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Digital Communication Challenges in agile teams: a proposed Framework

Desafios da Comunicação Digital em equipes ágeis: uma proposta de Framework

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Abstract

The study examines the impact of digital communication on remote or hybrid agile teams, identifying challenges and opportunities associated with replacing face-to-face communication with digital interaction. It proposes practical solutions to enhance collaboration. Using a qualitative approach, we conducted 15 semi-structured interviews with IT professionals. The data were automatically transcribed using Transkriptor software and subsequently analyzed through Bardin's content analysis methodology, supported by Atlas.ti (version 24) for thematic coding and pattern identification. The results indicate a preference for hybrid models and demonstrate good overall adaptability, but highlight seven key challenges: criticality assessment, alignment, availability, dehumanization, improvisation, technological limitations, and managerial challenges. The research contributes academically by exploring concepts such as "digital concealment" and the importance of a "culture of availability," while also proposing a Digital Communication Challenge Framework (DCCF) to address these challenges, thereby improving management and collaboration.

Keywords: digital communication, agile teams, remote work, hybrid work, flexible work arrangements, virtual collaboration

Notas dos Autores

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Resumo

O estudo analisa o impacto da comunicação digital em equipes ágeis remotas ou híbridas, identificando desafios e oportunidades ao substituir a comunicação presencial pela digital. Propõe soluções práticas para melhorar a colaboração. Utilizando uma abordagem qualitativa, foram realizadas 15 entrevistas semiestruturadas com profissionais de TI, cujos dados foram transcritos automaticamente pelo software Transkriptor e analisados por meio de análise de conteúdo baseada em Bardin, com apoio do software Atlas.ti (versão 24) para codificação temática e identificação de padrões. Os resultados apontam preferência por modelos híbridos e boa adaptação, mas destacam sete desafios: avaliação de criticidade, alinhamentos, disponibilidade, desumanização, improvisação, limitações tecnológicas e desafios gerenciais. A pesquisa contribui academicamente ao explorar "ocultação digital" e a importância de uma "cultura de disponibilidade", além de propor o *Digital Communication Challenge Framework* (DCCF) para enfrentar esses desafios, melhorando gestão e colaboração.

Palavras-chave: comunicação digital, equipes ágeis, trabalho remoto, trabalho híbrido, arranjos de trabalho flexíveis, colaboração virtual

1 Introduction

The adoption of agile methodologies has revolutionized task execution, employee motivation, and organizational processes (Cucolaÿ and Russo, 2023; Chakravarty and Singh, 2024). The COVID-19 pandemic accelerated their use, as agile practices adapted effectively to remote work and rapid changes during the health crisis (Schmidtner et al., 2021). This shift coincided with the rise of flexible work arrangements (FWAs), encompassing various combinations of geographical and temporal work distributions (Smite et al., 2023). Research highlights that 98% of workers prefer remote or hybrid models, with 41% adopting hybrid work in 2023 (Remote Work Statistics, 2023). FWAs have gained prominence due to cost reduction, IT talent retention, and increased geographical flexibility in hiring (Charalampous et al., 2022; Claro et al., 2021).

Studies indicate that agile teams adapted efficiently to FWAs without productivity loss and improved employee retention (Bezerra et al., 2021; Matos and Franca, 2022; Waldrep et al., 2024; Bloom et al., 2024). However, challenges emerged, including cultural integration difficulties, reduced social interactions, sedentary lifestyles, and the need for employee discipline and

proactivity (Bezerra et al., 2021; Schmidtner et al., 2021). These issues highlight the need for ongoing research on the effects of agile methods in FWAs (Ozkan et al., 2022).

Managing agile teams in virtual environments presents obstacles to maintaining motivation, engagement, and collaboration (Bao et al., 2022; Claro et al., 2021). The adaptation of agile practices has impacted communication, relationships, trust, knowledge sharing, and psychological safety (Riva et al., 2021; Rizmaldi and Jayadi, 2022; Santos and Ralph, 2022). Effective communication and the frequency of interruptions also significantly impact remote agile team performance (Levy et al., 2024).

