work entirely virtually has grown from 17% to 44%. Virtual teams have been defined based on the following aspects (Flavián et al., 2019): (1) they are work teams that operate totally or partially through telematic communication tools; (2) their members have diverse roles and are often geographically dispersed, even in different time zones; (3) they tend to have a flexible structure and endure only for as long as defined by the project for which they were created (e.g., to solve a problem in the supply chain, plan a communications campaign, manage a reputational crisis, develop a new product). Although we should not confuse teleworking with virtual teams (teleworkers do not have to work as a team; in a virtual team, some interactions can be carried out face to face), the truth is that the unstoppable growth of teleworking is a clear indicator of the interest of organizations in having their teams operating in telematic environments. Thus, teleworking has become the only way that many organizations are able to continue to operate, and this has meant a radical change in work practices. This has created a work dynamic for which many were

unprepared, and which causes stress (Deloitte, 2020) due the intensive use of videoconferences and the difficulty of delimiting working hours (Observe Research Foundation, 2020). Moreover, beyond the effects of the COVID-19 pandemic, teleworking is becoming an increasingly commonly used option. In 2018 the number of teleworkers in the EU28 stood at 13.5% of the employed population, although the differences between countries is very wide; in Sweden the figure is 30%, while in some countries, such as Romania, teleworking is almost non-existent and, in others, such as Spain, it is 7.5% (Anghel et al., 2020). The growth potential of teleworking and, therefore, virtual teams, is large; in the USA forecasts predict that 34% of jobs might be carried out remotely (Dingel & Neiman, 2020), while in Spain this figure might reach 30.6% (Anghel et al., 2020).

In the current context it is essential to understand which factors enhance the performance of virtual work teams. Previous studies into virtual teams have suggested that certain factors influence their management and results. For example, Hao et al. (2019) point out how personality, job design, self-efficacy affect knowledge sharing behavior. Haines (2021) suggests that activity awareness practices increase feelings of social presence within the team and a willingness to work harder for the team. The influence of team members' personalities on team performance has been widely examined in the management literature (LePine et al., 2011). Early studies reported that personality influenced team results (e.g., Heslin, 1964; Spector & Suttell, 1957), although at that stage there was still no clear conceptualization of personality traits. Subsequent studies more precisely

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provided a taxonomy of personality traits, taking as a reference the 'big five' model (Goldberg, 1990). Various authors (e.g., English et al., 2004; Halfhill et al., 2005; Yilmaz et al., 2017) have argued that personality traits, including extroversion and emotional stability, are decisive in team performance. However, the working context of a virtual team is noticeably different from that of traditional teams (Cascio, 2000), given the spatial and temporal separation of team members, and the use of digital communication tools. Despite the undoubted influence of personality on the performance of virtual work teams, and their current exponential growth, research in the area remains scarce (e.g., Hoch & Dulebohm, 2017; Pierce & Hansen, 2008). Therefore, the present study can be considered as one of the few contributions to research these important topics. Specifically, the objective of this research is to analyze the influence of subordinates' personalities on the efficiency of virtual teams through a fundamental variable, the trust they place in the team leader.

Previous research has examined the effects of personality, such as the willingness to collaborate (Brown et al., 2004; Sofi & Najjar, 2018) and to adopt certain technologies (De Vreede et al., 2012), within virtual environments. However, the role of personality in some key variables related to the efficiency of virtual teams has not hitherto been thoroughly examined. Thus, we highlight two key variables, leadership of, and trust within, the virtual team. The leadership of virtual teams is fundamental (Eubanks et al., 2016), as good leadership helps reduce psychological distance between team members (Adiguzel et al., 2020; Jarvenpaa & Leidner, 1999), and creates a sense of unity in an environment where the absence of physical interaction and the use of teleworking diminishes the richness of the communication between team members. Trust has been shown to be a fundamental factor in virtual environments (Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998), improving collaboration and knowledge sharing (Henttonen & Blomqvist, 2005; Jimenez et al., 2017), coordination between team members and performance (Haines, 2014; Lukic & Vracar, 2018). Virtual team leaders must, therefore, to maximize the efficiency of their teams, strive to build and maintain bonds of trust between themselves and their subordinates (Hambley et al., 2007; Lukic & Vracar, 2018).

Based on these points the present study analyzes the efficiency of virtual teams by examining the influence of subordinates' personality traits on the trust they hold in the team leader, and the effect of this trust on their commitment to the team. To do so, in this research, two solid theoretical bases are taken as reference points: (1) "trust-commitment theory" (Morgan & Hunt, 1994) and (2) personality theories. As we explain in this work, "trust-commitment theory", used in previous examinations into virtual teams (e.g., Badrinarayanan & Arnett, 2008; Powell et al., 2006), allows us to propose that trust in the leader of the virtual team can exert an important influence on its members' degree of organizational commitment. Morgan and Hunt (1994) also suggested that trust is determined by antecedent variables. Following this line, our proposal is that some factors of the subordinate's personality (degree of neuroticism and extroversion) can affect trust in the virtual team leader. The role of personality, which has solid theoretical bases (e.g., Blackburn et al., 2004; Costa & McCrae, 1992) discussed in studies into virtual teams (e.g., Hoch & Dulebohm, 2017), is in the present study combined with trust-commitment theory. In addition, the effect of the team's degree of virtuality is also taken into account, as digital work environments can take mixed forms that combine both virtual and face-to-face interactions (Webster & Wong, 2008). Greater or lesser degrees of virtuality may have effects on the influence exerted by subordinates' personality traits (Panteli & Chiasson, 2008). Finally, we also analyze the possible moderating effect of the team leader's gender, as previous studies (e.g., Jordán, 2015) have indicated that this variable could affect the generation of trust in the leader.

