

Review into the changes in the barriers and challenges of communication in remote project teams due to the COVID-19 pandemic

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Summary

In recent years there has been interest in the dynamics of physical and virtual communication in remote project teams. These dynamics have been impacted by the environmental pressures from COVID-19. This research performed a systematic literature review to identify if the change in dynamics have impacted on the barriers and challenges for remote project teams' communication practices and project lifecycle. A systematic literature review was performed using a keyword search in key databases between the years of 2004-2024. The literature showed the reactions to the barriers and challenges seen in the transformation process required by organisations and remote project teams adapting to environmental pressures. The research concludes that the literature focused on the transformation process and didn't fully explore the impact on changes in barriers and challenges on remote project teams. Further research opportunities have been identified, including questions into how the transformation impacted on communication during a project's lifecycle.

Word Count: 5423

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Introduction

Since 2019, the global COVID-19 pandemic has introduced significant communication challenges and pressures due to the enforcement of partial shutdowns, curfews, and quarantines aimed at controlling the spread of the virus (Berg, Hess and Matthias, 2021, p. 511). These measures were enforced by governments to reduce the transmission of the highly infectious COVID-19 virus, to protect the vulnerable and key workers (Subramaniam *et al.*, 2021, p. 2). This necessitated a rapid shift in organisational working practices, transitioning from traditional office-based environments to new ways to manage communication in the digital realm (Faraj, Renno and Bhardwaj, 2021, p. 2; Subramaniam *et al.*, 2022, p. 4; Anglani *et al.*, 2023, p. 1; González-Afonso *et al.*, 2023, p. 2). This shift had a profound impact on project teams, requiring team members to transition from face-to-face interactions to virtual communication channels.

In recent years, scholarly interest has focused on the dynamics of physical and virtual communication within remote project teams. Advances in virtual communication technologies have enhanced organisational flexibility, facilitating the integration of both co-located and remote project team members (Lumseyfai, 2020; Tigre, Curado and Henriques, 2023). With the emergence of COVID-19 and required changes in working patterns, this transition has introduced new challenges, including inadequate knowledge transfer due to digital limitations, team motivation, team productivity, management engagement and leadership (Mishra and Mishra, 2009, p. 443; Daim *et al.*, 2012, p. 200; Salamin, Khlefat and Qusef, 2021, p. 203; Korotkova, Austin and Hetemi, 2024).

There has been a dynamic shift in organisational working practices to adopt remote project teams within organisations (Scharf *et al.*, 2023, p. 432). This may have been due to advancements in virtual communication technology and the impact of the COVID-19 pandemic restrictions (Afridi *et al.*, 2023, p. 1). Questions remain about, where this has introduced barriers and challenges to communication and have the advancements in virtual communication technologies have effectively mitigated, eliminated, or altered the barriers and challenges to communication for remote project teams. Addressing these questions is crucial for organisations and remote project teams, as issues develop, including uncertainty (Song *et al.*, 2007, p. 64), ambiguity, and misunderstandings (Lee-Kelley and Sankey, 2008, p. 55). Such barriers can detrimentally impact teamwork, reduce operational efficiency, and impede overall project progress.

The purpose of this paper is to identify if the advancement in virtual communication mediums during the COVID-19 pandemic, the digital transformation process (Anglani *et al.*, 2023, p. 4), have mitigated the barriers and challenges that have previously impacted on organisations when using remote project teams. For example, the risk of miscommunication or misinterpretation (Daim *et al.*, 2012, p. 205) when using virtual communication technologies. This paper will draw upon recent literature with the aim to identify any differences in physical and virtual communication, as well as barriers and challenges organisations and remote project teams face and how it impacts the project lifecycle. These will be achieved by undertaking a systematic literature review over the last 20 years from a number of key journal databases. Papers will be selected for their relevancy, reviewed and results presented.

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The acceleration of digitalisation, propelled by the environmental pressures of the COVID-19 pandemic has highlighted the important role of virtual technologies in supporting remote work and distributed teams (Berg, Hess and Matthias, 2021, p. 512; Afridi *et al.*, 2023, p. 1; Kordova and Hirschprung, 2023, p. 2). Understanding how these dynamics have changed, their implications for communication efficiency during a project's life cycle, and their impact on project teams' communication, is crucial for allowing organisations to take full advantage of the benefits of using remote project teams.

Within this paper, it will first describe the background to the research areas of communication, the COVID-19 pandemic and project teams physical and virtual communication. The methodology describes the process for the systematic literature review, and this is followed by the literature review, investigating COVID-19 and its impact on communication, including the impact on physical and virtual communication in organisations and remote project teams. The last section concludes the paper, providing context and further avenues for research.

Background

Communication is defined as the transfer of information between stakeholders within projects (Čulo and Skendrović, 2010; Barrett, 2013; Zulch, 2014) and has been identified as one of the main factors impacting a project's success or failure (Müller, 2003, p. 345). Inadequate communication is a significant risk on many projects that can lead to misunderstandings, miscommunication, and ambiguity, regardless of the project teams being remote or co-located (Reed and Knight, 2010, p. 423).

During a project life cycle, effective communication is essential to ensure the stakeholders needs, issues, problems and suggestions are clearly communicated and understood, thereby reducing the likelihood of confrontations (Toor and Ogunlana, 2008, p. 427). If communication lapses within remote teams, this can result in increased cost and delays as the focus of the team will be on communication problems and not project tasks (Toor and Ogunlana, 2008, p. 427).