Digital communication in FWAs poses significant challenges for agile teams, particularly due to the limitations in interpersonal communication, which is central to agile methodologies (Beck et al., 2001; Wang et al., 2023; Chakravarty and Singh, 2024). Key challenges include:

- Reduction in Non-Verbal Language: Digital tools limit body language and facial expressions, critical for understanding emotions, leading to misunderstandings and conflicts (Ågren et al., 2022; Charalampous et al., 2022; Knapp and Hall, 2013).
- Heterogeneity in Hybrid Meetings: In hybrid settings, differences in participant experiences can reduce focus, engagement, and collaboration (Ågren et al., 2022).
- Loss of Informal Communication: FWAs reduce casual interactions, impacting cross-team collaboration and knowledge sharing (Ågren et al., 2022; Sani et al., 2022; Sporsem and Moe, 2022).
- Increased Asynchronous Communication: Tools like email and chat can distract team members and reduce productivity (Charalampous et al., 2022; Claro et al., 2021; Tanner and Naidoo, 2021).
- Lack of Meeting Spontaneity: Digital meetings often inhibit spontaneous interactions, reducing collaboration quality (Matos and Franca, 2022).
- Loss of Uniqueness in Meetings: Repetitive video conferencing formats can diminish attention and engagement (Riva et al., 2021).
- Home Environment Distractions: Non-dedicated workspaces at home can lead to distractions and information loss (Salamin et al., 2021).

- Burnout from Videoconferences: Overusing digital tools, particularly video calls, can lead to fatigue and psychological strain (Griffin, 2021; Riva et al., 2021).

Although remote work has proven effective in agile projects (Cucolaÿ and Russo, 2023; Ågren et al., 2022; Marek et al., 2021), these challenges must be addressed to prevent adverse impacts on outcomes (Claro et al., 2021; Miller et al., 2021; Oliveira et al., 2020; Rizmaldi and Jayadi, 2022; Tanner and Naidoo, 2021).

This study addresses the question: *"How does digital communication influence the dynamics of agile teams in remote or hybrid regimes?"* It proposes a framework to analyze these impacts and suggests managerial actions to mitigate challenges and enhance team effectiveness.

2 Theoretical background

2.1 Agile methods and the Scrum framework

Agile methods are flexible, collaborative software development approaches prioritizing incremental value delivery and adaptability to changing customer needs and market conditions (Beck et al., 2001). Unlike traditional methodologies like the waterfall model, which follow rigid, linear processes with formalized communication, agile methods emphasize continuous stakeholder interaction, iterative development, and frequent delivery of functionality (Schwaber, 1997; Chakravarty and Singh, 2024). Traditional methods often struggle with unpredictability in requirements and environment changes, contributing to lower project success rates (Suganya and Sahaya, 2010). The Agile Manifesto (Beck et al., 2001) outlines four core values:

- Individuals and interactions over processes and tools.
- Working software over comprehensive documentation.
- Customer collaboration over contract negotiation.
- Responding to change over following a plan.

Scrum, a widely used agile framework, organizes work into short sprint cycles (typically 2–4 weeks), delivering value incrementally while fostering team collaboration and adaptability

(Schwaber, 1997). Scrum emphasizes self-organization, transparency, and continuous improvement through retrospectives. It is prevalent in approximately 63% of agile projects (Digital.ai., 2023; Chakravarty and Singh, 2024). Key roles in Scrum include:

- Product Owner: Manages the product backlog and ensures stakeholder needs are met.
- Scrum Master: Facilitates adherence to Scrum principles and removes obstacles.
- Development Team: Self-managed group responsible for delivering sprint goals.

Scrum artifact include:

- Product Backlog: A prioritized list of features and tasks.
- Sprint Backlog: Selected items from the Product Backlog for a specific sprint.
- Increment: The potentially deliverable product resulting from the sprint (Sutherland and Schwaber, 2007).

This framework supports iterative, adaptive development, aligning with agile principles of flexibility and collaboration (Beck et al., 2001).

2.2 Flexible work arrangements

The evolution of work structures has introduced terms like FWA, "new ways of working", and "blended work" to describe the integration of face-to-face and remote work regimes without fixed time or place constraints (Allen et al., 2015). The concept of telework originated in the U.S. during the 1970s oil crisis. Jack Nilles coined it in 1973, aiming to reduce commuting and energy consumption by relocating work to workers' locations.

Today, FWA encompasses a spectrum of work arrangements, from fully co-located, synchronous teams to fully remote, asynchronous setups, with numerous intermediary combinations (Allen et al., 2015). While often used interchangeably with telework, FWA is a broader concept that includes geographic flexibility (remote work), temporal flexibility (working hours), and workload flexibility (Kumar et al., 2023).

Researchers have defined telework differently, complicating result comparisons. Morganson et al. (2010) categorized teleworkers based on location (home, satellite office, or field), while Mokhtarian (1991) described telecommuting as using telecommunications to replace or reduce physical commuting. Shockley and Allen (2007) defined FWA as alternative work options beyond traditional temporal and spatial limits. Due to its comprehensive scope, this study adopts the term FWA to encompass all remote.