The remainder of the present study is set out as follows: First, the literature related to personality and virtual teams is discussed.

Second, the research model is proposed and the working assumptions argued. Third, the empirical analysis and the results are presented. Fourth, the main conclusions of the work, its management implications, the study's limitations and future lines of research are discussed.

## 2. Personality and virtual work teams

The personality of the individual has received great attention in psychology (McCrae & Costa, 1991) and management (Barrick & Mount, 1991; LePine et al., 2001). Mayer (2005) defined personality as a stable pattern of psychological processes, characteristics and trends which create cognitive feelings and processes that can be used to determine individual similarities, and differences, in thoughts, feelings and actions.

The literature has proposed various models in which personality traits converge. Initially, the most salient was the five factors, or 'big five', model, featuring: extroversion, emotional instability/neuroticism, openness, kindness and consciousness (Goldberg, 1990). However, subsequent research has shown that the five dimensions of the 'big five' model are not independent, and that there are two higher-order factors (Blackburn et al., 2004; Costa & McCrae, 1992). These two dimensions, extroversion and neuroticism, are described as forming the 'big two' model. The structure of the 'big two' model has been, over many years, widely tested with disparate samples, which has provided substantial evidence of its ability to measure personality differences (John, Naumann & Soto, 2008). Indeed, Costa and McCrae (1992) demonstrated that these two traits are stable and normally distributed in the population. The 'big two' model appears in most personality trait taxonomies (Goldberg, 1993).

The present study is based on the 'big two' model: extroversion is defined as a positive social trait, and neuroticism/emotional instability is defined as a tendency to experience negative feelings (Costa & McCrae, 1992). In particular, extroversion has been defined as the propensity to be sociable, enthusiastic, energetic and optimistic (Goldberg, 1990); related to the amount and intensity of an individual's interpersonal activity (Bruck & Allen, 2003); linked to success in jobs that require extensive social interaction (Barrick & Mount, 1991); positively correlated with participation levels in computer-mediated teams (Straus, 1996; Barry & Stewart, 1997a). Neuroticism, on the other hand, is characterized by a lack of psychological adjustment and high negative emotional stability. Neurotic individuals are typically fearful, sad, embarrassed, suspicious and have difficulty managing stress.

Personality traits have been analyzed within the context of working relationships and team leadership, both from the viewpoint of the personality traits of the leader, and from that of his/her subordinates (Strang & Kuhnert, 2009). Several meta-analyses have documented the positive impact of personality traits on the functioning and performance of teams (e.g., Barrick & Mount, 1991; Bell, 2007). Staff selection has been examined in the virtual context: D'Souza and Colarelli (2010) proposed that the personal characteristics of subordinates are key criteria in recruitment. Other works have linked personality traits to the social and technological skills needed to be part of a virtual team. Thus, it is expected that certain personality traits influence willingness to trust, and willingness to collaborate, within virtual environments (Luse et al., 2013). Hoch & Dulebohm (2017) demonstrated that the personality dimensions of the members of virtual teams influence their operations and results. However, although significant progress has been made in recent years in the study of personality in virtual work teams, further work is needed to examine the relationship between the personality traits of virtual team subordinates and team performance (Gilson et al., 2015; Serban et al., 2015).

### 3. Hypotheses development

The model presented in this section aims to narrow the gap in the existing literature regarding the influence of the personality traits of subordinates on the efficiency of virtual teams. In line with previous works (e.g., Hambley et al., 2007; Henttonen & Blomqvist, 2005; Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Jimenez et al., 2017) the model proposes that trust is a fundamental element in team success. In particular, focus is put on the trust that team leaders generate among their subordinates, which allows us to introduce into the research another very important factor, leadership. Our model is based on Morgan & Hunt's (1994) "trust-commitment theory", one of the most robust theories in relation to the study of trust in digital environments (e.g., Akrouf & Nagy, 2018; Ameen et al., 2021; Mosteller & Poddar, 2017; Cui et al., 2020; Casalo et al., 2011). This theory proposes that the development of lasting relationships between parties depends on the influence exercised by trust on commitment, an interaction that is influenced, in turn, by different antecedent variables, and that has various consequences. This theoretical framework has been applied in diverse contexts, including the study of relationships within virtual work teams (e.g., Flavián et al., 2019; Harvey et al., 2004; Badrinarayanan & Arnett, 2008; Powell et al., 2006). Thus, we argue that it is an appropriate framework for assessing the effects of personality on the efficiency of virtual teams.

The present study seeks to answer the following questions: To what extent is trust held in the leader of a virtual team and, consequently, organizational commitment, conditioned by the personality of the team members and degree of virtuality? The proposed model is at Fig. 1.

#### 3.1. Influence of subordinates' personality traits on trust held in the virtual team leader

Trust has been defined as one party's acceptance of being vulnerable to another party's actions in the expectation that the latter will take certain actions (Mayer et al., 1995). The level of trust team members hold in a team leader is, to an extent, associated with their perception that (s)he will exhibit a set of behavior patterns (Dirks & Ferrin, 2002).

Traditionally, trust has been studied in management literature (e.g., Greenberg et al., 2007). Recently, some studies have attempted

to validate trust in virtual environments, as the variable takes on greater importance in a virtual context (e.g., Basaglia et al., 2010; Choi & Cho, 2019; Guinalíu & Jordan, 2016; Kim et al., 2008; Anaya-Sánchez et al., 2020; Tahir, 2021).

