# Virtual team performance: E-leadership roles in the era of COVID-19

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## Abstract

**Purpose** – The coronavirus disease 2019 (COVID-19) situation has led to the emergence of virtual teams in all organizations, and the role of leadership has become more pertinent. The current research focuses on understanding the factors for better team performance in virtual teams. Based on the contingency perspective, the behavioral complexity in leadership (BCL) theory is the most appropriate as BCL requires the leader to demonstrate multiple contrasting leadership behaviors according to the situation. Both internal as well external roles were explored, which could facilitate better communication quality and role clarity to increase interpersonal trust and leadership effectiveness in the current crisis.

**Design/methodology/approach** – Data were collected from employees who have worked in virtual teams during the crisis and who have experience of working in a virtual team environment. A total of 200 questionnaires were distributed, and 175 were received. A path model was built applying partial least squares structural equation modeling (PLS-SEM).

**Findings** – Communication quality has come as a partial mediator for the relationship between internal and external leadership roles and trust. Role clarity fully mediated the relationship between external leadership roles and conflict. Internal and external leadership roles showed a significant effect on leadership effectiveness, which were further related to team performance in virtual teams. Additionally, synchronous technology was used more by virtual teams.

**Research limitations/implications** – The study did not examine cultural differences or cultural adaptation in virtual teams. Instead of the BCL theory, future research may apply attribute-based or relational-based theory to examine leadership roles in virtual team performance.

**Originality/value** – Using the BCL theory, the current study contributes to an understanding of virtual team performance and the internal as well as external role of leaders. This is relevant in an environment of extreme ambiguity such as COVID-19.

**Keywords** COVID-19, Team performance, Virtual teams, E-Leadership roles, Communication quality, Conflict, E-Trust

**Paper type** Research paper

## 1. Introduction

The COVID-19 pandemic has led to a global crisis, hitting many service industries (Suneson, 2020) and disrupting markets and service ecosystems (Craven *et al.*, 2020). The firms providing essential services like health care, logistics, and food retailing remained operational, while other services involved in finance, information technology, media, and education adopted new ways of working (Tuzovic and Kabadayi, 2020). This has resulted in organizations creating a virtual environment to continue their businesses (Carnevale and Hatak, 2020). The emergence of COVID-19 has led many organizations to think through a new way of working as work from home (WFH) has become the new normal. The relevance of virtual teams and e-leadership has now become more prominent than ever before.

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Virtual teams are widely used as they can overcome the limitation of time and space (Lilian, 2014; Piccoli *et al.*, 2004; Potter and Balthazard, 2002) and replace traditional teams (Brunelle, 2012; Collins *et al.*, 2014). A virtual team relies on technology for communication (Jarvenpaa and Leidner, 1999; Martins *et al.*, 2004). Virtual teams are good at leveraging and integrating different expertise like functional expertise, organizational expertise, and regional expertise (Black and Edwards, 2000). This enables innovation, collaboration, and business effectiveness (Gressgård, 2011; Hosseini and Chileshe, 2013; Rogbeer and Ambos, 2014). The flexible infrastructure reduces cost and saves time, which in turn helps raise productivity (Anderson and Carletta, 2007; Martinic *et al.*, 2012).

On the other hand, a virtual team also faces many challenges due to diversity, trust issues, and a shared understanding among team members who are dispersed across physical space. This may lead to poor performance, lack of trust, miscommunication, and intragroup conflict (Ferrazzi, 2014; Pinjani and Palvia, 2013). Diversity may cause confusion and poor understanding between team members (Collins *et al.*, 2014; Hunsaker and Hunsaker, 2008). Communication in virtual teams is different from teams that communicate face to face (Jarvenpaa *et al.*, 2004; Maznevski and Chudoba, 2000), and communication technologies used to facilitate information exchange between virtual teams play an important role (Malhotra and Majchrzak, 2004; Majchrzak *et al.*, 2005).

Bartsch *et al.* (2020) considered task-oriented and relationship-orientated leadership behavior to study team performance in a virtual environment, particularly in crises like the COVID-19 pandemic, and showed that individual autonomy and team cohesiveness mediated the relationship between leadership behavior and team performance. Tuzovic and Kabadayi (2020) developed a conceptual framework to understand different social distancing practices used to prevent the spread of COVID-19 and emphasized the role of leaders in managing the performance of virtual teams. This leads us to think about whether we can apply the behavioral complexity leadership (BCL) theory based on the contingency perspective emphasizing that the leader exhibit multiple contrasting leadership behaviors and adapt to different roles as per the situation. Looking at the current COVID-19 crisis, behavioral complexity leadership (BCL) is ever so relevant, and both internal roles (mentor, facilitator, monitor, and coordinator) and external roles (innovator, broker, producer, and director) as suggested by Denison *et al.* (1995) to understand team performance can be explored in the current crisis. As these roles also overlap with the digital leadership framework of Weber *et al.* (2019): digital pioneer, innovator, networker, manager, enabler, mentor, and digital mentee, they look quite relevant to us in the COVID-19 pandemic. The current research attempts to answer the following questions:

*RQ1.* What factors determine the team performance of virtual teams, especially in an extremely uncertain situation like the COVID-19 pandemic?

*RQ2.* Do internal roles, external leadership roles, or both help in building trust and reducing conflict within virtual teams?

*RQ3.* Do communication quality and role clarity mediate/moderate the link between leadership roles and trust, conflict, and leadership effectiveness?

## 2. Literature review

(1) E-leadership and virtual teams

Tuzovic and Kabadayi (2020) studied different social distancing practices affecting organizational continuity, which impacts different dimensions of employee well-being like mental, physical, social, and financial aspects during the COVID-19 pandemic. When looking

into micro factors like skill and support obtained from family, friends, and coworkers, the role of leaders in managing the performance was also emphasized. Hence, leaders play an important role in the delivery of performance of the team, especially during a crisis like the COVID-19 pandemic.