2.3 Communication Models

Communication is a vast, multidisciplinary field, and many theorists and scholars have proposed various concepts over time. In Shannon and Weaver's classic model, communication is described as a linear process involving a sender, a message, a channel, a receiver, and the potential presence of noise that can distort the message (Shannon and Weaver, 1948). In contrast, Schramm's Interpersonal Communication Model emphasizes exchanging information and meaning face-to-face, underscoring the importance of active listening, empathy, and feedback (Schramm, 1954; DeVito, 2019). Barnard introduced an organizational communication model focusing on communication dynamics, addressing information dissemination, decision-making, organizational culture, and conflict management (Barnard, 1938). As the world progresses into the digital age, Ball-Rokeach and DeFleur defined Computer-Mediated Communication as communication that occurs through computing devices and networks, encompassing tools such as email, instant messaging, online forums, social networks, and video conferencing (Ball-Rokeach and DeFleur, 1976). Dennis et al. (2008) then expanded on this concept with the introduction of Technology-Mediated Communication, which encompasses both synchronous and asynchronous forms of communication supported by various technologies, including mobile devices and other technological tools (Dennis et al., 2008).

This evolution culminates in the concept of digital communication, which Krotoski explains as the exchange of information that takes place through digital technology. This form of communication depends on the encoding and transmission of data in digital format, generally binary, and is facilitated by electronic devices like computers, mobile devices, digital networks, and the Internet (Proakis, 2008).

2.4 Digital communication

In FWAs, digital communication often replaces face-to-face interactions (Ågren et al., 2022; Sani et al., 2022; Sporsem and Moe, 2022). It involves exchanging information through computing devices and electronic networks, including emails, chats, video conferences, and social media. Characterized by the absence of physical contact, it enables synchronous or asynchronous communication, overcoming geographical barriers (Choudhury et al., 2023).

Digital communication has transformed human interactions by enabling real-time global collaboration, instant information sharing, and connectivity (Choudhury et al., 2023). Walther (1996) introduced the "absence effect", where nonverbal cues are compensated with textual strategies like emoticons and emojis (Cai, 2023). In organizations, it enhances internal communication, coordination, and productivity through tools like email, virtual meetings, and intranets (DeSanctis and Monge, 1998). However, its impact on agile teams in FWAs remains underexplored (Cucolaÿ and Russo, 2023; Ozkan et al., 2022).

This research defines digital communication as the transfer of information via digital technologies, encompassing both synchronous (e.g., video conferencing) and asynchronous (e.g., emails) forms (Simpson, 2002). It extends beyond computers to include mobile devices and other technologies (Proakis, 2008; Silard et al., 2022), integrating concepts of technology-mediated (Silard et al., 2022) and computer-mediated communication (Walther, 1996).

2.5 The state of the art on digital communication in agile teams working in FWA

There is relatively little research on the impacts of digital communication on agile teams operating in FWA (Cucolaÿ and Russo, 2023). Most of these studies emerged as a response to the isolation imposed by the COVID-19 pandemic (Cucolaÿ and Russo, 2023; Ozkan *et al.*, 2022). Table 1 and 2 present, respectively, the challenges and advantages identified in 20 studies conducted over the past five years. Table 1 lists 35 challenges pointed out by the authors, including negative effects of digital communication or situations that require managerial action.