It would seem reasonable to suggest that the trust placed in the leader of a virtual team by its members may be affected by the subordinates' personalities. Individuals with high extroversion levels (sociable, communicative, optimistic) tend to be more participatory in teams that use teleworking tools to communicate (Straus, 1996; Barry & Stewart, 1997b). Moreover, Jarvenpaa and Leidner (1999) argued that increased communication skills have a greater impact on the trust generated within virtual teams, and that these skills are more characteristic of extroverts. Thus, an outgoing person may be more likely to initiate and participate in social conversations, thereby contributing positively to communication within the team. In fact, Ignatius and Kokkonen (2005) found that levels of trust were best predicted through the extroversion, kindness and emotional stability of team members. Therefore, subordinates with higher degrees of extroversion have communication and social skills better suited to a virtual work context, and hold greater trust in their virtual leader. On the basis of this reasoning, the first working hypothesis is proposed:

H1: Higher levels of extroversion among virtual team members will directly and positively influence the trust they give to their team leader.

Individuals with low emotional stability, or neuroticism, have accentuated anxiety, depression, worry and insecurity traits (Barrick & Mount, 1991). In work environments that operate under pressure - such as virtual teams - individuals with higher level of neurosis may find it harder to cope with stress (Bruck & Allen, 2003), resulting in poorer performance (Barrick et al., 2001). This is because anxiety creates greater reactions to environment-based risks, which results in those with greater neuroticism developing a lower tendency to trust (Smith, 2020; Thielmann & Hilbig, 2015). Based on this reasoning the second working hypothesis is proposed:

H2: Higher levels of neuroticism among virtual team members will directly and negatively influence the trust they give to the team leader.

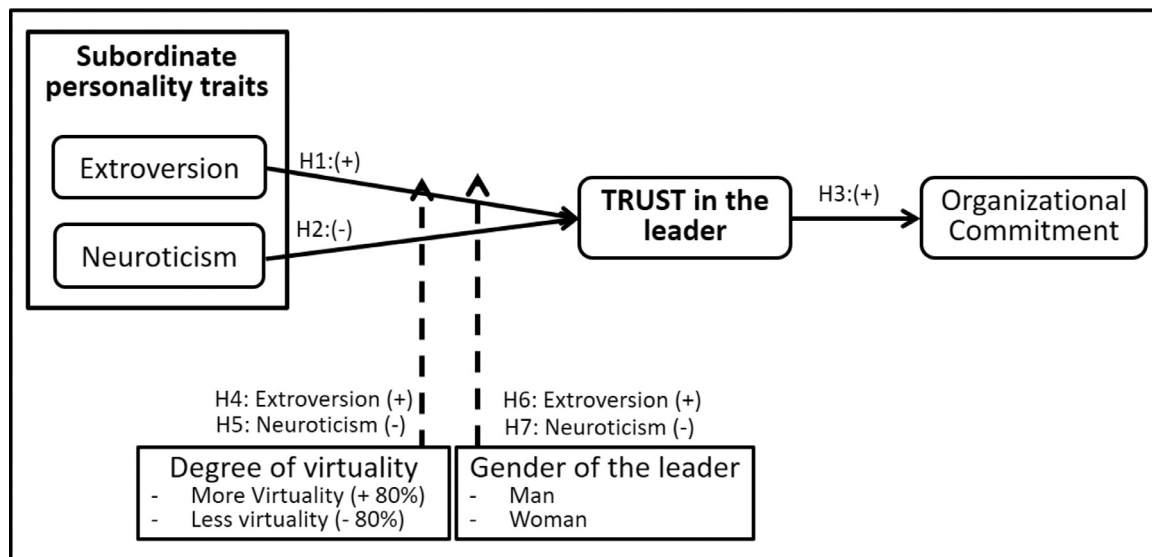


Fig. 1. Conceptual Model.



### 3.2. Consequences of trust in the virtual team leader

Organizational commitment is one of the team-efficiency measurement variables most accepted in the literature (Belanche et al., 2019; Eliyana et al., 2019; Eslami & Gharakhani, 2012). Mowday et al. (1979) described organizational commitment as a strong belief in the goals and values of the organization and a willingness to strive for its benefit. Later, the same authors, Mowday et al. (1982), defined it as the intensity with which employees participate and identify with an organization. This commitment is particularly important in uncertain environments, such as virtual teams, where it can be key to the success or failure of a particular project (Luo et al., 2020; Newman & Ford, 2020).

The trust that the team hold in their leader may depend both on the contextual factors shared by the group and the unique experiences of its members (Korsgaard et al., 2008). In the context of a virtual team, where physical separation can cause each member to develop distinct traits and characteristics in the way they interact with their teammates and the leader (Beldad et al., 2010), the effects of trust within the team should be analyzed holistically. Subordinates with a higher level of trust in their leader are more prone to develop behaviors oriented toward the success of the team (Schoorman et al., 2007), tend to be more loyal to the organization and more active in decision-making. On the other hand, Dirks and Ferrin (2002) and McEvily and Tortoriello (2011), in their meta-analyses, argued that a relationship exists between trust given by team members to the team leader and organizational commitment. In a virtual team, trust positively influences information exchange and mitigates uncertainty about the behavior of others (Muethel et al., 2012). In fact, the relationship between interpersonal trust and team effectiveness has been found to be stronger with increased geographical dispersion and electronically mediated communication (Muethel et al., 2012).