Empirical evidence has identified that projects have been delayed and or cancelled due to communication breakdowns, this detrimental impact has been linked to project delays, cancellations, and rework within remote teams (Hsu *et al.*, 2012, p. 329). The impact of these disruptions can increase projects costs and timelines, highlighting the critical need for effective communication strategies to reduce and mitigate these challenges.

The COVID-19 pandemic

The COVID-19 pandemic emerged during 2019 and had a severe impact on various economic and organisational activities worldwide. The first UK lockdown was announced by the UK government on 23rd March 2020 to reduce the spread of the virus and, protect vulnerable people and keyworkers (Government Digital Service, 2022). The lockdown announcement by the UK government started the implementation of social distancing. This restriction reduced the amount of face-to-face communication and organisations were forced to shift the hitherto face-to-face communication toward digital communication and remote working (Scharf *et al.*, 2023, p. 1). This shift has evolved the communication dynamics of remote project teams throughout the project life cycle. The COVID-19 restrictions started to

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be lifted as the UK government changed its strategy on 24th February 2022 to 'living with COVID' (Government Digital Service, 2022).

Project communication

Barrett (2013) has defined communication as the transmission of meaning between stakeholders, the meaning is to create a common understanding, and the transmission can be verbally or non-verbally. The research performed by Fatimayin (2018) also suggests that communication should mean to share a common understanding between stakeholders, this also includes a feedback loop that distinguishes it from just information into a communication process.

Čulo and Skendrović (2010) identify that communication has to cover the effective exchange and understanding of information between stakeholders, yet it should also be clear and timely. The selected communication medium will have an impact on the communication being clear and timely. The definition of communication is to share a common understanding between stakeholders in a timely manner, where the common understanding is from an information exchange through a selected communication medium. A communication model has been developed by (Čulo and Skendrović, 2010, p. 229) shown in Figure 1

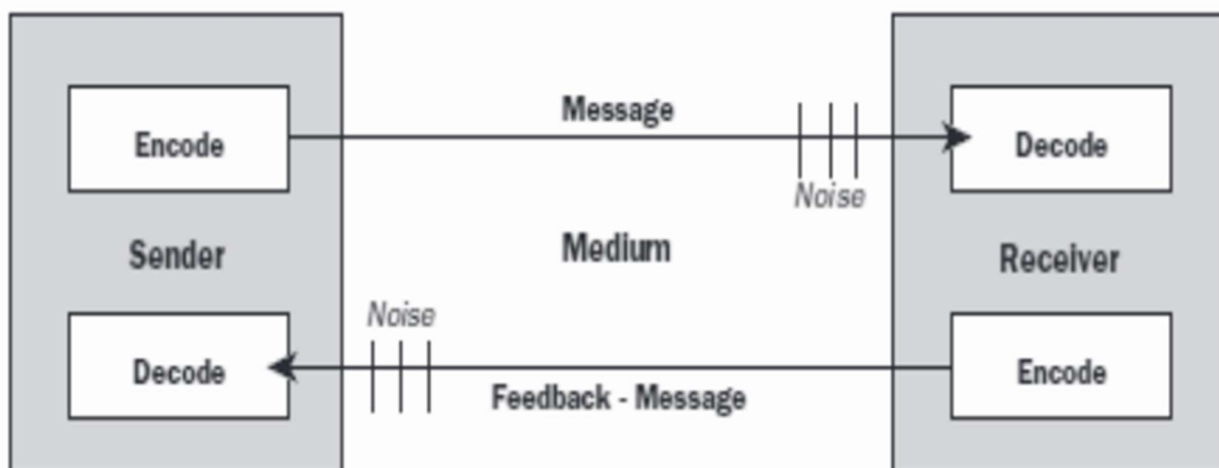


Figure 1: Basic communications model (Čulo and Skendrović, 2010, p. 229)

Project communication is defined as a process of gathering all relevant information, interpreting the information and effectively disseminating it (Zulch, 2014, p. 1001). In order for projects to be successful, effective communication of information is required, this also helps to build project team collaboration (Shukor *et al.*, 2021, p. 4380; Subramaniam *et al.*, 2021, p. 7; Anglani *et al.*, 2023, p. 1). Prahinski and Benton, (2004) suggest that collaborative communication positively influences team members' relationships. The collaborative communication between team members comprises an influence strategy, setting a formality level for communication and necessary feedback between team members. These communication elements are needed to ensure successful communication of information.

Research has demonstrated that effective communication extends beyond merely transferring information, and includes the transmission of meaning between stakeholders (Barrett, 2013; Fatimayin, 2018), with the meaning being the shared understanding of the information transferred. This is often facilitated by a feedback loop that supports a dynamic

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communication process (Fatimayin, 2018, p. 4). Physical and virtual communication mediums are both used to transfer information, this dynamic has changed in recent years due to technological advancement and the impact of COVID-19. The selection of the communication medium will determine the clarity and timeliness of the meaning being transferred. Particularly in virtual environments where using virtual technologies will increase the speed of communication and lower its cost compared to face-to-face communication and interactions (Enberg, 2012, p. 773).