Avolio *et al.* (2000) introduced the concept of e-leadership by analyzing the relationship between technology and leadership. The area of e-leadership needs to be explored further to obtain deep insights for understanding its role (Van Wart *et al.*, 2019). According to Avolio *et al.* (2014), a strong framework needs to be built as e-leadership "remains at the very nascent stage of development." Van Wart *et al.* (2017) have suggested looking at e-leadership by breaking it into different sub-fields from a theory-building perspective and testing a specific hypothesis. One area of research focuses on skill sets needed by e-leaders that include communication and the ability to reduce miscommunication (Balthazard *et al.*, 2009; Marlow *et al.*, 2017), e-social skills to provide a better work environment (Dahlstrom, 2013; Fernandez and Jawadi, 2015; Liu *et al.*, 2020), and aptitude to build e-trust (Crisp and Jarvenpaa, 2013; Savolainen, 2014; Breuer *et al.*, 2016; Malhotra *et al.*, 2007). Other areas have emphasized team building (Cascio and Shurygailo, 2003; Hunsaker and Hunsaker, 2008; Malhotra *et al.*, 2007) and technology adoption to manage media issues (Lareki *et al.*, 2010).

As per Liao (2017), there is very little available research to understand the process and behavior that a leader needs to lead a virtual team, and very few studies have examined work satisfaction (Vadi *et al.*, 2011), the antecedents, and consequences of team efficacy (Schepers *et al.*, 2011) and different leadership forms (Nixon and Pillay, 2013). Stoker *et al.* (2019) studied leadership in the manufacturing and financial sectors during the 2008 financial crisis and showed that there was an increase in directive leadership but no change in participative leadership behavior. Liao (2017) demonstrated that task- and relation-oriented leadership behaviors are crucial in a virtual environment for managing the challenges concerning how tasks should be done together.

Weber *et al.* (2019) suggested a digital leadership framework greatly relevant for digital transformation and virtual environment. This includes a digital pioneer, innovator, networker, manager, enabler, mentor, and digital mentee. Bartsch *et al.* (2020) considered task- and relationship-orientated leadership behavior to identify its connection with the performance of teams in a virtual environment, particularly in crises very similar to the COVID-19 pandemic. The research showed that individual autonomy and team cohesiveness mediated the relationship between leadership behavior and work performance. The study employed the digital leadership framework of Weber *et al.* (2019) and considered enabling leadership behavior (ELB) as relationship oriented and managing leadership behavior (MLB) as task oriented.

As technology adoption theory leadership needs to be explored more deeply. Van Wart *et al.* (2017) suggested a more detailed model named the e-leadership communication adoption model for the individual perspective (ECAMi), which looked into the relationship between adoption, intentions, mediators, and the actual use of leadership traits. They suggested specific leadership traits like energy, need for achievement, willingness to take responsibility, analytical skills, technical skills, continued learning, and flexibility. Liu *et al.* (2018) also approved of the ECAMi model for explaining e-leadership concerning the technology adoption model and proposed that some traits and skills such as energy, analytical skills, and the responsibility for increasing team performance in a virtual environment are more relevant for e-leadership.

According to Bono *et al.* (2012), transformational leadership styles have always shown better results for the organization and team performance even in uncertain conditions and crises. Maduka *et al.* (2018) identified competencies needed by leaders to manage their virtual teams' performance in virtual teams. They also emphasized on transformational leadership style when selecting virtual leaders as it leads to highly effective team formation. Turesky

*et al.* (2020) showed that a high-trust environment and conflict resolution were two critical components of virtual teams.

(2) Behavioral complexity theory of leadership (BCL)

According to the Theory of behavioral complexity of leadership (BCL), effective leaders must be able to deal with paradoxes and contradictions by performing multiple and competing leadership roles simultaneously (Denison *et al.*, 1995; Hooijberg, 1996). Denison *et al.* (1995) came up with behavior complexity theory by linking it to cognitive complexity (Streufert and Swezey, 1986), behavior repertoires (Mintzberg, 1973, 1990; Bass, 1981; Yukl, 1989), and paradox and contradiction (Mitroff, 1984; Quinn, 1984, 1988). The research further examined the leadership model of Quinn (1984, 1988) and empirically tested eight roles.

Effective leaders are competent in noticing the needs and altering their behavior to meet those needs (Kenny and Zaccaro, 1983). A leader should also know not to assume roles that are not required in the situation or rather do not suit the situation (Hooijberg, 1996). Kayworth and Leidner (2002) argued that effective leaders deal with paradox and contradiction by performing multiple leadership roles as suggested by behavioral complexity leadership (BCL). This can also be applied to virtual team leaders. Adopting the framework of Denison *et al.* (1995), they picked internal and external roles from it and suggested that a mentoring role is crucial for virtual leadership as it shows empathy and understanding towards team members.

According to Quinn (1988), leadership roles are categorized on two dimensions: stability/flexibility and internal/external focus. Denison *et al.* (1995) recommended eight leadership roles: Quadrants 1 and 2 mention the roles that the manager needs to play to adapt to the external environment (innovator, broker, producer, and director) of the organization, while quadrants 3 and 4 concentrate on roles needed to maintain the internal environment (mentor, facilitator, monitor, and coordinator), as seen in Figure 1.