These arguments suggest that perceptions of trust in the leader of a virtual team will directly and positively influence the degree of commitment of subordinates to the team. Thus, the following working hypothesis is proposed:

H3: Higher levels of trust held by subordinates for the leader of a virtual team will directly and positively influence their degree of commitment to the team.

### 3.3. Moderating effect of virtuality on the personality-trust relationship

The virtualization of activities influences our mood, behavior (Flavián et al., 2011; 2020) and work performance (Henderson, 2008). Virtuality refers to the greater or lesser use of teleworking and internal group communications. Degree of virtuality is based on the proportional combination of traditional face-to-face and virtual communication. The conceptualization of virtuality has evolved. At first, virtuality was regarded as a dichotomous variable (Guzzo & Dickson, 1996); however, some studies have described it as a continuum featuring mixed communication formulas (De Guinea et al., 2012; Marlow et al., 2017; Martins et al., 2004).

Virtuality affects all aspects of teamwork: procedures, performance and efficiency (Henderson, 2008). The leader must understand this to maximize the chances of team success (Orhan, 2014). Previous studies have suggested that virtuality can have a negative, direct impact on team operations, particularly in internal communications (Purvanova, 2014). Taking degree of virtuality as a continuum, that is, from fully virtual to mixed forms, group members have been shown to associate a high degree of virtuality with risk, because it may involve losing the advantages inherent in face-to-face communication, such as physical interaction and nonverbal "language" (Panteli & Chiasson, 2008), and force the team to work in different time slots.

As previously noted, extroverted individuals, due to their better communication skills and emotional stability, have more ability to deal with uncertain environments. Thus, for these individuals, the increased uncertainty caused by higher levels of virtuality may have no effect on perceived trust in the leader. However, we cannot make this statement quite so bluntly, as virtuality may also create increased risk for extroverted individuals; we must consider the possibility that the positive effects of extroversion on trust will be adversely affected by increased virtuality. Thus, we propose the following working hypothesis:

H4: The positive impact of the subordinate's degree of extroversion on trust held in the virtual team leader is lower in more virtual contexts.

Neurotic people are especially sensitive to uncertainty (Furumo et al., 2009); thus, as virtual working is associated with higher risk, it represents for them a significant challenge. It is, therefore, to be expected that the negative impact of neuroticism on trust in the team leader will be accentuated by increased virtuality. This moderating effect of virtuality leads us to posit the following hypothesis:

H5: The negative impact of the subordinate's degree of neuroticism on perceptions of trust in the virtual team leader will be greater in more highly virtual contexts.

### 3.4. Moderating effect of the leader's gender on the personality-trust relationship

The literature has extensively investigated the gender perspective. Gilligan (1992) suggested that an individual's gender can play an important role in how a person views the world. Specifically, women and men have different values and ethical views (Galea & Wright, 1999). In this sense, women tend to show more interest in others, be more dependent, and often need to be part of a community (Eagly, 1987). On the other hand, men are more focused on individual success, self-improvement and respect (Eagly, 1987).

Extroverts are more emotionally stable and less affected by the uncertainty that exists in a virtual work environment. Nevertheless, the leader's gender may impact on the generation of trust, as previous literature has suggested. For example, Jordán (2015) proposed that trust in a virtual team leader is higher when the leader is a woman, at least in the early stages, so it is reasonable to propose the following working hypothesis:

H6: The positive impact of the subordinate's degree of extroversion on trust held in the virtual team leader will be greater when the leader is a woman.

On the other hand, previous studies have recognized that working in a virtual team, as opposed to a classic team, is associated with a higher degree of uncertainty (Cascio, 2000), which can especially affect workers who have neurotic personality traits (Furumo et al., 2009). In this context, the gender of the team leader can influence the degree to which a subordinate manages the effects of neurosis. As noted, from a gender perspective, women display more group-oriented behaviors and greater empathy with other people (William & Best, 1990). For this reason, we propose that when the virtual team leader is a woman, the negative effect of neurosis on trust is reduced. Based on these arguments we propose the following hypothesis:

H7: The negative impact of the subordinate's degree of neuroticism on perceptions of trust in the virtual team leader will be lower when the leader is a woman.

#### 4. Methodology

The study data were obtained through an Internet-based self-administered survey of regular virtual team workers, using a database extracted from the LinkedIn social network (Guinaliú & Díaz de Rada, 2021). First, 1000 invitations to participate in the research were sent by email to a database of team leaders/managers. The invitation included a question about their participation in virtual work teams. Some 320 people answered the invitation, but once incomplete questionnaires and responses from those who did not work in virtual teams were removed, the sample was reduced to 211. Structural equations modeling was used to analyze the data. As this technique is highly sensitive to missing and atypical data, a thorough analysis of the database was undertaken before the statistical treatment.

In order to improve the quality of the data, avoiding biases derived from the use of a single source, the information collection process was diversified. It should be noted that the fact that the origin of the data has a diverse origin reduces the error of the common variance of the method (Podsakov et al., 2003). The error due to the common variance of the method is usually problematic in the measurement of affective and attitudinal constructs focused on psychological and sociological aspects, and which are also measured through a single questionnaire in which the respondent himself reports his answers. For this reason, data was collected from individuals from both the academic and professional world, although the survey model they responded in both cases was similar, a different process of recruiting respondents was followed.

In this sense, the Harman single factor test was carried out, one of the most used analyzes to address the analysis of variance of the common method. This method consists of loading all the variables of the model in an exploratory factor analysis (Andersson & Bateman, 1997) and examining the unrotated solution to determine the number of factors that are necessary to take into account the variance in the variables. The result of this analysis shows a total variance extracted of 35.38%, therefore the existence of bias caused by the common variance of the method is ruled out, as it does not exceed 50% of the total variance extracted.