Physical communication in project teams

Physical communication in research has been considered to be a traditional medium of communication that includes face-to-face, telephone, and written communication (Montoya *et al.*, 2009, p. 142), this has also been identified in other research as comprising of verbal, personal and written communication (Müller, 2003, p. 350; Froehle and Roth, 2004, p. 5). These are communication mediums that either transfer information physically or use a personal interaction. Müller (2003, p. 350) goes further to identify different physical communication media's that included: Face-to-face, written status reports, verbal status updates and written and verbal analysis. This suggests there is a physical interaction of stakeholders during communication.

Physical communication is a form of communication that requires a physical presence where project team members mingle, share and empathise challenges and to build mutual rapport (Lee-Kelley and Sankey, 2008, p. 57). Without physical presence in communication, this will lead to a lack of physical cues causing possible conflict from ambiguity and misunderstandings (Lee-Kelley and Sankey, 2008, p. 55) and be a cause of stability issues (Lee-Kelley, 2006, p. 236) within a project team.

Physical presence increases project teams face-to-face communication frequency, communication duration, and communication content (Khazanchi *et al.*, 2018, p. 595) and is considered the most common method of transferring knowledge (Reed and Knight, 2010, p. 426) as this type of communication is considered to be a more powerful communication type than other mediums (Cooper and Sommer, 2016, p. 516).

There is a suggestion that the propinquity effect of increasing physical proximity increases the chance encounters of in-person and frequency of face-to-face interactions (Khazanchi *et al.*, 2018, p. 595). Consequently, due to physical proximity face-to-face communication requires little effort to initiate in co-located teams (Song *et al.*, 2007, p. 56). Frequent face-to-face and in-person communication help to resolve functional conflicts and differences due to reducing the uncertainty and ambiguity (Khazanchi *et al.*, 2018, p. 596).

Face-to-face communication displays rich personalisation, high in interactivity and social presence (Lee, 2009; Montoya *et al.*, 2009), this is also highlighted by (Müller, 2003; Froehle and Roth, 2004; Prahinski and Benton, 2004) that face-to-face communication is a rich medium for communication. This rich personalisation of communication includes body language and tone of voice (Daim *et al.*, 2012; Verburg, Bosch-Sijtsema and Vartiainen, 2013), Daim *et al.* goes on to suggest that Face-to-face interaction is often the most effective precursor to establishing good communication (Daim *et al.*, 2012, p. 204). With the recipient of the message receiving body language and tone of voice information, this can lead for less uncertainty and ambiguity in the information being received. Less uncertainty and ambiguity between project team members will increase the effectiveness of project communication.

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Virtual communication in project teams

Virtual communication within the literature has been described as the technology-oriented approach to communication (Verburg, Bosch-Sijtsema and Vartiainen, 2013, p. 69). With technology-oriented defined as the frequency and the quality of electronically mediated communication (Verburg, Bosch-Sijtsema and Vartiainen, 2013, p. 69). The technology-oriented communication methods have been identified as including telephone, e-mail, groupware, web-based chat rooms, Web conferencing, instant messaging, texting, electronic bulletin boards, document sharing sites, blogs, wikis, social networks internet, video conference, audio bridges, and computer-assisted decision-aiding technologies (Reed and Knight, 2010; Song and Song, 2010; Daim *et al.*, 2012; Tang, Mu and Thomas, 2015; Henderson, Stackman and Lindekilde, 2016; Ilk, Shang and Goes, 2020). These create a rich communication environment for remote project teams.

These are not limited to remote project teams as virtual communication mediums are also used by co-located teams, giving team members the ability to communicate with each other by sending e-mails, instant messages or using other tools (Verburg, Bosch-Sijtsema and Vartiainen, 2013, p. 69). This suggests that using a virtual communication medium is not only used by remote teams but also be a useful tool for project team members in the same office or building.

Virtual communication can provide a rich communication environment for team members that are remote using such mediums as web conferencing, instant messaging and document sharing sites (Reed and Knight, 2010, p. 424). The virtual mediums that include Internet-based synchronous messaging and conversation programs (Song and Song, 2010, p. 385) can act as spontaneous communication where it is not possible to have face-to-face communication, and this results in greater project team collaboration.

Virtual communication is a medium for transferring a message between a 'sender' and a 'receiver' and equally used as mediums for feedback between both parties. However, the mediums that have been selected to transmit information will introduce different types of 'noise' into the message and this can impact on what is being received. While some of the virtual communication mediums are spontaneous, others are not and this can impact on the feedback from the receiver of the message, causing challenges in understanding if the message has been transferred successfully.

There are communication media's that cross the boundaries of physical and virtual communication as it uses both 'physical' and 'virtual', this includes physical documents with diagrams and drawings (Papadonikolaki, van Oel and Kagioglou, 2019, p. 381), this would also include physical documents sent via electronic form, such as email.

Research methodology

The systematic approach to a literature review is facilitated by keywords that were searched in the databases selected, and defined are the reasons of selecting/excluding keywords. The approached used in this paper is shown in Figure 2. There are five stages for the systematic literature review, with each stage setup to either identify, refine, select, or synthesise the research in the papers selected.