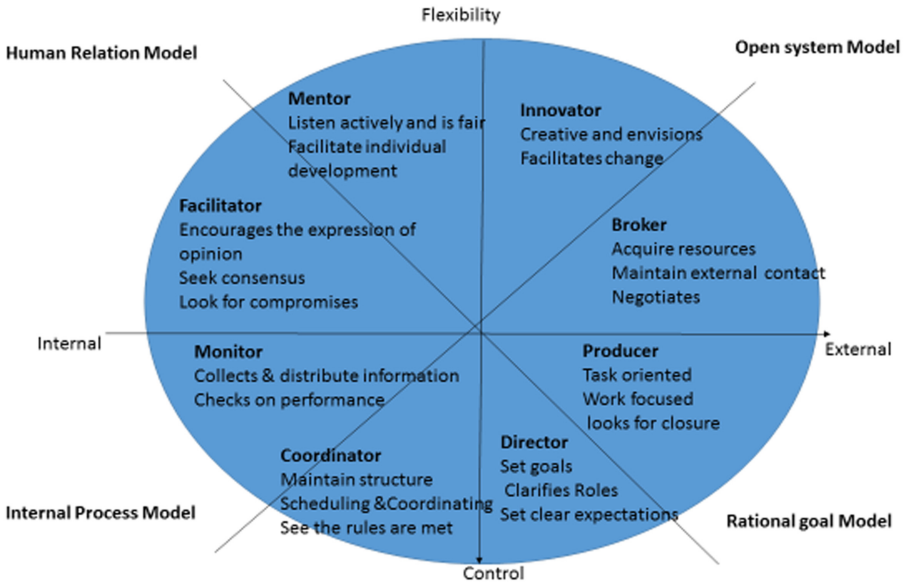


**Figure 1.**
Quinn internal and external leadership roles

*2.1 Internal leadership roles*

For the monitoring role, the leaders need to manage the information available to the team (Denison *et al.*, 1995). The team leaders monitor the day-to-day tasks and manage the team performance (Bell and Kozlowski, 2002). They provide a sense of stability and continuously guide the team members. This could be a greater challenge for a leader in a virtual team that is physically dispersed, resulting in a lack of information sharing. Hence, the role of a leader would be to not only monitor the team but also encourage all team members to monitor themselves toward achieving the goals (Hertel *et al.*, 2005). The coordinator's role deals with ensuring having the continuity of the tasks, which requires the involvement of team members. They should work in cohesion and listen and work toward managing the continuity (Kahai *et al.*, 1997; Sagie *et al.*, 2002). In virtual teams, the coordinator's role becomes challenging as the members work independently, although technology can be used effectively to make tasks more interdependent; however, the issues with technology adoption may be a big hurdle (Griffith and Meader, 2004). The leader needs to coordinate with different team members and create shared norms and values among team members. It is evident from the previous research that consistent communication leads to better team performance than inconsistent communication (Jarvenpaa and Leidner, 1999).

The mentor's role is yet another important role leaders need to fulfill. They work on the development of team members by providing support and understanding them by empathizing with them (Denison *et al.*, 1995). Mentoring can be measured based on how many leaders have concerns about the well-being of their team and how they can create a place for support and appreciation (Sarin and McDermott, 2003). In a virtual team, this role can become difficult as every team member needs to perform many roles, which can cause dissatisfaction among team members. By clearly defining the role of team members in a virtual team, leaders can provide them with a sense of everyone's work (Fiol and O'Connor, 2005). The leader can build good leader-member relationships in the virtual team for compensating the inability to work together in the workplace (Cooper and Kurland, 2002). While leaders as facilitators need to resolve differences in opinions and bring the team together (Denison *et al.*, 1995; Quinn, 1988), the role of the facilitator is not only to resolve conflict and encourage teamwork but also to reach a consensus by negotiating with everyone (Curral *et al.*, 2001). The leader can use appropriate technology to distribute knowledge and document all the activities of team members. This will help avoid conflict situations as they are often caused by a misunderstanding between team members due to limited knowledge sharing (Hertel *et al.*, 2005).

*2.2 External leadership roles*

The external leadership role that is characterized by flexibility and the focus on the external environment emphasizes innovation and resource acquisition. The innovator's role entails scanning the external environment for any external contingencies or crises and thinking creatively to adapt to these changes. While the broker's role is to keep the connection to the outside world and negotiate and acquire the right resources to build a power base, the task leadership role is characterized by control and a focus on the external environment. A producer helps achieve goals and improve productivity by managing time and stress, and a director's role is to clarify expectations, create vision/objectives, and design and organize. In a crisis like the COVID-19 pandemic, the external role of a leader becomes more relevant and needs further investigation.

(3) Leadership roles and communication quality and role clarity

Much research has been done on team communication, but virtual teams are still emerging (Badir *et al.*, 2012; Piekkari and Tietze, 2011). The study by Reed and Knight (2010) found that poor communication leads to lowers knowledge transfer, which impacts team performance.

As per Bjørn and Ngwenyama (2009), virtual meetings often hamper communication within dispersed teams due to language barriers. Poor communication results in less-effective relationship building and coordination with the team (Montoya *et al.*, 2009). The team leader should also ensure that no member is lagging due to lack of performance or miscommunication (Anderson and Shane, 2002). It becomes essential to understand how to maintain communication in a virtual team environment, and it thus needs to be investigated (Johnson *et al.*, 2001; Chang, 2011; Hiltz and Johnson, 1990).

Electronic communication causes many problems because of the lack of social cues and relationships for smooth working (Maznevski and Chudoba, 2000). Communication technology can play an essential role here as it can build a close bond between team members by sharing information and data even in a different location and time zone (Bell and Kozlowski, 2002). Lau *et al.* (2000) mentioned three important factors that lead to effective communication and channel quality: technology, time and space, and communication patterns. The technology is concerned with accessibility, synchronicity, and medium richness. Time and space pertain to time zone and physical differences. The communication patterns can be divided into synchronicity and asynchronicity (Warkentin *et al.*, 1997). Synchrony of communication can be defined as the degree to which communication technology helps team members work in different spaces and times (Montoya-Weiss *et al.*, 2001). Organizations can use electronic chat rooms and "open door" e-mail to be informed of employee concerns, problems, and grievances before they get into severe crises.

Curnin *et al.* (2015) showed that role clarity acts as an important enabler in forming temporary organizations and managing collaborative work environments. Role clarity can be defined as the extent to which different team members understand their duties, roles, tasks, and responsibilities (Hinkin and Schriesheim, 2008; Katz and Kahn, 1978). The literature recognizes that role clarity does impact both performance (Bolino and Turnley, 2005) and satisfaction (Martins *et al.*, 2004). Hence, it becomes critical for virtual team members to know their roles and express their expectations and needs (Wong *et al.*, 2007). By effectively communicating through media, the team members can build swift trust for creating clarity in their roles (Curnin *et al.*, 2015; Gilson *et al.*, 2015; Malhotra *et al.*, 2007). Trust is an essential aspect of team members' adjustment to a virtual team (Raghuram *et al.*, 2001).