The scales proposed for measuring the component variables of the model were validated as follows:

First, we reviewed the previous literature (see Table 1). Due to this review it was possible to formulate an initial proposal for the scales. However, the scales had to be adapted to the context of virtual work teams. The objective of the adaptation was to ensure face validity, that is, the degree to which a measurement scale is representative of what it is designed to measure. Face validity is often confused with the concept of content validity; however, content validity is the extent to which items correctly represent the theoretical content of constructs and is achieved by a thorough literature review. The face validity of the model was tested using a variation of Zaichkowsky's (1985) model; a group of management experts classified the items as "clearly representative", "somewhat representative" or "unrepresentative". Finally, in line with Lichtenstein et al. (1990), items were retained if there was a high degree of consensus among the experts.

The validation process included an exploratory analysis of the reliability and dimensionality of the scales. First, Cronbach's  $\alpha$  method, where a minimum value of 0.7 is considered acceptable (Nunnally & Bernstein, 1994), was used to assess scale reliability. This analysis removed 3 items. In addition, the item-total correlation, which measures the correlation of each item with the sum of the other scale items, was greater than the recommended 0.3 minimum (Nurosis, 1993).

Second, the degree of one-dimensionality of the scales was assessed through a factorial analysis. Factor extraction was based on the existence of eigenvalues greater than 1. The factorial load of each item must be greater than 0.5, and the variance explained for each

extracted factor should be high. In this way, a single factor corresponding to each of the proposed scales was extracted. Subsequently, a confirmatory factor analysis (CFA) was performed to confirm the dimensional structure of the scales. The robust maximum likelihood estimation method, with EQS 6.1 statistical software, was used for the analysis as it provides greater security when working with samples that might contain some multivariate anomaly. A factorial model was designed that included the variables that meet the criteria proposed by Jöreskog and Sörbom (1993) for item purification (see Table 1): (1) The weak convergence criterion, by which all indicators must possess significant factorial regression coefficients ( $t\text{-Student} > 2.58$ ;  $p < 0.01$ ); (2) the strong convergence criterion, which eliminates all indicators whose standardized coefficients are less than 0.5; and (3) the elimination of the indicators that contribute little to the explanation of the model (we eliminated indicators with  $R^2 < 0.3$ ). At this stage one item was deleted (see Table 1). The confirmatory model presented acceptable fit indicators. Comparative fit index (CFI) = 0.908; Bollen (IFI) fit index = 0.955; root mean square error of approximation (RMSEA) = 0.045; 90% confidence interval of RMSEA (0.034; 0.054).

Finally, it should be noted that the variable "trust in leader" was measured as a multidimensional construct, as this provides a much more precise understanding of the nuances of the construct. To confirm the existence of multidimensionality in the variable "trust in leader", a rival model strategy (Anderson & Gerbing, 1988) was followed, that is, a comparison was made of a second-order model, in which several dimensions measured the multidimensional construct, with another first-order model in which all items loaded onto a single factor (Steenkamp & Van Trijp, 1991). The results corroborated the multidimensional structure of the trust variable (integrity, benevolence, ability), because the second-order model had a much better fit than the alternative first-order model. Table 2 shows the results of the multidimensionality analysis.<sup>1</sup>

Although Cronbach's  $\alpha$  is the generally accepted indicator for assessing scale reliability, some authors have argued that it may underestimate reliability (e.g., Smith, 1974). For example, Jöreskog (1971) recommended the use of an additional statistic, construct reliability (CR). As shown at Table 3, the results obtained in the present study were positive, at least 0.7 (Steenkamp & Geyskens, 2006).

Construct validity was analyzed as follows:

- *Convergent validity* indicates whether the scale items converge on a single construct: convergent validity was confirmed by verifying (see Table 1) that the factorial load of each indicator was greater than 0.5 and significant at a 0.01 level (Steenkamp & Geyskens, 2006). In addition, average variance extracted (AVE) (Ping, 2004), based on the Fornell & Larcker (1981) criterion, was used; measures with an adequate level of convergent validity must contain less than 50% of the error variance, that is, have AVEs greater than 0.5. Satisfactory results were obtained, as shown in Table 3.
- *Discriminant validity* verifies whether any model constructs differ significantly from other theoretically unrelated constructs. This is assessed by examining whether a construct shares more variance with its own measures than with those of any of the model's other constructs (Fornell & Larcker, 1981). Thus, an assessment was made of whether the square roots of the AVEs were greater than the inter-construct correlations. Table 3 shows a possible discrimination problem between the "integrity" and "benevolence" constructs. However, it should be noted that these constructs are two

<sup>1</sup> Benevolence is the perception that there is a positive orientation toward an individual who is trustworthy, that is, a relationship in which there is good faith between the two parties (Mayer et al., 1995). Ability refers to a person's personal ability to perform a specific task according to the expectations of a third person (Mayer et al., 1995). Integrity is the perception that the other party adheres to ethical principles that are considered fundamental to the establishment of a relationship (Butler, 1991).