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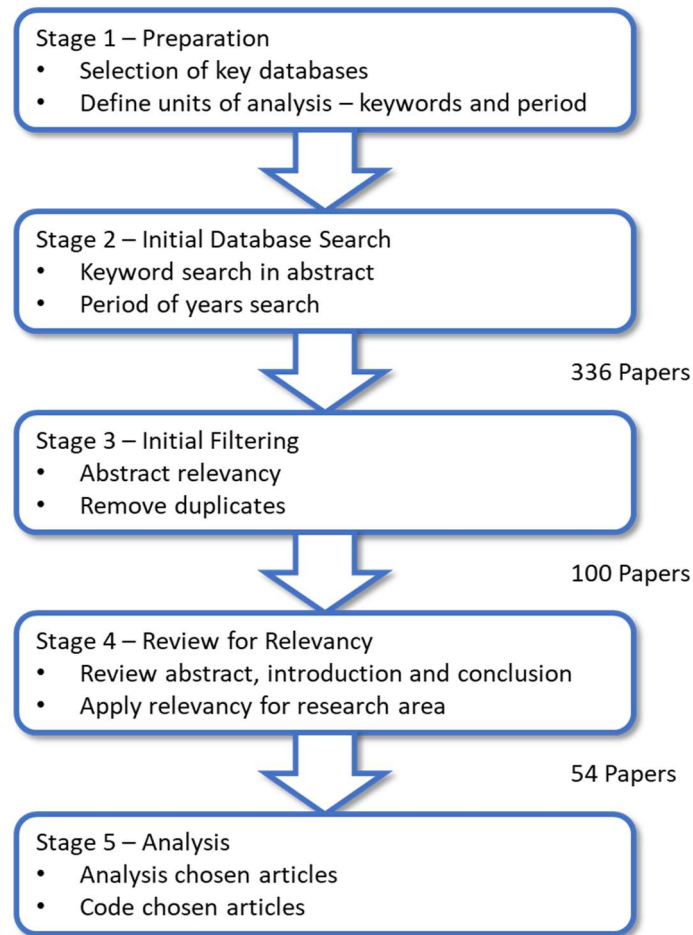


Figure 2: Systematic Literature review process flowchart

The research was framed around a ‘Review into the changes in the barriers and challenges of communication in remote project teams due to the COVID-19 pandemic’. The first stage was to select databases that would hold a comprehensive selection of papers related to the research area, allowing for a focused and rigorous systematic literature review. The second stage was to scope the framing of the questions, with the recent changes in virtual communication, the period from March 2004 – March 2024 years was chosen. Twenty years of literature was chosen to allow for a review into literature that identified changes in communication mediums and to gain literature that covered the period prior to, throughout and subsequent to the COVID-19 pandemic.

Keywords were developed from the initial physical and virtual keywords; this included a keyword developed from a focused literature review and refinement from current literature. A specific keyword search was performed in paper abstracts and keywords, the keyword phrasing used is shown in Table 1. Communication ‘AND’ Project was used to maximize the collection of papers with the theme within the field of interest. The third stage filtered the papers identified in the keyword search, a review of the abstracts for relevancy and removing duplicates of papers. Stage four, the papers abstracts, introductions, and results were reviewed and ranked as either ‘relevant’ and ‘not relevant’. Relevant papers were considered to include key information in this research area. Stage 5, the papers were analysed and coded according to the keywords and the results synthesised. The description of criteria used in each stage has been specified in Table 1.

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Table 1: Process of the systematic approach to the literature review

Stage	Description
Stage 1	The selected databases for this literature review were the Gale Literature, Pro Quest Platform, Science Direct, Web of Science and Wiley Online Library.
Stage 2	Keyword searches performed in selected databases during the period of 2004 – 2024: ‘Communication’ AND Project AND’ (‘Physical’ OR ‘Person’ OR ‘Visible’ OR ‘Digital’ OR ‘Electronic’ OR ‘Direct’ OR ‘COVID’ OR ‘Pandemic’ OR ‘Environmental’). During this stage, 336 papers were identified from the keyword search.
Stage 3	The papers were filtered before downloading by a review of the abstracts for relevancy to the research subject and duplicates were removed. During this stage, 100 papers were filtered for downloading.
Stage 4	The papers abstracts, introduction and conclusions were reviewed against the relevancy for this research and classified as ‘relevant’ and ‘not relevant’. Relevant papers were considered to have abstracts that had clear indication that the subject addressed communication and different mediums used in projects. This narrowed down the papers and removed ‘not relevant’ papers from the systematic literature review. During this stage 46 papers were removed as either not relevant to the research field subject or was a duplicate.
Stage 5	The relevant papers were analysed and coded according to the relevance of information to the keywords and the results synthesised. The results are presented later in this review.

Preliminary findings

Methodological Approach Taken in the Literature

The methodological approaches taken from the literature review for the data collection of the 54 papers was reviewed. The distribution of the qualitative and quantitative research approaches is shown in Figure 3.