Table 1

Digital Communication Challenges in FWA

Study	Finding	Reference
1	Communication has a positive effect on performance.	(Rizmaldi and Jayadi, 2022)
2	Reduction in nonverbal language and sensory resources in communication.	(Ågren *et al.*, 2022; Charalampous *et al.*, 2022; Deshpande *et al*., 2016; Matos and Franca, 2022)
3	Difficulty in managing information homogeneity in communication within hybrid teams.	(Ågren *et al.*, 2022; Deshpande *et al*., 2016)
4	Reduction in informal conversations and personal communication.	(Ågren *et al.*, 2022; Deshpande *et al*., 2016; Raišiene *et al.,* 2020; Sporsem and Moe, 2022)
5	Reduction in out-of-team conversations.	(Ågren *et al.*, 2022)
6	Increase in written (asynchronous) communication.	(Ågren *et al.*, 2022; Charalampous *et al.*, 2022; Claro *et al.*, 2021; Tanner and Naidoo, 2021)
7	Less observance of unwritten rules in communication.	(Ågren *et al.*, 2022)
8	Difficulty/reduction in knowledge sharing.	(Ågren *et al.*, 2022; Deshpande *et al*., 2016; Raišiene *et al.,* 2020)
9	Increase in the number of virtual meetings with the team and/or individually.	(Ågren *et al.*, 2022; Bezerra *et al.,* 2021; Claro *et al*, 2021; Miller *et al*., 2021; Salamin *et al.*, 2021)
10	Decrease in the number of virtual meetings	(Topp *et al*., 2022)
11	Hybrid meetings are less effective (difference in "communication bandwidth" among participants).	(Ågren *et al.*, 2022)
12	Difficulty in contacting colleagues.	(Bezerra *et al.*, 2021; Charalampous *et al.*, 2022; Marek *et al.*, 2021; Miller *et al.,* 2021; Raišiene *et al.,* 2020)
13	Longer meetings.	(Matos and Franca, 2022; Raišiene *et al*., 2020)
14	Lack of spontaneity in meetings.	(Matos and Franca, 2022)
15	Reduction or alteration of visual communication.	(Matos and Franca, 2022)
16	Improvisation in communication (use of unofficial tools).	(Santos and Ralph, 2022)
17	Reduction of less important meetings.	(Topp *et al*., 2022)
18	Reduction in social communication.	(Topp *et al*., 2022)
19	Increase in the number of digital channels used for communication.	(Bezerra *et al.*, 2021; Salamin *et al*, 2021)
20	Loss of uniqueness (video conference meetings all seem the same).	(Riva *et al.*, 2021)
21	Image and voice distortions in video conferences due to bandwidth/connectivity issues.	(Sani *et al.*, 2022; Riva *et al.*, 2021)
22	Seeing multiple images simultaneously on the screen can trigger a sense of danger (video conference).	(Riva *et al.*, 2021)
23	Looking at our own image makes it harder to control emotions (video conference).	(Riva *et al.*, 2021)
24	Turning off the camera in a video conference further reduces nonverbal cues.	(Riva *et al.*, 2021)
25	Lack of proximity can create understanding difficulties.	(Claro *et al.*, 2021)
26	Lack of focus in meetings (participants doing other things: eating, responding to emails, domestic noises, etc.).	(Sani *et al.*, 2022)
27	Parenting can affect clarity and focus on video conference communication.	(Salamin *et al.*, 2021)
28	Use of virtual communication tools can affect communication effectiveness, motivation, quality, responsibility, and team delivery time.	(Salamin, *et al.*, 2021)
29	Use of multiple communication tools can lead to information fragmentation.	(Tanner and Naidoo, 2021)
30	Difficulty maintaining communication with all stakeholders.	(Mendonça *et al*., 2020)
31	Difficulty in disseminating and obtaining work-related information from colleagues.	(Deshpande *et al*., 2016; Miller *et al*., 2021; Raišiene *et al.,* 2020)
32	The team focuses more on communication than work (needs to divide attention between work and intense communication).	(Raišiene *et al*., 2020)
33	Everyone must use the same means of communication in hybrid meetings.	(Lous *et al.*, 2017)
34	Difference in observation horizon between co-located and remote members (hybrid teams).	(Deshpande *et al*., 2016)
35	Intensive use of video conferences can lead to fatigue.	(Griffin, 2021; Riva *et al.*, 2021)

Source: created by the authors (2025).

Table 2 highlights 10 advantages, representing positive findings attributed to digital communication.

Table 2

Advantages of Digital Communication in FWA

Study	Finding	Reference
1	The use of presence indicators (digital tools) facilitates virtual communication.	(Tanner and Naidoo, 2021)
2	Increased focus—without the distractions of a co-located environment.	(Claro *et al.*, 2021)
3	Greater use of communication tools (video conferencing, chat, email).	(Bezerra *et al.*, 2021; Salamin *et al.*, 2021)
4	Virtual meetings are more focused and efficient.	(Claro *et al.,* 2021; Matos and Franca, 2022; Neumann *et al*., 2022; Topp *et al*., 2022)
5	Quick adaptation to the new mode of communication.	(Schmidtner *et al.* 2021)
6	Increased comfort/convenience in communication (due to being at home).	(Claro *et al.*, 2021)
7	Easier scheduling of meetings (using tools).	(Claro *et al.*, 2021)
8	Teams are satisfied with the communication adaptations.	(Bezerra *et al.*, 2021; Schmidtner *et al*., 2021)
9	Shorter meetings.	(Topp *et al.,* 2022)
10	Teams had to learn new communication tools.	(Matos and Franca, 2022)

Source: created by the authors (2025).