**Table 1**  
Content validity, scale items, standardized coefficients and R<sup>2</sup>.

TRUST IN THE LEADER		Standardized coefficients	R2
Adapted from	Roberts and O'Reilly (1974); Korsgaard et al. (1995).		
Trust 1 - Integrity	My team leader is sincere in his/her relationships with subordinates.	.747*	.550
Trust 2 - Integrity	I trust my leader because (s)he is a person of integrity.	.835*	.697
Trust 3 - Integrity	I trust my leader because (s)he keeps the promises (s)he makes.	.810*	.657
Trust 4 - Integrity	I feel that I can trust the determination of my leader in all circumstances.	.838*	.702
Trust 5 - Integrity	I trust my leader because (s)he has not disappointed me so far.	.807*	.651
Trust 6 - Integrity	When making decisions, my leader takes the welfare of the team members into account.	.736*	.542
Trust 7 - Benevolence	I can expect a positive attitude from my leader, even though sometimes I may make mistakes.	.777*	.604
Trust 8 - Benevolence	If I have difficulties with my job, I know my leader will try to help me.	.750*	.562
Trust 9 - Benevolence	I feel safe and comfortable discussing problems and difficulties with my leader.	.743*	.552
Trust 10 - Benevolence	I know my leader takes my opinions into account when making decisions that affect me professionally.	.791*	.625
Trust 11 - Ability	I have confidence in my leader's ability.	.703*	.494
Trust 12 - Ability	I trust my leader's ability to manage a team.	.896*	.804
Trust 13 - Ability	I trust my leader because of his/her reputation in managing teams.	.675*	.496
Trust 14 - Ability	I think my leader has the appropriate knowledge to manage a team.	.796*	.635
EXTROVERSION		CFA	R2
Adapted from	Walczuch and Lundgren (2004).		
Extroversion 1	I transmit energy to the people around me.	.833*	.694
Extroversion 2	I consider myself a sociable person.	.832*	.692
Extroversion 3	I consider myself a person who generates a lot of enthusiasm.	.852*	.726
Extroversion 4	I consider myself a talkative person with the people around me.	.791*	.517
NEUROTICISM		CFA	R2
Adapted from	Walczuch and Lundgren (2004).		
Neuroticism 1	I consider myself a person who gets nervous easily.	.848*	.720
Neuroticism 2	I consider myself a person who worries a lot about things.	.643*	.493
Neuroticism 3	I consider myself a depressive person.	.676*	.457
ORGANIZATIONAL COMMITMENT		CFA	R2
Adapted from	Allen and Meyer (1990)		
Commitment 1	I would like to stay part of this team for a long time.	.770*	.593
Commitment 2	<i>I like to talk about my work with people outside of it.</i>	.545*	.280
Commitment 3	I truly feel the problems of the team as my own.	.754*	.568
Commitment 4	This team means a lot to me.	.947*	.897
Commitment 5	I have a strong sense of belonging to this team.	.897*	.804

Note: The eliminated items are in italics; \*  $p < 0.01$ .

of the dimensions of trust. Previously, the dimensionality analysis of the "trust" construct verified that it was a multidimensional construct (see Table 2). To eliminate any potential discrimination problems, an additional analysis was carried out, in this case the heterotrait-monotrait (HTMT) ratio of correlations (Henseler et al., 2015). This methodology proposes that it is possible to accept discrimination between latent variables when the HTMT ratio is less than 1, with 0.85 being recognized as an acceptable maximum threshold. Table 4 shows that the HTMT values are below that threshold, so discriminatory validity is confirmed.

### 5. Results

To test the hypotheses, the structural equations model at Fig. 2 was developed.

The model fit presented acceptable values: Bentler-Bonett non-normed fit index =0.947; comparative fit index (CFI) =0.957; Bollen

(IFI) fit index =0.957; RMSEA =0.062; 90% confidence interval of RMSEA (0.046; 0.078).

Extroversion was seen to have a positive, significant effect on trust held in the leader ( $\beta$  0.411;  $p < 0.01$ ), so H1 is supported. While the neurosis level of subordinates was shown to have a negative effect on perceptions of trust in the leader ( $\beta$  -0.013;  $p > 0.05$ ), the effect was not statistically significant, so H2 is not supported. In addition, the results revealed the existence of a positive, significant relationship between the trust given to the team leader and the commitment that the subordinate has to the virtual team ( $\beta$  0.747;  $p < 0.01$ ), which allows us to support H3.

To test the moderating effect of virtuality and the leader's gender, a multi-sample analysis was carried out. For each analysis, the total sample of individuals was divided into two groups for each variable. The criterion for splitting the sample corresponded to the percentage of virtual work they carried out. Individuals whose virtual work was 80%, or more, of their total were assigned to the high-virtuality scenario, and individuals with a virtual workload of less than 80% were

**Table 2**  
Multidimensionality Analysis.

		Suggested value	TRUST	
			First Order	Second Order
Absolute Fit	Chi-Square	$p > 0.05$	473.355	22.558
			90 df	88 df
			$p < 0.001$	$p < 0.001$
	RMSEA	RMSEA < 0.08	.103	.054
Incremental Fit	90% Confidence interval RMSEA		[.091; 0.115]	[.038; 0.068]
	NFI	NFI > 0.9	.766	.890
	NNFI	NNFI > 0.9	.788	.942
	CFI	Near 1	.818	.951
Parsimony Fit	IFI	Near 1	.820	.952
	Normed Chi-square	[1;5] o minor	5.25	2.50

**Table 3**  
Analysis of construct reliability and convergent and discriminant validity.

	Alpha	CR	AVE	1	2	3	4	5	6
1. Trust – Integrity	.92	.91	.63	.796	.820	.761	.322	.288	.128
2. Trust – Benevolence	.87	.85	.59	.819	.765	.710	.272	.384	.033
3. Trust – Ability	.83	.85	.60	.758	.682	.772	.344	.324	.112
4. Commitment	.89	.91	.72	.315	.297	.365	.846	.216	.011
5. Extroversion	.88	.90	.68	.303	.399	.314	.216	.827	.170
6. Neuroticism	.79	.77	.53	–0.102	–0.040	–0.071	–0.007	–0.200	.728

Notes: The cells on the diagonal are the square roots of the AVEs. The cells below the diagonal are the inter-construct correlations. The HTMT values are above the diagonal and all of them are below the threshold cut-off point of 0.85.