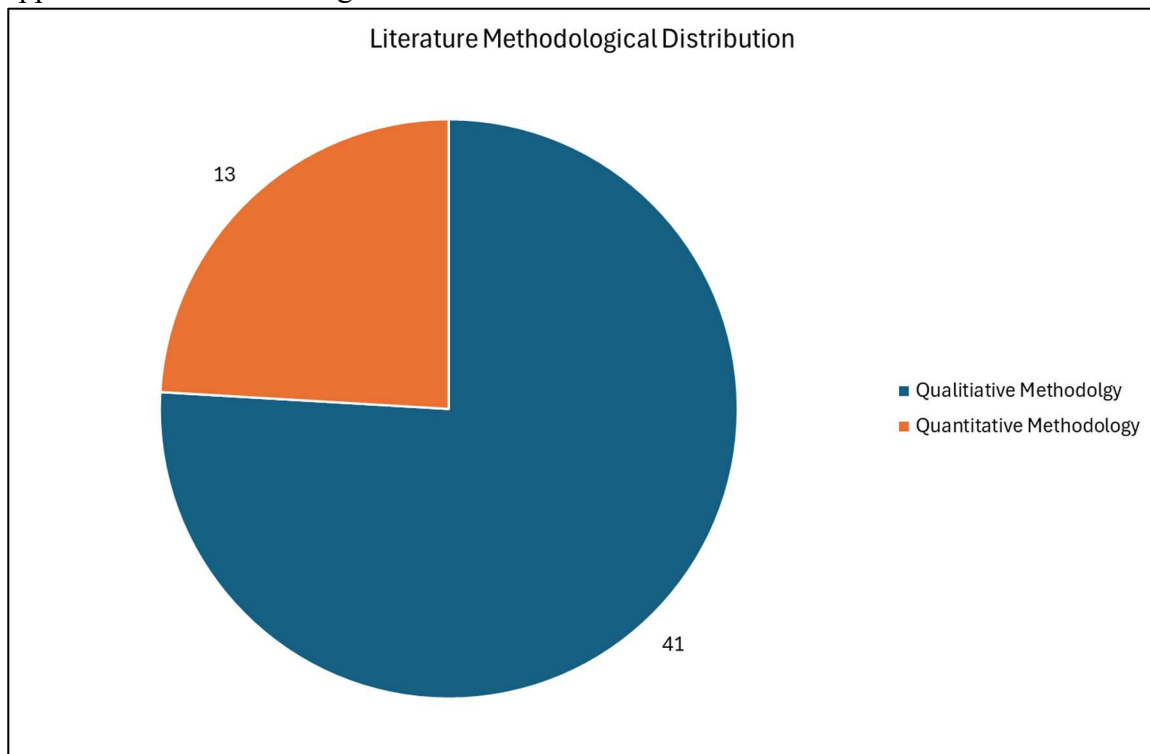


Figure 3: Reviewed Literature Methodological Distribution

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The breakdown of methodologies shows that a qualitative approach to data collection in the papers was preferred at 76% and quantitative approach was the remaining 24%. With a high distribution of qualitative research performed, it has helped the researchers to understand the ‘why’ behind the research phenomenon’s that were being analysed and help develop a richness and depth of understanding in the literature.

Distribution of papers

The quantity of papers identified by the keyword search was 336, after filtering, 54 papers were deemed relevant by the filtering for literature on the changes in the barriers and challenges of communication in remote project teams in the five databases. Shown in Figure 4, the science direct database (20 papers) was the highest contributor to this research review. The Gale Literature database had the lowest contribution of 3 papers.