The analysis of 20 studies reveals contradictions between reported advantages and challenges. For instance, while five studies noted an increase in meetings under FWAs (Ågren et al., 2022; Bezerra et al., 2021; Claro et al., 2021; Miller et al., 2021; Salamin et al., 2021), Topp et al. (2022) reported the opposite. Similarly, challenges such as "reduction in non-verbal language" and "difficulty contacting colleagues" were highlighted in five studies, while "reduction in informal conversations" and "increased asynchronous communication" appeared in four. Conversely, four studies identified "more objective and efficient meetings" as an advantage;

however, Sani et al. (2022) reported issues with maintaining focus during meetings. Contradictions also exist regarding meeting durations, with some studies finding that meetings are longer (Matos and Franca, 2022; Raišiene et al., 2020), while others report shorter ones (Topp et al., 2022).

Despite these challenges, literature lacks specific frameworks or models to address digital communication issues in agile teams operating in FWAs. For example:

- Lous et al. (2017) explored Scrum in distributed software development but did not focus on communication.
- Cai (2023) examined psychological factors in digital communication but proposed only exploratory research directions.
- Riva et al. (2021) analyzed the psychological impacts of videoconferences using neuroscience but offered no concrete solutions.
- Conboy and Carroll (2019) proposed a framework for scaling agile methods but overlooked detailed communication analysis.
- Conboy et al. (2023) discussed hybrid work environments without addressing communication adaptations for distributed teams.

In summary, a significant research gap exists in developing processes and strategies to enhance communication in agile teams within FWAs, particularly regarding digital communication (Ozkan et al., 2022).

Research method

This research adopts a qualitative approach, in accordance with Bryman (2016), aiming to deepen the understanding of the phenomena related to the impact of digital communication on the dynamics of agile teams operating in FWA. The qualitative method was chosen because it effectively explores participant experiences and perceptions in detail, providing valuable insights for the study (Bryman, 2016). This detailed analysis is essential to identifying the practical effects of digital communication in remote and hybrid settings.

The selection of interviewees was made by convenience, using the snowball technique to choose candidates based on the recommendations of existing interviewees. Senior IT professionals with at least two years of FWA experience were selected, seeking a balance between developers

and managers. The interviews were conducted via videoconference (Google Meet), recorded with the consent of participants, and later transcribed using the Transkriptor software. The content analysis was carried out according to the guidelines of (Bardin, 2011) Atlas.ti software, which, together with the literature review, formed the basis for the formulation of the framework proposed by the study.

Units of analysis and observation

The unit of analysis of this study is the management of digital communication in agile teams. This unit focuses on the process of coordinating, facilitating, and optimizing communication among members of an agile team using digital tools and platforms (Swart *et al.*, 2022). The unit of observation is the managers and technicians directly involved in this communication. The selection of participants was conducted using the snowball technique, which involved starting with initial participants chosen for convenience and then following the criteria established by the researcher. Following the participation of these initial interviewees, suggestions were requested for other individuals or cases that could provide pertinent information for the study. New participants were then contacted and invited to participate in the research. The process continued iteratively, as new participants suggested others, until data saturation was reached, indicating that there was no longer an emergence of new information (Biernacki and Waldorf, 1981). The interviewees are all IT professionals who are part of agile teams and perform their functions remotely or in hybrid work arrangements. Data source triangulation was adopted (Thurmond, 2001) for the data analysis of this study, in which the unit of observation was divided by hierarchical levels (managers and developers), aiming at a comprehensive understanding of the challenges and impact of digital communication on the practices of agile teams. Table 3 presents the characteristics of the interviewees.

Table 3

Interviewee Characteristics

ID	Sex	Age	Role	Time in Role	IT Experience	Time at Company	Time Working Remote/Hybrid
R01	M	38	M	12	18	5	3
R02	F	32	M	4	17	6	4
R03	M	36	D	19	19	2	4
R04	M	30	D	6	12	6	3
R05	M	34	D	6	17	2	5
R06	M	41	M	5	20	8	4
R07	M	45	M	5	25	5	3
R08	M	41	M	10	23	10	3
R09	M	34	D	5	18	10	2
R10	M	42	D	11	25	11	4
R11	M	63	D	32	32	13	4
R12	M	44	M	2	28	18	14
R13	F	38	M	2	2	16	4
R14	F	48	D	12	32	12	4
R15	F	47	D	6	27	3	3

Source: Created by the authors (2025). Role: M – Managers, D - Developers. Numerical values expressed in years.

All participants interviewed are IT professionals working in agile teams, with approximately half performing management activities. The interviewees have extensive experience, with an average of 19.7 years of work experience in IT and 9.2 years in their current roles. They have experience in remote or hybrid work (AFT) ranging from 2 to 14 years, with an average of 4.4 years. As to interviewee profile, most are male (73.3%), aged between 30 and 63, with an average age of 41. Most (38%) work in the IT sector, followed by education (23%). The remaining 38% corresponds to the pharmaceutical industry, the third sector (foundations), public services, and banks. Approximately 50% perform management functions. The others work in software production functions (developers).