**Table 4**  
Multi-sample analysis.

Restrictions for VIRTUALITY	Coefficients(more Virtuality)	Coefficients(less Virtuality)	d.f.	DifferencesChi-square	Prob.
H4: Extroversion -> Trust	.297**	.479**	1	1.206	.272
H5: Neuroticism -> Trust	–0.154*	.057	1	3.928	.047**

Note: \*  $P < 0.10$ ; \*\*  $P < 0.05$ .

assigned to the low-virtuality scenario. To examine gender, two groups were analyzed according to the leader’s gender. Second, an LM-test analysis was applied to identify differences between the parameters obtained in the two groups, and whether they were significant. Specifically, the variation in the Chi-square statistic was analyzed by removing the constraint and matching a particular parameter in both groups in the most restricted model.

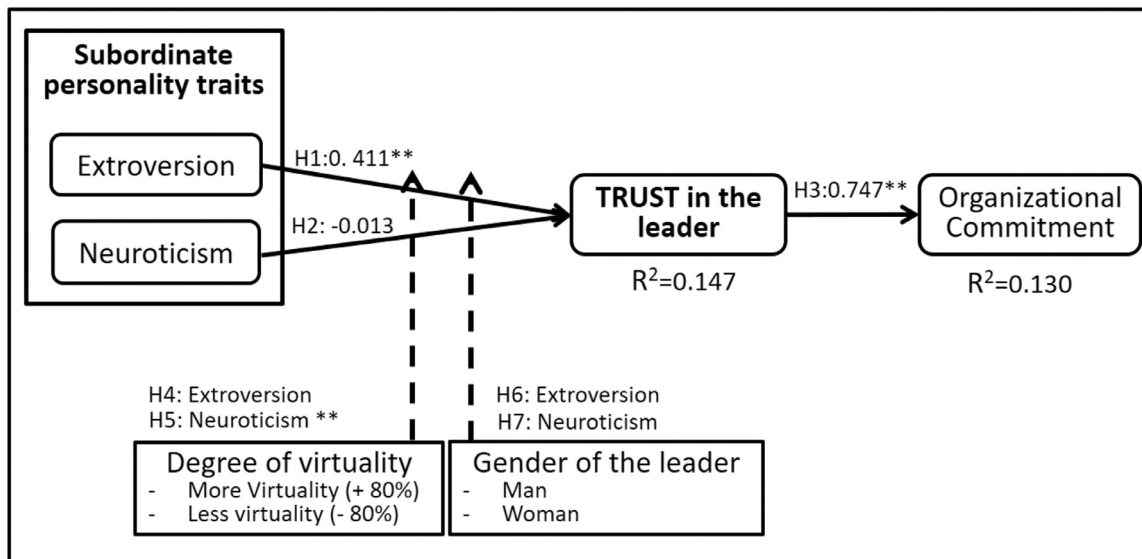
Table 4 shows the existence of a moderation effect between subordinates’ personality traits and trust in the leader. Specifically, it shows there are significant differences in the impact of neuroticism on perceived confidence felt toward the leader ( $p < 0.05$ ) allowing us to support H5. Specifically, in the more virtual scenario, the impact is clearly negative ( $\beta = -0.154$ ), while in the low-virtuality scenario the impact is almost non-existent ( $\beta = 0.057$ ). However, no significant differences are found in the case of extroversion. Therefore, H4 is not supported.

As to gender (see Table 5), hypothesis H6 is not supported as the data indicate that the leader’s gender does not affect the impact of extroversion on trust in the leader ( $p = 0.802$ ). In fact, the parameters are practically the same in both scenarios ( $\beta = 0.387$  leader man;  $\beta$

$0.333$  leader woman). Finally, we also reject hypothesis H7 that proposes that the negative impact of neuroticism on trust was lower when the leader was a woman. Although the differences are significant ( $p < 0.05$ ), the parameters in both scenarios are not significant ( $\beta = -0.116$  leader man;  $\beta = 0.117$  leader woman).

**6. Discussion**

The results of the present study showed, first, that more extroverted subordinates place higher levels of trust on their leaders (H1). This result is in line with expectations, given the characteristics that define extroverted individuals, in particular their enhanced ability to establish interpersonal relationships and interactions (Hoch & Bulebohn, 2017), which allows them more easily to develop bonds of trust. In addition, extroverted individuals tend to feel more comfortable within teams (Kristof-Brown et al., 2005), and more easily establish close relationships with both their peers and their leaders. Extroversion is especially important when tasks require high degrees of performance, interaction and teamwork (Halfhill et al., 2005), as is



**Fig. 2.** Model results.  
Note: \*  $P < 0.10$ ; \*\*  $P < 0.05$ .



**Table 5**  
Multi-sample analysis.

Restrictions for GENDER OF LEADER	Coefficients(leader man)	Coefficients(leader woman)	d.f.	DifferencesChi-square	Prob.
H6: Extroversion -> Trust	.387**	.333	1	0.063	.802
H7: Neuroticism -> Trust	-0.116	.177	1	5.103	.024**

Note: \*  $P < 0.10$ ; \*\*  $P < 0.05$ .

the case with virtual work teams. Thus, having extroverted workers is especially important for virtual teams.