Role clarity reduces the confusion that may arise in doing any job by clarifying work expectations and is the opposite of role ambiguity (Jackson and Schuler, 1985). Role clarity would be reduced if the tasks are abstract and complex and employees are working in many teams under multiple managers and often find themselves in cross-functional teams (Wong *et al.*, 2007). The situation may get worse in a multinational organization as the employees may need to fulfill varied expectations from many stakeholders concerning their roles (Daim *et al.*, 2012). Webster and Wong (2008) have maintained that role clarity leads to creating swift trust, as suggested by previous research by Meyerson *et al.* (1996). Further, as per Daim *et al.* (2012), trust in the virtual team can be strengthened by defining clear roles and maintaining consistent role behavior. As virtual team members cannot build strong relationships as compared with face-to-face teams (Curnin *et al.*, 2015), role clarity can help develop trust by reducing uncertainty. Hence the following hypothesis can be formalized:

*H1a.* The greater the team members perceive that the leader is performing the internal roles (mentor, facilitator, monitor and coordinator) greater is the communication quality perceived by the team members.

*H1b.* The greater the team members perceive that the leader is performing the internal roles (mentor, facilitator, monitor and coordinator) greater is the role clarity perceived by the team members.

*H2a.* The greater the team members perceive that the leader is performing the external roles (director, producer, innovator and broker) greater is the communication quality perceived by the team members.

*H2b.* The greater the team members perceive that the leader is performing the external roles (director, producer, innovator and broker) greater is the role clarity perceived by the team members.

(4) Leadership roles and conflict, trust, and effectiveness

The dynamic model of conflict in distributed teams means that the nature of a virtual team makes conflicts harder to manage as communication is through technology (Hinds and Mortensen, 2005) and which leads to miscommunication (Mannix *et al.*, 2002). There are three types of conflicts that affect teams the most: task conflict, relational conflict, and process conflict (Jehn, 1995, 1997). Task conflict occurs when all do not understand a necessary activity aimed at reaching the team goal, which causes disagreements about work. Relational conflict can invoke negative emotions and differences unrelated to the task. Process conflict is a disagreement over the process or method to complete tasks. These conflicts are damaging to team performance (Hinds and Bailey, 2003). The leader must detect these conflicts at an early stage, which is harder in a virtual team, especially if the leader is less effective (Hinds and Mortensen, 2005).

Trust in teams is the level of confidence felt among team members (Pinjani and Palvia, 2013), and it leads to the goodwill and credibility of every team member, reflected by predictable behavior (Ulbrich *et al.*, 2011; Piccoli and Ives, 2003). In virtual teams, developing trust is difficult due to a lack of one-to-one interaction (Rusman *et al.*, 2010), but it becomes essential for team performance. Interpersonal trust is needed to create and maintain an environment of cooperation, excellent performance, and other attitudes (Evaristo, 2003). In virtual teams, trust will come from the belief that each member will follow the commitment levels as agreed, that they all will work with good intentions, and that every member will put in their best for the virtual team (Zaccaro and Bader, 2003). A capable virtual team can develop in a positive climate with regular communication, which contributes to personal growth and learning through well-structured intervention led by mutual trust and shared understanding (Holton, 2001).

Jarvenpaa *et al.* (1998) conceptualized a model of trust for a virtual team based on dyadic and collective relationships. The dyadic trust relationship focuses on the perceived ability, benevolence, and integrity of the trustee (Mayer *et al.*, 1995) according to the team members. For trusting and depending on others (McKnight *et al.*, 1998), taking risks (Jones and George, 1998), and being vulnerable (Mayer *et al.*, 1995), team members need to create social and personal relationships among teams. The leader's emotional intelligence, behavior, and personality can create a positive climate (Liu *et al.*, 2012) and enhance communication, engagement, and trust. The idea of "swift trust" was conceptualized by Meyerson *et al.* (1996) for individuals who have not worked together, are involved in a complex task, have deadlines, and are non-routine in nature. Many researchers have started correlating virtual teams and "swift trust" (Iacona and Weisband, 1997; Jarvenpaa *et al.*, 1998).

Leaders' effectiveness is measured by their ability to influence a group of individuals and commit to team goals. Hence, a leader who can divert team members away from conflict is effective (Yukl and Tracey, 1992). Leaders need to act according to the situation (Stott and Walker, 1995), employ skills that will influence their subordinates, and improve their morale and productivity (Kipnis *et al.*, 1980). According to Denison *et al.* (1995), Quinn (1988), and Hart and Quinn (1993), managers who perform both people-

and task-oriented roles are more useful to the team than those who focus only on one function. This leads us to the following hypothesis for internal leadership roles:

*H3a.* The greater the team members' perception that the leader is performing internal roles (mentor, facilitator, monitor, and coordinator), the lesser is the conflict (task, process, and relational) as perceived by the team members.

*H3b.* The greater the team members' perception that the leader is performing internal roles (mentor, facilitator, monitor, and coordinator), the greater the leadership effectiveness as perceived by the team members.

*H3c.* The greater the team members' perception that the leader is performing internal roles (mentor, facilitator, monitor, and coordinator), the greater the trust (benevolence, integrity, and ability) as perceived by the team members.

*H3d.* The relationship between internal leadership roles and conflict, leadership effectiveness, and trust are mediated/moderated by communication quality.

*H3e.* The relationship between internal leadership roles and conflict, leadership effectiveness, and trust are mediated/moderated by role clarity.

This leads us to the following hypothesis for external leadership roles:

*H4a.* The greater the team members perceive that the leader is performing the external roles (director, producer, innovator and broker) less is the conflict (task, process and relational) perceived by the team members.

*H4b.* The greater the team members perceive that the leader is performing the external roles (director, producer, innovator and broker) greater is the leadership effectiveness perceived by the team members.

*H4c.* The greater the team members perceive that the leader is performing the external roles (director, producer, innovator and broker) greater is the trust (benevolence, integrity and ability) perceived by the team members.

*H4d.* The relationship between external leadership roles and conflict, leadership effectiveness, and trust are mediated/moderated by communication quality.

*H4e.* The relationship between external leadership roles and conflict, leadership effectiveness, and trust are mediated/moderated by role clarity.

(5) Trust, conflict, leadership effectiveness, and team performance

Leadership effectiveness is directly related to team outcomes, and when efficiency increases, so do the outflows. Effective leaders are expected to be equipped with technical skills as well as conceptual knowledge so that they can lead the team in a clear direction (Hackman, 1986). Both directive and participative leadership have shown high performance, and the nature of leadership directs the outcomes of the team Katzenbach and Smith (1993).