Data collection and Data analysis

The research process began with semi-structured interviews, a flexible approach that allowed for tailored questions based on participant responses (Bryman, 2016). This method provided detailed insights into participants' experiences (Biernacki and Waldorf, 1981). The interview protocol consisted of 15 questions, conducted online via Google Meet and recorded with the participants´ consent. Interviews were transcribed using Transkriptor software, ensuring anonymity by replacing names and company identifiers with codes (e.g., R01, E01). Data collection ceased upon reaching theoretical saturation, where no additional interviews provided new information (Guest et al., 2006). Theoretical saturation was achieved by the 13th interview, consistent with Guest et al.'s (2006) criteria, as no new substantive themes or conceptual insights emerged during the final two interviews (14th and 15th iterations), thereby confirming sample adequacy for comprehensive understanding of the studied phenomenon.

For data analysis, content analysis was performed following Bardin's (2011) methodology, using Atlas.ti software to encode, categorize, and interpret themes and patterns. Findings were classified into challenges, causes, effects, and mitigating actions, validated against existing literature, and organized into a framework for clarity. The content analysis process was based on Bardin (2011) and comprised the following stages:

1. Pre-analysis: Interviews transcribed via Transkriptor underwent three cycles of preliminary readings to identify inconsistencies and ensure textual coherence.
2. Inductive Coding: Relevant excerpts aligned with the research objectives were tagged and grouped by thematic affinity, with annotations documenting contextual nuances.
3. Inference: Emerging categories were refined using semantic networks in Atlas.ti to visualize relationships and patterns.
4. Validation: A random sample (30%) of the corpus was independently reviewed by the second author, achieving an initial agreement rate of 85%.
5. Interpretation: Categories were triangulated with literature on remote teams (as detailed in Tables 1 and 2). The semantic networks generated from the content analysis are presented in Appendix B.

Data triangulation (Denzin, 1978) was employed to enhance validity and reliability by integrating perspectives from executives (strategic level), middle managers (tactical level), and operational staff. This approach, grounded in organizational structure theory (Mintzberg, 1983), enabled discourse comparison through cross-thematic analysis (Braun & Clarke, 2006), thereby minimizing hierarchical biases while ensuring comprehensive understanding of digital communication challenges.

Findings and discussion

Work organization arrangements

Most respondents (60%) work in hybrid arrangements, while 40% operate fully remotely. All interviewees adhered to a core schedule with minimal flexibility.

- **Full Remote Model**: Employees work entirely outside the company's premises, relying solely on digital communication. Forty percent of respondents practiced this model.
- **Hybrid Models**:
  - *Predominantly Remote Hybrid*: Remote work dominates, with occasional office presence. This arrangement was reported by 40% of respondents, including 13% with flexibility to choose between remote and in-person work.
  - *Balanced Hybrid*: Equal division between office and remote work, reported by 13%.
  - *Predominantly Face-to-Face Hybrid*: Mostly office-based with some remote work, also reported by 13%.

These findings align with the 17th Annual State of Agile Report (2023), which indicates that 86% of respondents work in hybrid models and 14% in full-remote regimes. The predominantly remote hybrid model was the most prevalent, accounting for 43% in the report and 40% in our survey. However, our study recorded a higher proportion of full remote work (40%) than the 13% reported in the Agile Report (Digital.ai, 2023). 73.5% preferred the predominantly remote hybrid model when asked about their ideal work regime.

Communication tools

Video conferencing tools adopted included Google Meet, Microsoft Teams, Zoom, Skype, WhatsApp, Webex, and Slack. Additionally, Outlook was identified as the email client used by all respondents. Other tools, such as GitLab, Jira, Excel, SharePoint, and Trello, were also mentioned as resources used in digital communication for sharing information, documents, and monitoring issues. These tools are also mentioned in other research carried out on remote work (Bezerra *et al.*, 2021; Claro *et al.*, 2021; Santos and Ralph, 2022; Marek *et al.*, 2021; Oliveira *et al.*, 2020; Salamin *et al.*, 2021; Schmidtner *et al.*, 2021; Tanner and Naidoo, 2021). It was observed in the interviews that the use of chat is predominant in communications, representing 60% to 70% of interactions. Next, videoconferences account for 20% to 30% of communications, while email accounts for 10% to 20%.

In general, survey respondents are satisfied with the tools used in digital communication. For example, R08 says, "*The tools work well and we can get a good performance from them*" (R08). R10, on the other hand, attributes the familiarity with the tools to the fact that they are an IT team: "*As we are IT teams (...), I don't see any difficulties.*" (R10).