Second, H2, which proposed that higher levels of neuroticism are negatively related to trust held in the virtual team leader, cannot be supported because, while the parameter is negative, it is not statistically significant. Although this result was unexpected, it is in line with the limited scientific evidence that exists regarding the impact of neuroticism on trust (e.g., Thielmann & Hilbig, 2015).

Third, the proposed model suggests that commitment to the team is a consequence of the trust subordinates give to the virtual team leader, given that the results show there is a direct, positive relationship between that trust and the commitment its members give to the team. This result is of particular importance for geographically dispersed individuals, among whom it is more difficult to create a sense of team unity.

Fourth, in the present study we demonstrated that degree of virtuality (Hoch & Kozlowski, 2014) is key for explaining team members' interactive behaviors (Peñarroja et al., 2013). The results showed that degree of virtuality clearly influences individuals with high levels of neuroticism, as in the high- virtuality scenario the negative impact of neuroticism on trust given to the leader was much greater (H5 supported). This result is even more important given the lack evidence for the H2 hypothesis, which suggests that future studies should introduce moderating effects into examinations of the impact of neuroticism on trust.

Finally, the results suggested that the leader's gender does not affect the impact of personality traits on trust. However, although there is no statistical significance (H6 and Hy7 are not supported) en it seems that when the leader is a woman the negative impact of neurosis is moderated, so additional studies into this aspect are highly recommended.

## 7. Managerial implications

The results of the study provide important conclusions about virtual work teams that can help organizations manage them more efficiently; the performance of virtual work teams can be improved through a better understanding of the factors that affect trust, in particular, the importance of generating trust in the team leader.

First, because it is easier for extroverted individuals to work in teams and to trust their leaders, they should be assigned the more complex tasks. Sensible task assignment, which takes into account any inherent risks, can enhance individual and team performance. This leads us to conclude that the successful leadership of a virtual team will depend, among other things, on the leader's ability to assess his/her subordinates' personalities and assign responsibilities accordingly. Second, the results of the study showed that degree of virtuality influences the relationship between personality traits and trust, in particular, by negatively reinforcing the relationship between neuroticism and trust. Thus, following similar reasoning to the extroversion case, virtual team leaders should adapt the degree of virtuality of the work to mitigate its negative effects on subordinates with low emotional stability; for example, by assigning more face-to-face meetings to the more emotionally unstable subordinates, and by increasing his/her interaction, and that of the more outgoing, with the more unstable.

## 8. Limitations and future research lines

One of the main limitations of this research is that the vast majority of participants were Spanish-speaking. While the variety of economic sectors represented in the sample makes it possible to make certain generalizations, it would be advisable to validate the proposed model with a wider sample of work teams.

Another limitation is that only the personality variables of the subordinates were taken into account in the examination of the antecedents of trust held in the leader. This allowed us to focus closely on these variables, but excluded others that might influence the process of generating trust in the virtual leader. Therefore, a future line of research might expand the list of trust antecedents and analyze the subordinates' other behavioral characteristics (Van Wart et al., 2019), and take into account the leader's personality (Won Kim & Makana, 2017). Similarly, the present study could be extended by introducing personality- and behavior-related variables (e.g., sociability), and by examining the role of the virtual team leader's personality and its interaction with the subordinate's personality.

On the other hand, some research has suggested that the problems of leadership of virtual teams lie in the fact that their leaders do not possess specific skills adapted to the virtual context (Kayworth & Leidner, 2002). Future research should investigate what specific skills are needed to lead and manage virtual teams, that is, distinct from the skills needed to lead traditional teams (Vallejo, 2009), and examine their relationship with the process of building trust in the team leader.

The present study examines the degree of virtuality of the team in relation to the personality variables of subordinates and the trust they hold in their leaders. However, the degree of virtuality of a team can influence a wider spectrum of variables linked to teamworking. An interesting future research line would be to expand the list of variables that can be influenced by degree of team virtuality, from the viewpoints of both the team leader and his/her subordinates, and the characteristics of the work team.

Finally, it would be interesting to delve into the effect of gender on the generation of trust. The differences identified are not significant, but they are not far from being so. The results obtained show that in neurotic individuals, trust in the leader can be increased if the leader is a woman. This result, and the possible effects of interaction between the leader's gender and his/her subordinates, require more attention in future studies.

## 9. Conclusions

Virtual teams are becoming increasingly important and have experienced exponential growth during the Covid-19 pandemic. While virtual work teams were already common in large companies, the changes prompted in the internal organization of entities by the pandemic have accelerated throughout economies and this development is expected to be permanent (Deloitte, 2020). Among the advantages of virtual work teams are their abilities to bring together the best specialists in a field despite spatial and temporal distance, and the flexibility they offer for addressing specific organizational challenges. However, virtuality creates managerial challenges, as teleworking-based communication networks raise doubts about managers' leadership capacities and team members' responses. In the present study we discuss: first, key aspects of the management of

virtual teams, that is, the trust that subordinates give to their leaders; second, the influence of subordinates' personality traits on that trust; third, the influence of the team's degree of virtuality on the process; and fourth, the consequences of that trust for the degree of commitment subordinates give to the team.

Our work has shown the importance of subordinates' personalities for the trust they give to their virtual team leaders. We have demonstrated that higher degrees of extroversion among team members are positively related to trust given to these leaders. In addition, the moderating role of degree of virtuality on the influence of personality was also demonstrated. In contexts of greater virtuality, the results showed that degree of neuroticism has a more negative influence on trust. Finally, the trust they give to their leaders was shown to be positively related to the degree of commitment that its members give to the virtual team.

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