Berber *et al.* (2020) researched to understand the factors that lead to better team performance and the long-term sustainability of teams. Factors like team innovativeness, quality of teamwork, and synergy of teams were positively related to team performance. One of the approaches for understanding team performance is an input-process-output (I-P-O) framework (McGrath, 1964; Dulebohn and Hoch, 2017): inputs can be competencies, personalities, skills, task structure, leadership, organization structure, and environmental factors; processes help convert inputs into outputs, and

outcomes contribute to productivity, performance, satisfaction, commitment, and viability (Mathieu *et al.*, 2008).

Another model called input moderator outcome (IMO) was proposed by Ilgen *et al.* (2005) as the (I-P-O) framework received criticism and they added time and suggested multiple processes and outcomes in teamwork (Graaf *et al.*, 2009). Ulrych (2014) introduced an improved version of the IMO model consisting of the inputs stage having team composition, team level, and organization level/context level. The team level included five domains: team interdependence, technology, training, leadership, and team structure. The organization/context level comprises areas like the HR system, culture, and climate. These inputs decide the mediators that consist of processes and emergent states. The final stage of the IMO is team outcomes and involves organizational-level performance, team performance behavior, role-based performance, and performance composition.

Team performance can be viewed from various perspectives. Hackman suggested productivity, cohesion, and learning to be the three most important factors influencing team effectiveness. Some researchers have measured team performance in terms of quality concerning decisions, products, and production (De Dreu and Weingart, 2003). While Rosen and Dietz (2017) proposed that the main team outcomes are task outcomes such as error rates, completion time, member satisfaction, and learning outcomes like the gain in knowledge, skills, and altitudes, the major indicator of team performance is consumer satisfaction (Edmondson, 1999). Ulrych (2014) recommended affective reaction and team viability as the criteria for team performance. The affective reaction includes team atmosphere and the treatment of team members, while team viability includes the level of satisfaction, team climate, and team cohesion (Mathieu *et al.*, 2008). Berber *et al.* (2020) also stated that factors like team innovativeness, quality of teamwork, and synergy of teams were positively related to team performance and the long-term sustainability of teams.

*H5a.* Greater is the communication quality perceived by the team members lesser is the team members' perception of team conflict.

*H5b.* Greater is the communication quality perceived by the team members greater is the team members' perception of team leader effectiveness.

*H5c.* Greater is the communication quality perceived by the team members greater is the team members' perception of team trust.

*H6a.* Greater is the role clarity perceived by the team members lesser is the team members' perception of team conflict.

*H6b.* Greater is the role clarity perceived by the team members greater is the team members' perception of team leader effectiveness.

*H6c.* Greater is the role clarity perceived by the team members greater is the team members' perception of team trust.

*H7.* The lesser the team members' perception about team conflict, the greater the perception of a team about their team performance.

*H8.* The greater the team member's perception of the team's interpersonal trust, the greater the perception of a team about their team performance.

*H9.* The greater the team member's perception of the team leader's effectiveness, the greater the perception of a team about their team performance.

## 3. Research design

(1) Research model:

From the above literature review and stated hypothesis, the study proposes the conceptual model (Figure 2) for E-leadership relating internal and external leadership roles with trust, conflict, and leadership effectiveness keeping communication quality and role clarity as mediators and also testing for their moderation effect. Finally, the impact of trust, conflict, and leadership effectiveness is also tested on the overall team performance of the virtual team.

(2) Sample and data collection

Data were collected from employees who have worked in virtual teams and have experience working in a virtual team environment during the COVID-19 period. Data were collected through the purposive sampling method as the study's objectives were narrow, and obtaining the right sample was essential but challenging. A total of 200 questionnaires were distributed, of which 175 were received. Hence, the response rate was 87.5%.

The respondents were asked to rate the various aspects of virtual leadership concerning two leadership roles (external and internal), quality of communication, role clarity, trust, conflict, leadership effectiveness, and overall team effectiveness. The reliability and validity of the instrument were further tested.

(3) Measures:

The leadership role measures were based on Denison *et al.* (1995). Role clarity was adapted from Fritz *et al.* (1998), and communication quality was determined using the scale of Mohr and Spekman (1994), Johlke and Duhan (2001), and Hinds and Weisband (2003). Communication technology was evaluated by asking: "to what extent were the following means of communication employed?" with responses ranging from never to a great extent (Kayworth and Leidner, 2002). Task and relational conflict were measured using the intragroup conflict scale (Jehn, 1995; Hinds and Mortensen, 2005), and the process conflict items were derived from Shah and Jehn (1993). Interpersonal trust was adapted from Jarvenpaa and Leidner (1998). The leader effectiveness scale was derived from Denison *et al.* (1995). Items measuring team performance were adopted from Mortensen and Hinds (2001) and were used by Wakefield *et al.* (2008).

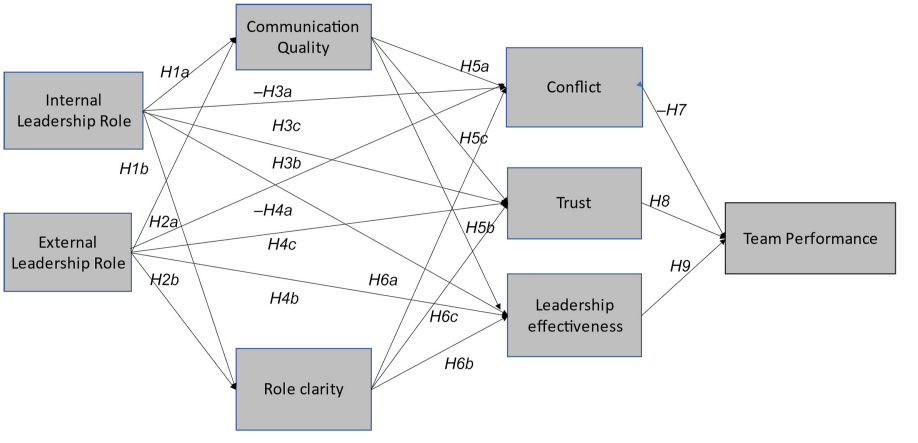


**Figure 2.**
Conceptual model proposed by authors

## 4. Findings and discussions

The demographic details showed that 56.0% were from the age group 20–25, 26.9% from the 26–30 group, 13.7% from the 31–40 group, and 3.4% from the group 40 and above. Out of the respondents, 55.4% were female and 44.6% male; 38.9% were from the junior level, 42.9% from the middle level, and 18.3% from the senior level. A total of 59.4% worked in a team with 1–5 members, 29.7% worked with 6–10 members, and 10.9% worked with 11–15 members.