Adaptation to digital communication was also observed in previous research. These findings demonstrated that teams quickly adapted to digital communication during the period of forced remote work resulting from the pandemic (Schmidtner *et al.*, 2021). Additionally, it was found that agile teams were satisfied with the adaptations made to communication routines due to remote work (Bezerra *et al.*, 2021; Schmidtner *et al.*, 2021). However, despite the ease of adaptation to digital communication tools, our research identified some limitations and challenges in managing this communication.

Impact of digital communication on agile teams

According to Rizmaldi and Jayadi (2022), communication positively impacts performance. Digital communication can facilitate collaboration among members of an agile team, enabling them to connect more quickly and effectively, regardless of their geographical location (Oliveira *et al.*, 2020). Empirical data has shown that the use of digital tools, such as chats, videoconferences, and collaborative platforms, can increase the transparency of information and promote greater

integration between team members. However, although the pandemic has broken paradigms, demonstrating to managers that remote work can be as effective as face-to-face work (Claro *et al.*, 2021), it was also evident that managing remote work is more complex (Santos and Ralph, 2022; Topp *et al.*, 2022). Our research came to similar conclusions. The findings summarized in Table 1 (challenges) and Table 2 (advantages) were used to validate and complement the empirical findings listed in this session.

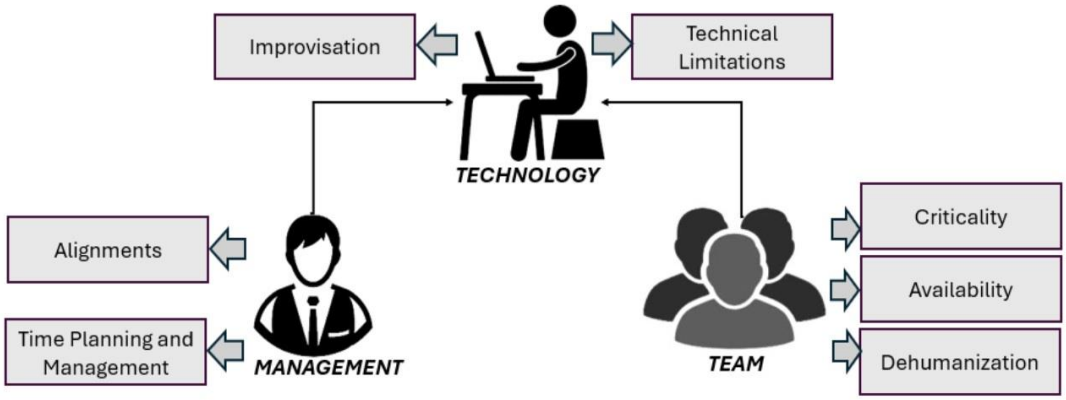
Productivity: The survey data did not indicate a decline in perceived productivity resulting from digital communication. On the contrary, we observed that meetings became more objective, and the use of asynchronous written communication improved the detail of the activities to be carried out. Furthermore, employees showed greater satisfaction with their work. These findings confirm the results of previous studies (Claro *et al.*, 2021; Bezerra *et al.*, 2021; Schmidtner *et al.*, 2021; Charalampous *et al.*, 2022; Topp *et al.*, 2022; Neumann *et al.*, 2022; Marek *et al.*, 2021; Connor *et al.*, 2022; Waldrep *et al.*2024; Bloom *et al.*, 2024).

Ceremonies: Empirical data indicate that digital communication has a minimal impact on Scrum ceremonies. Although some challenges have been identified, the adaptations made have not compromised performance and the results obtained by the teams. These findings corroborate those of Cucolaÿ and Russo (2023). Nonetheless, management faces several challenges in the field of digital communication. These challenges were meticulously identified and categorized based on empirical data from this research and validated through references in literature.

The results of this research led to the development of the Digital Communication Challenge Framework (DCCF), as illustrated in Figure 1. DCCF presents the main challenges, which are classified into three dimensions (Team, Management, and Technology), and seven specific categories: improvisation, availability, alignment, dehumanization, criticality, technical limitations, planning, and time management.

Figure 1

Digital Communication Challenge Framework (DCCF)



Source: Created by the authors (2025).

In the technological sphere, improvisation in the use of unofficial tools and the technical constraints of existing tools are notable. At the same time, at the team level, the challenges include determining the criticality of situations, ensuring the availability and readiness of employees for remote work, as well as addressing the perception of dehumanization resulting from the replacement of personal contact with virtual interactions. These challenges have significant impacts on management, which is faced with the need to deal with each of them, in addition to demanding greater alignment and feedback, ultimately interfering with time management. Next, the origins and consequences of each of these challenges will be analyzed. Finally, suggestions are made for addressing each of the challenges, as suggested by the interviewees and/or the literature.