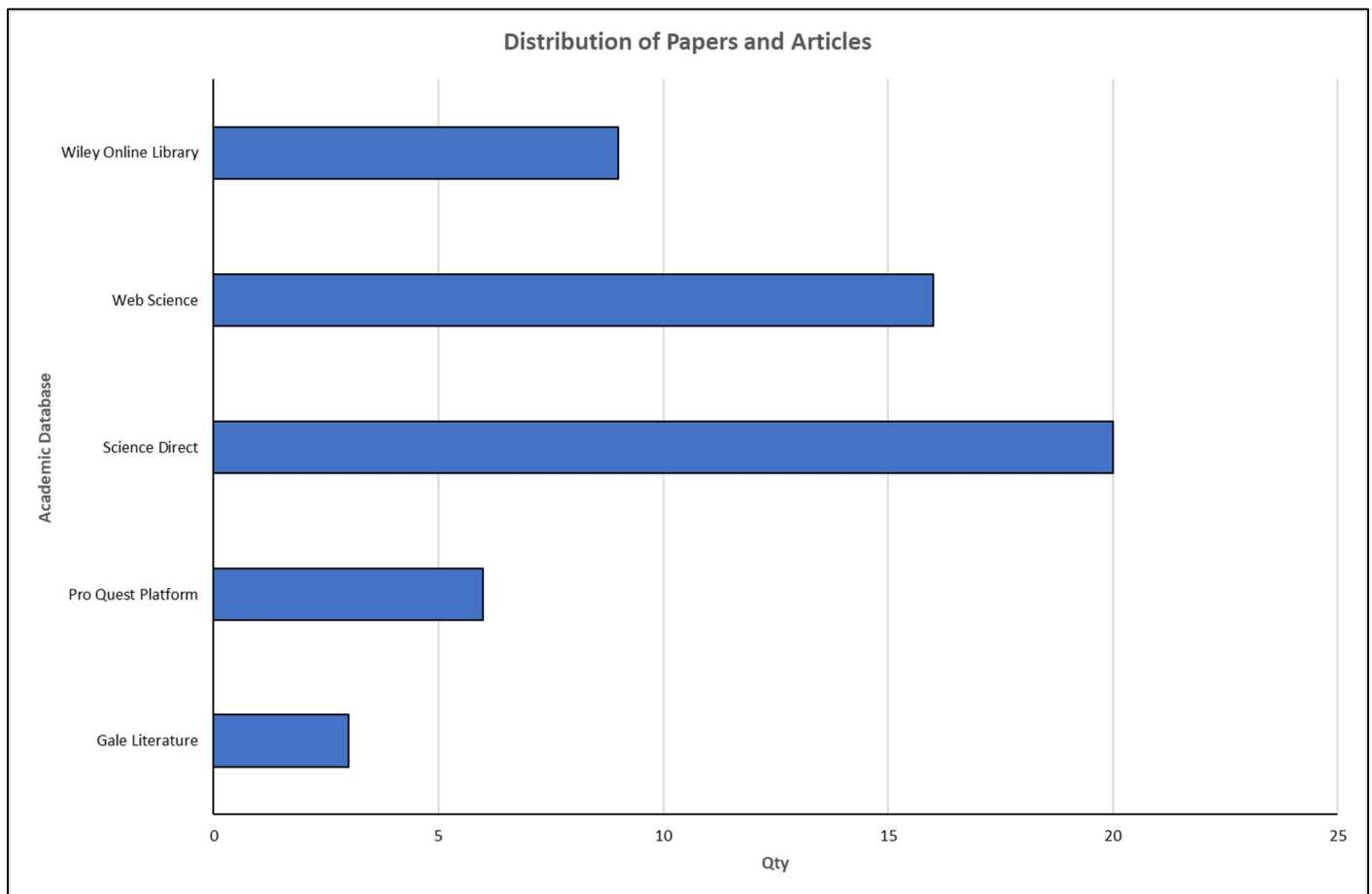


Figure 4: Distribution of Papers

In Figure 5 the distribution of papers over the period of years shows an increase in scholarly research in the field of communication, with the highest number of papers per year published post the COVID-19 pandemic. While the paper distribution is increasing during the chosen period, the databases have a good coverage apart from 2005, at least one paper each year. The six papers from Pro Quest Platform are mainly distributed during and post COVID-19 and Gale Literature having no papers during and post. Web Science and Pro Quest database have the largest quantity of papers during and post the pandemic.

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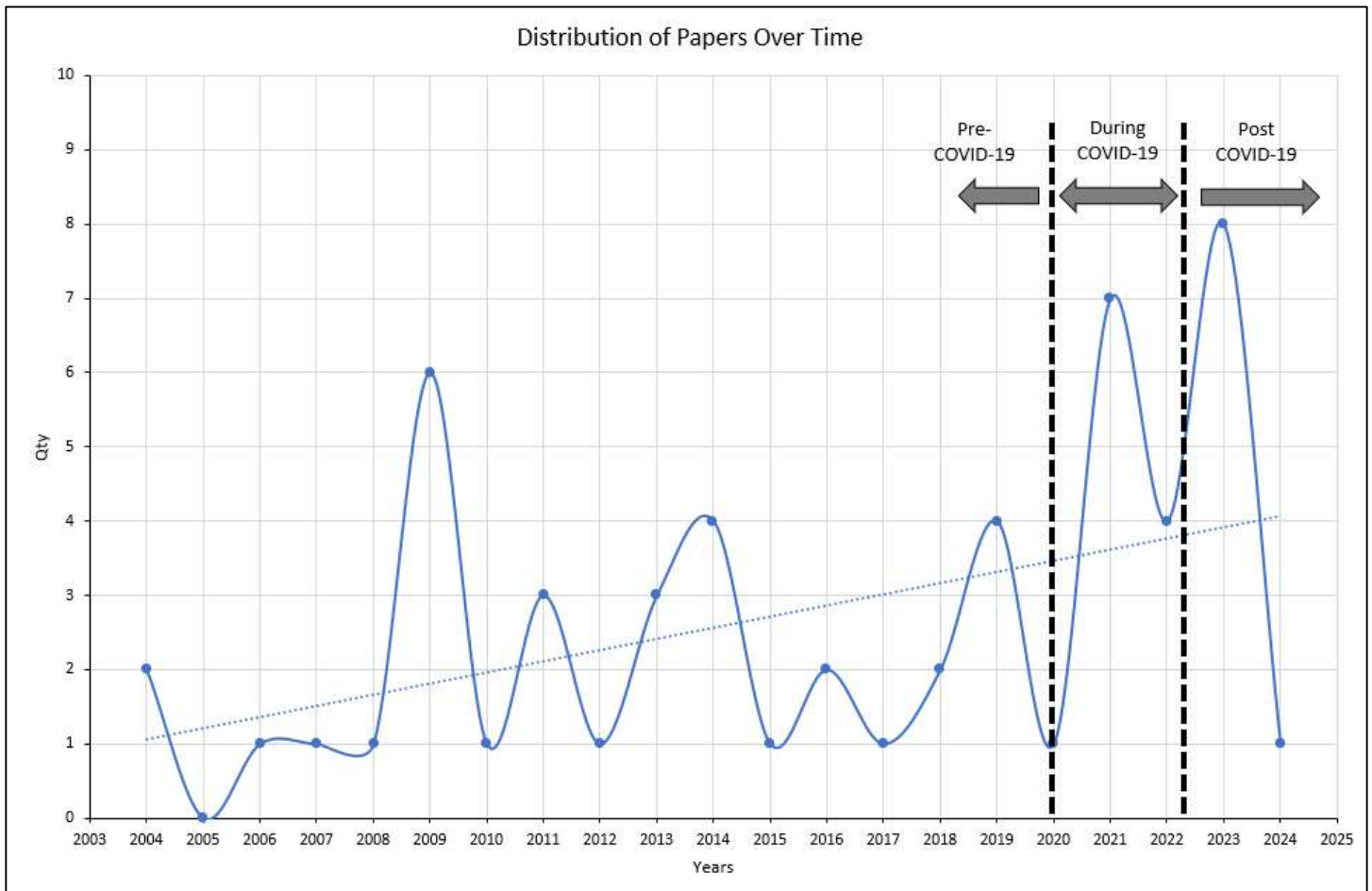


Figure 5: Paper Distribution Over Time

The 53 papers that were selected during the systematic literature review were reviewed and coded. This was realised according to the relevance of information to the keywords used to perform the systematic literature review and any keyword identified from themes reviewed in the literature and relevance to the research subject. This meant that each paper was aimed to be coded to at least one keyword but could be coded too more.