For communication technology, it was seen that asynchronous technology (e-mail, voice mail, and web collaboration) showed a mean of 3.00, and synchronous technology (telephone, conference call, and video conferencing) showed a mean value of 3.4.

It is suggested that "In situations where theory is less developed, the researcher should consider using [partial least square equation modeling] PLS-SEM" (Hair *et al.*, 2017, p. 40). PLS-SEM becomes more relevant when a model is complex and the situation is changing or completely new (cf Akter *et al.*, 2011). PLS-SEM is a good method for theory generation rather than it is for theory confirmation (Urbach and Ahlemann, 2010). Moreover, this approach does not need a normal distribution as the covariance approach and can work even with a small sample (Hair *et al.*, 2014).

In the current research role of leaders is seen in the era of COVID-19 and virtual team performance in the challenging situation was studied. The conceptual model developed is complex and was tested in a completely new situation hence PLS-SEM is chosen. Previous studies have also emphasized to use of PLS-SEM for models with mediation and moderation effects (Henseler and Fassot, 2010). The PLS-SEM model with mediation and moderation is shown in Figure 3.

When handling common method bias concerning the procedure, confidentiality was maintained as the responses were taken online and anonymous (Fleming and Wilson, 2000).To draw psychological separation multiple items were added between independent and dependent variables and items were clubbed together explaining the phenomenon.

The common bias method becomes very crucial for self-reporting surveys, and this was tested by loading all the indicators on their latent variables and then loading all the indicators on a common method latent variable. The items did not load on a single factor when the Harman single-factor test was conducted (Podsakoff *et al.*, 2003) and the model did not converge. The correlation coefficient was modest to high as a value for $r < 0.90$ (Wamba *et al.*, 2017). The collinearity test showed that all the VIFs values were less than 3.00 and hence no collinearity effect was seen (Kock, 2015).

For the inner model assessment, the reliability and validity were tested, reliability values of more than 0.60 were accepted, and two items, namely LE2 and Ben 1, were dropped. As seen in Table 1, the composite reliability of the construct was higher than 0.70, and the construct convergent validity, i.e. the average variance extracted (AVE), was higher than 0.5 (Hair *et al.*, 2014). The discriminate validity was also tested as the square root of AVE values was higher than the inter-construct correlations, and all indicators of loading were higher than their respective cross-loadings (Table 2).

The structural model assessments showed the path coefficients when nonparametric bootstrapping with sample (5,000) was applied, as shown in Tables 3 and 4. The model fit values were acceptable as SRMR for the saturated model was $0.071 < 0.08$ and the NFI value was 0.696.

It was observed that internal leadership roles were related to communication quality but not role clarity (which supports H1a but not H1b).In contrast, external leadership roles were related to both communication quality and role clarity (both H2a and H2b supported). Internal leadership roles showed an effect on leadership effectiveness and trust but not on conflict (H3b and H3c were supported but not H3a), whereas external leadership roles were related to both leadership effectiveness and trust but not conflict (H4b was supported but not H4a and H4c).

Communication quality impacted leadership effectiveness and trust but not conflict (H5b and H5c were supported but not H5a). Similarly, role clarity impacted conflict and but not leadership effectiveness and trust (H6a supported but not H6b and H6c). Finally, it was noted

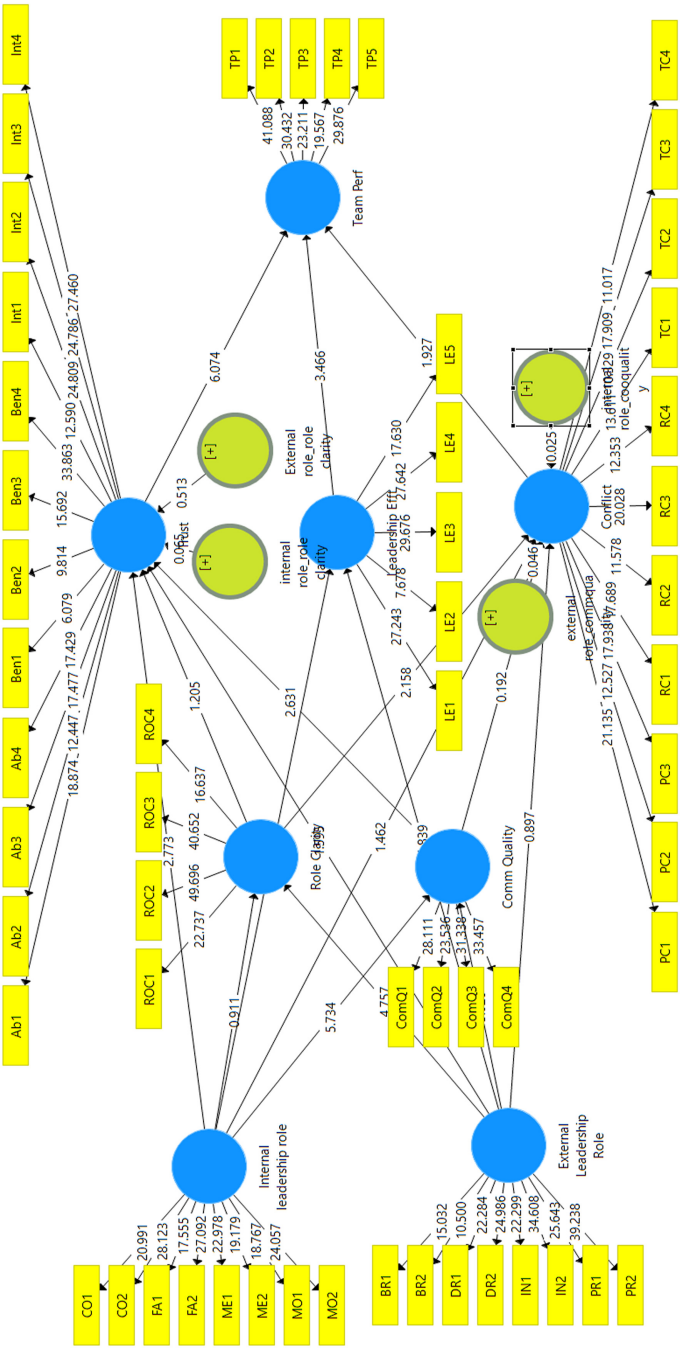


**Figure 3.**
PLS-SEM diagram

that the team performance of the virtual team did get impacted by trust and leadership effectiveness (both H8 and H9 supported). The conflict had a positive impact on team performance, but it was hypothesized as a negative relation (H7 not supported).

The R-square values that give the endogenous construct predictive power were role clarity (0.295), communication quality (0.463), trust (0.545), conflict (0.160), leadership effectiveness (0.140), and team performance (0.486). The team performance can be explained to 48.6% by the variable considered.

When tested for the moderation of communication quality between internal leadership and external leadership roles and conflict, the moderation did not come significant. Similarly, the moderation of role clarity between internal leadership and external leadership roles and trust did not come significant (Table 5).

### *4.1 Mediation analysis*

The mediation effect as suggested by Preacher and Hayes (2004) and Shrout and Bolger (2002) was used. This method investigates the indirect effect of the mediation between the predictor and criterion variables using the bootstrapping procedure. Communication quality as a mediator between internal leadership roles and trust came out significant. Variance accounted for (VAF) was calculated by dividing the indirect effect by the total effect ($0.444 \times 0.269/0.280$), which came to 0.426, showing partial mediation (VAF lies between 20 and 80%). Communication quality as a mediator between external leadership roles and trust was also observed to be significant. The VAF was calculated by dividing the indirect effect by

| | Cronbach's alpha | rho_A | Composite reliability | (AVE) |
|---|---|---|---|---|
| Comm quality | 0.866 | 0.866 | 0.909 | 0.713 |
| Conflict | 0.932 | 0.944 | 0.94 | 0.590 |
| External leadership role | 0.908 | 0.911 | 0.926 | 0.611 |
| Internal leadership role | 0.904 | 0.907 | 0.923 | 0.60 |
| Leadership efft | 0.857 | 0.884 | 0.898 | 0.642 |
| Role clarity | 0.855 | 0.857 | 0.902 | 0.699 |
| Team perf | 0.897 | 0.902 | 0.924 | 0.709 |
| Trust | 0.916 | 0.922 | 0.929 | 0.527 |

**Table 1.** Reliability

| | Comm quality | Conflict | External leadership role | Internal leadership role | Leadership efft | Role clarity | Team perf | Trust |
|---|---|---|---|---|---|---|---|---|
| Comm quality | 0.844 | | | | | | | |
| Conflict | 0.279 | 0.768 | | | | | | |
| External leadership role | 0.624 | 0.353 | 0.781 | | | | | |
| Internal leadership role | 0.66 | 0.352 | 0.788 | 0.774 | | | | |
| Leadership eff | 0.262 | −0.05 | 0.354 | 0.353 | 0.801 | | | |
| Role clarity | 0.52 | 0.348 | 0.54 | 0.464 | 0.196 | 0.836 | | |
| Team perf | 0.547 | 0.214 | 0.606 | 0.589 | 0.434 | 0.501 | 0.842 | |
| Trust | 0.639 | 0.193 | 0.651 | 0.67 | 0.359 | 0.486 | 0.653 | 0.726 |

**Table 2.** Discriminate validity

| Hypothesis | Original sample (O) | *T* statistics (\|O/STDEV\|) | *p* values | Results |
|---|---|---|---|---|
| H1a: Internal leadership role → Comm Quality | 0.444 | 5.734 | 0 | Accepted |
| H1b:I nternal leadership role → Role Clarity | 0.100 | 0.911 | 0.363 | Not accepted |
| H2a: External Leadership Role → Comm Quality | 0.274 | 3.026 | 0.003 | Accepted |
| H2b: External Leadership Role → Role Clarity | 0.461 | 4.757 | 0 | Accepted |
| H3a: Internal leadership role → Conflict | 0.187 | 1.462 | 0.144 | Not accepted |
| H3b: Internal leadership role → Leadership Efft | 0.192 | 2.007 | 0.045 | Accepted |
| H3c: Internal leadership role → Trust | 0.268 | 2.773 | 0.006 | Accepted |
| H4a: External Leadership Role → Conflict | 0.106 | 0.897 | 0.37 | Not accepted |
| H4b: External Leadership Role → Leadership Efft | 0.202 | 1.839 | 0.066 | Accepted |
| H4c: External Leadership Role → Trust | 0.195 | 1.595 | 0.111 | Not accepted |

**Table 3.**
Results of path coefficients (H1a to H4c)

| Hypothesis | Original sample (O) | *T* statistics (\|O/STDEV\|) | *p* values | Results |
|---|---|---|---|---|
| H5a: Comm Quality → Conflict | −0.021 | 0.192 | 0.848 | Not accepted |
| H5b: Comm Quality → Leadership Eff | 0.234 | | 0.007 | Accepted |
| H5c: Comm Quality → Trust | 0.264 | 2.631 | 0.009 | Accepted |
| H6a: Role Clarity → Conflict | 0.223 | 2.158 | 0.031 | Accepted |
| H6b: Role Clarity → Leadership Eff | 0.07 | | 0.338 | Not accepted |
| H6c: Role Clarity → Trust | 0.081 | 1.205 | 0.228 | Not accepted |
| H7: Conflict → Team Perf | 0.124 | 1.927 | 0.054 | Not Accepted |
| H8: Trust → Team Perf | 0.542 | 6.074 | 0 | Accepted |
| H9: Leadership Efft → Team Perf | 0.245 | 3.466 | 0.001 | Accepted |

**Table 4.**
Results of path coefficients (H5a to H9)

| | Original sample (O) | *T* statistics (\|O/STDEV\|) | *p* values | Results |
|---|---|---|---|---|
| External role_commquality → Conflict | 0.01 | 0.046 | 0.963 | Not accepted |
| Internal role_cooquality → Conflict | 0.005 | 0.025 | 0.980 | Not accepted |
| Internal role_role clarity → Trust | −0.008 | 0.065 | 0.948 | Not accepted |
| External role_role clarity → Trust | −0.071 | 0.513 | 0.608 | Not accepted |

**Table 5.**
Moderating effect

the total effect (0.274 × 0.269/0.203), which came to 0.363 with partial mediation. Hypotheses H3d and H4d were supported only for trust. The specific indirect effect shows that *p*-values 0.027 < 0.05 (95%) for internal leadership and 0.09 < 0.10 (90%) for external leadership were significant, as shown in Table 6.