The Codes identified from themes in the literature relevant to this research included 'Communication', 'COVID', 'Digital', 'Face-to-Face', 'Project Lifecycle', 'Physical', and 'Virtual'.

The Physical and Virtual Codes content includes the Codes of 'Constraining' and 'Benefit'. Understanding the codes relationship can be measured as either constraining or a benefit is important to understand the barriers and challenges to using the communication medium.

COVID-19 impact on communication from literature review

The enforcement of lockdowns and social distancing during the COVID-19 pandemic caused limitations on face-to-face communications in organisations (Subramaniam *et al.*, 2021, p. 2; Swart, Bond-Barnard and Chugh, 2022, p. 60). This change from physical interactions to mainly digital and virtual interactions forced organisations to undertake a significant transformation process (Afridi *et al.*, 2023, p. 1; Anglani *et al.*, 2023, p. 4; Scharf *et al.*, 2023,

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p. 432). The transformation process had undoubtedly added to the barriers and challenges that already exist in establishing reliable communication among team members.(Subramaniam *et al.*, 2022, p. 3)

The aim of this transformation by organisations was to compensate for the social distancing and lockdowns (Kordova and Hirschprung, 2023, p. 2) and overcome the difficulties these imposed on the operation of the organisations. This has forced adoption of potentially new communication technologies (Kordova and Hirschprung, 2023, p. 2) for organisations that have not relied on them in the past. This had a benefit for organisations as using these technologies to develop remote project teams from workers around the world, with the increased use of platforms to replace face-to-face meetings. These technologies include Zoom, WhatsApp, Microsoft Project Online, Microsoft Teams, Google Meeting, Skype, Slack (Salamin, Khlefat and Qusef, 2021, p. 202; Anglani *et al.*, 2023, p. 4; Kordova and Hirschprung, 2023, p. 2), virtual meetings, digital conference, digital work offices (Afridi *et al.*, 2023, p. 1; Scharf *et al.*, 2023, p. 432).

Changes in physical communication

With the environmental pressures of the COVID-19 pandemic causing the requirement of always ensuring social distancing, this had an impact of mandating a major reduction in project teams physical and face-to-face communication discussions, group meetings, and crowding in common areas (Subramaniam *et al.*, 2021, p. 2). This change in communication to digital resulted in project teams being cut off from physical interactions, including nonverbal cues (Anglani *et al.*, 2023, p. 4), ambiguity, uncertainty, and the personality factor (Subramaniam *et al.*, 2021, p. 8) that are present in face-to-face communication and important to project team communication. With this reduction in physical interactions project teams face the challenge of working in a highly digitalised environment (Anglani *et al.*, 2023, p. 5) causing miscommunication due to the uncertainty caused in the change in communication processes (Subramaniam *et al.*, 2022, p. 4).

With the rapid change in communication practices, it is critical to understand how the current environment has changed communication (Subramaniam *et al.*, 2021, p. 2). Without this evolution, organisations relying on previous project communication standards and processes will lead to uncertainty, resulting in waste and rework (Subramaniam *et al.*, 2021, p. 7). As organisations communication standards and processes change in remote project teams, organisations may have to train their employees accordingly, as part of the increase in barriers and challenges can be overcome by upskilling employees (Anglani *et al.*, 2023, p. 4) to use the technology and updated processes to communicate more effectively in remote project teams.

During a project's lifecycle, good communication during all phases is an important success factor (El-Saboni, Aouad and Sabouni, 2009, p. 130). Different expectations in communication styles are expected during a project lifecycle; for example, during the planning phase of a project, communication would be more exploratory, whereas during the implementation phase, communication on tasks would be more exploitative (Tang, Mu and Thomas, 2015, p. 418). During the exploratory phase of a project lifecycle, it is suggested that face-to-face activities, to facilitate training sessions and problem-solving activities, are more appropriate (Tang, Mu and Thomas, 2015, p. 419). The restrictions of social distancing will have a high impact on this phase of a project's lifecycle. None of the literature during

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and post COVID-19 reviewed the change in communication practices on the phases of a project's lifecycle.

Changes in virtual communication

Where organisations are facing the environmental pressures from the COVID-19 pandemic and to allow for continuous operation of projects and services, they will be required to develop technological strategies to come up with new ways of managing communication between colleagues, team members and supervisors (Subramaniam *et al.*, 2022, p. 4; Scharf *et al.*, 2023, p. 432). They will be required to get around the technical problems with using these new strategies for communicating. These strategies include organisations acquiring digital tools and training employees accordingly, this is not just for remote project teams but a move for the whole organisation to be online (Afridi *et al.*, 2023, p. 3; Anglani *et al.*, 2023, p. 4).

This will be a potential benefit to some parts of the organisation that regularly used digital technologies before COVID-19, including streaming, video conferencing, cloud computing and data analysis (Anglani *et al.*, 2023, p. 4) as more parts of the organisation and external stakeholders are now forced to use similar technologies. Literature has further more suggested that the transformation towards digital communication is not just internal to organisations but that it also includes external stakeholders such as vendors, distributors, clients etc (Anglani *et al.*, 2023, p. 6). Not only will external stakeholders be undergoing a transformation process on internal communication but also communication challenges and barriers between external stakeholders will need to be considered.

Departments within organisations that are required to adapt to working with the digital technologies, that previously were not used, will see these digital technologies as a barrier to communication. To help overcome some of the initial barriers, organisations have encouraged and implemented practises that included inclusion and validity to remote project teams using online communication (Kordova and Hirschprung, 2023, p. 2). This encouraged the use of digital technologies with remote project teams, helping to compensate for the initial adaption from the limitations to face-to-face communication with social distancing. The digital technology being adopted also needed to be user-friendly, effective, efficient, and secure (Anglani *et al.*, 2023, p. 6).

While the use of digital technologies and online communication was encouraged, it has had an impact on team members using communication technologies and support from management, the In-Person touch has been lost (Afridi *et al.*, 2023, p. 2). The loss of the In-Person touch will cause challenges and barriers to remote project teams communication, including uncertainty and miscommunication.

With the move to digital technologies, organisations also compensated to reduce the barriers and challenges by using digital technologies that could partially replicate face-to-face communication. These technologies provided audio and video streams, both online and later recorded offline (Kordova and Hirschprung, 2023, p. 2), using platforms such as Teams, Zoom or WhatsApp. These technologies helped to reduce some of the barriers and challenges from not being able to use face-to-face communication, but they are still limited. For example, audio and video help to communicate implicit knowledge, tone of voice, facial expression etc but it wouldn't be as effective as face-to-face communication.

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The benefits of using digital technologies to communicate allowed project team members to work remotely, for example, working from home (Scharf *et al.*, 2023, p. 436) and with team members from different locations, global teams (Anglani *et al.*, 2023, p. 6), bringing diversity to remote project teams with geographic dispersion of team members (Afridi *et al.*, 2023, p. 2). While the benefit of a more diverse remote project team and the ability for team members to work from home Scharf *et al.*, (2023, p. 432) comment that this is a benefit as it allows team members to flexibly adjust their work to suit ad hoc changes in their personal life.

However, it has also been argued that using only digital technologies, open up remote project teams to new demands and expectations of increased availability (Scharf *et al.*, 2023, p. 436). This creates a new barrier that without the forced adaption for only digital communications, remote project teams wouldn't have. For example, global project teams will likely have team members working in different time zones, for the project team members to work effectively together, some team members would be expected to work outside their standard working hours to communicate with members from different time zones.

Conclusion

The information from the literature review has identified that the environmental pressures from the COVID-19 pandemic and the enforcement of lockdowns and social distancing forced organisations to undertake a significant transformation process to using mainly digital technologies to communicate. While this has helped remote project teams and organisations to compensate for the environmental pressures it undoubtedly added to the barriers and challenges that already existed in remote project teams' communication.

The adoption of working mainly with digital technologies was reviewed in the literature by highlighting the importance of organisations changing their communication standards and processes to suit the new communication practices of project team. Also highlighted was the need to upskill team members to using the digital technology, without this communication will lead to uncertainty resulting in wastes and rework. There was limited research on the barriers and challenges to this adoption, what had changed in project team communication, how, and if remote project teams are communicating differently post COVID-19.

The transformation to communicating with mainly digital technologies has the opportunity of different sections of an organisation using similar communication technologies to communicate. However, this can also be a barrier between organisational sections and project teams as they adopt to the changing communication practices, instead on the practices they were previously reliant on. To help reduce this barrier, the digital technology being adopted needs to be user-friendly, effective, and efficient. With external stakeholders going through a similar transformation process, this can increase the barriers to communication between stakeholders, as they adopt to the changing of their communication practices

The literature showed different techniques and practices that remote project teams and organisations had used to reduce the barriers and challenges from transforming to digital communication. For example, using technology that attempts to replicate implicit knowledge transfer that was lost due to the restriction in face-to-face communication, however, this still has its limitations. There was scarce research on the impact of miscommunication and uncertainty on remote project teams from the changes in barriers and challenges produced by the adoption to digital technologies. This was similar when investigating research on how the

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implications of the environmental pressures from the COVID-19 pandemic impacted on project team's communication practices during the different phases of a project's lifecycle. For example, the barriers and challenges will change depending on the exploratory phase or implementation phase, as different communication styles will be dominant.

Limitations and further research

While the systematic literature review investigated research on COVID-19 and its impact to remote project teams' communication in the timeframe set out from 2004 to 2024, there was only a small amount of research post COVID-19. With the UK government starting to lift the restrictions during February 2022, this timeframe allows for only two years of potential research post COVID-19. The limitation of this was that most of the research investigated focused on the transformation process of organisations and remote project teams and the challenges to the adoption to only digital technologies. The understanding of its impact to the challenges and barriers to remote project teams' communication practices and how this can impact on communication uncertainty and miscommunication was limited.

Over the investigation of twenty years of research, there was limited research on communication barriers and challenges during a project lifecycle and the different types of communication required during a project's lifecycle phases. Post COVID-19, there was no research on how these changes to digital communication technologies have impacted the barriers and challenges to communication in the different phases of a project's lifecycle. The questions arise: has the changes in project team communication impacted on the challenges and barriers to project communication and how does this relate to the different phases of a project's lifecycle.

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