External leadership roles exhibited a significant effect on role clarity which in turn showed a significant effect on conflict. However, external leadership roles had no significant direct effect on conflict; hence, role clarity shows a full mediation effect with VAF (0.46 × 0.218/0.104), which came to 0.964. Hypothesis H4e was supported only for conflict. The specific indirect effect indicates that *p*-values 0.040 < 0.05(95%) for external leadership were significant as seen in Table 6. As 0 does not fall in the range of upper-level and lower-level CI, the indirect effect was proved by bootstrapping.

## 5. Discussion

### *5.1 Theoretical contribution*

The COVID-19 pandemic has forced employees to work from home and rely on technology to communicate with each other. Virtual teams have immerged in a big way, and virtual team performance has become crucial for any organization to succeed. Virtual team leaders play an important role in determining the success or failures of the teams; hence, it becomes crucial to understand the skills, competencies, and attitudes that these leaders need to demonstrate. This study particularly focuses on internal and external roles proposed by Denison *et al.* (1995) and the digital leadership framework of Weber *et al.* (2019) and their implication for virtual team performance.

The current study makes three crucial contributions. First, the internal (mentor, facilitator, monitor, and coordinator) and external (innovator, broker, producer, and director) leadership roles based on BCL are explored in the virtual teams, while Denison *et al.* (1995) only examined the internal roles. The current research has found a significant relationship between external roles and role clarity other than communication quality; hence, it becomes essential to assess external roles like innovator and broker to provide an opportunity for the team to think innovatively and acquire resources in time. Further, both internal and external leadership roles have shown an impact on increasing leadership effectiveness. These roles also overlap with the digital leadership framework of Weber *et al.* (2019) which includes digital pioneer, innovator, networker, manager, enabler, and mentor. Leadership development should consider developing leaders in digital pioneer roles.

Second, communication technology was also observed for synchronous and asynchronous technology. The teams used telephones, conference calls, and video conferencing calls mostly to collaborate, and synchronous technology was more employed in virtual teams. This supports the e-leadership communication adoption model for the individual perspective (ECAMi) and specific leadership traits like energy, analytical skills,

| | Original sample (O) | *T* statistics (\|O/STDEV\|) | *p* values | Bias | 2.50% | 97.50% |
|---|---|---|---|---|---|---|
| 3d: Internal leadership role → Comm Quality → Trust | 0.117 | 2.503 | 0.012 | 0.002 | 0.047 | 0.229 |
| 3d: Internal leadership role → Comm Quality → Trust → Team Perf | 0.063 | 2.258 | 0.024 | 0.001 | 0.023 | 0.136 |
| 4d: External Leadership Role → Comm Quality → Trust | 0.072 | 1.672 | 0.095 | 0.004 | 0.014 | 0.183 |
| 4e: External Leadership Role → Role Clarity → Conflict | 0.103 | 1.922 | 0.055 | −0.011 | 0.017 | 0.24 |

**Table 6.**
Specific indirect effects

and responsibility needed to ensure virtual team performance (Van Wart *et al.*, 2017; Liu *et al.*, 2018).

The current research has found that communication quality partially mediates the relationship between both leadership roles and different aspects of trust (benevolence, integrity, and ability). Continuous communication leads to better trust-building, and both roles can help achieve it. As suggested by Evaristo (2003), advanced information and communication technology should be planned to build e-trust, which can be critical for team performance (Crisp and Jarvenpaa, 2013; Savolainen, 2014; Breuer *et al.*, 2016). The findings also resonate with the IMO model for team performance by Ulrych (2014), which showed that one of the team-level inputs includes technology/virtuality, and mediators as emergence states are team climate, cohesion, and trust that are essential for team outcomes.

Third, role clarity fully mediates the relationship between external leadership roles and conflict. Hence, external leadership roles become more relevant as leaders should clarify the roles in a virtual environment for reducing conflict. These results are greatly in line with the finding of Curnin *et al.* (2015) about the critical aspect of role clarity in forming temporary organizations and managing collaborative work environments.

### *5.2 Managerial implications*

In the current COVID-19 crisis, it becomes more essential to investigate external leadership roles, especially those of innovators/directors to manage the external organizational disorder. This provides direction to the leadership development in terms of enhancing crisis manager and disturbance handler as an important external role of a virtual leader to manage virtual teams.

As virtual leaders do not meet their team face to face frequently, they may not be able to reassure them with their continuous presence and may be unable to communicate their message. The leaders' and managers' development should focus on their quality of communication (concerning accuracy, adequacy, completeness, and credibility) and communication skills to clarify roles, maintain structure to ensure information flow, and exhibit assertiveness. Future leaders should be taught how to use communication technology (synchronous and asynchronous) effectively to manage virtual teams.

Leadership development should look into grooming leaders to build and maintain e-trust through appropriate technology usage and the understanding of team dynamics. Building e-trust is a very difficult task, but if leaders are aware of it and trained, then they can work toward creating a higher level of trust even in virtual teams that are dispersed.

## 6. Limitations and future research

First, the study could only find a mediation relationship between the variables and in the future moderating effect of some new variables can also be explored. Second, these findings are limited to the culture like that of the respondent understudy; a future study may investigate the characteristics of a virtual team's leadership, which vary across cultures, as well as the factors that remain constant or universal across all cultures. Third, the study is focused on leadership roles as suggested by behavioral complexity theory, and future research may adopt the attribute- or relational-based approach for leadership roles than BCL.

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