Technological challenges in digital communication

Table 4 summarizes the main technological challenges identified in this research about the use of digital communication: improvisation and technical limitations.

Table 4

Technological Challenges

	*Digital Communication Challenge Framework* (*DCCF*) Technological Challenges	
Challenges	**Improvisation**	**Technical Limitations**
Problems and Consequences	Lack of appropriate tools (1). Lack of universality in tool usage (1). Lack of adequate training (1). Use of unofficial tools (2). Loss or fragmentation of information (2).	Difficulty managing meetings with many participants (3). Difficulty managing hybrid meetings (4). Connection issues (5). Inappropriate equipment (6). Misunderstandings in virtual meetings (7). Lack of criticality perception (6). Frustration and loss of interest (7).
Recommended Actions	Promote and provide access to official tools (1). Seek popular tools (1). Provide adequate training (1).	Plan and regulate virtual meetings (8). Avoid long virtual meetings – schedule breaks (8). Avoid consecutive meetings (8). Provide appropriate equipment (5). Provide technical support (5).
References	(1) Empirical data from this Research (2) Santos and Ralph, 2022 (3) Griffin, 2021; Riva *et al.*, 2021 (4) Ågren *et al.*, 2022 (5) Charalampous *et al.*, 2022; Tanner and Naidoo, 2021 (6) Saatçi *et al.*, 2019 (7) Ågren *et al.*, 2022; Charalampous *et al.*, 2022; Matos and França, 2022; Riva *et al.*, 2021 (8) Tanner and Naidoo, 2021	

Source: Created by the authors (2025).

Improvisation: This refers to using unofficial tools for communication between team members or creating private groups in chats. Alternatively, the use of official communication channels in a manner that differs from the recommendations. This practice can result in the loss of important information for teams. This aspect was also identified in the work of Santos and Raph (Santos and Ralph, 2022). R09's response illustrates the problem:

> "*Today we basically have the Teams tool, ... so all meetings are through Teams. But there are some groups on WhatsApp, but then they are only for some people (...) You are often triggered by a WhatsApp message, but when you need to solve an actual problem, a room is created in Teams.*" (R09).

Unofficial Communication Mechanisms: A third of respondents (33%) reported using unofficial tools, such as WhatsApp messages and private groups, for work-related communication. While these tools are popular, their use risks losing essential information and fragmenting communication (Tanner and Naidoo, 2021). Causes of improvisation include the use of inappropriate tools, limited access to official platforms, and insufficient training, resulting in a reliance on familiar but unregulated solutions. Companies should ensure that proper training and universal access to official digital communication tools are in place to mitigate these risks.

Technical Limitations: Despite widespread satisfaction with digital communication tools (Claro et al., 2021; Matos and França, 2022; Neumann et al., 2022; Topp et al., 2022), technical challenges persist. Large virtual meetings can be confusing and hard to manage, hybrid meetings create unequal experiences between remote and co-located participants, and connectivity issues may disrupt meeting quality or prevent them entirely. Addressing these limitations is critical to maintaining effective communication in digital environments.

Meetings with many participants: Some respondents mentioned challenges related to the complexity of communication tools when meetings involve many people. Tools like Teams, Webex, Zoom, and Google Meet are highlighted as effective but can become cluttered with too many participants. There is concern about the effectiveness of the tools in meetings with many participants, leading to the possibility of distraction and a lack of information retention. R01, for example, says that:

> "*I often notice difficulties when the meeting involves too many people. Although you have a series of plug-in tools to make a whiteboard together, I think that a meeting with more than 5 people is already starting to get a little tumultuous.*" (R01).

All virtual meetings are subject to a certain level of distraction, as participants who are not present in person may be engaging in other activities in parallel, such as eating, answering emails or chats, or performing household chores, which can be accompanied by background sounds (Sani *et al.*, 2022). In large virtual meetings, these problems are potentially greater according to the number of participants and require more careful preparation and condition, about *participation* – control in the order of interventions, use of the chat for registration, use of the "Raise Hand", etc., *understanding* – use of subtitles, use of visual support material, prior and/or subsequent

distribution of the material used in the meeting, publication of abstract, recording, etc. and *time* – avoiding very long meetings and if this is not possible, scheduling breaks (Tanner and Naidoo, 2021).

Hybrid meeting management: A hybrid meeting is a type of meeting where participants can connect both in person and remotely, using video and audio technologies to integrate all participants into the same collaborative environment. In this format, some participants are physically present in the same place, while others participate remotely, ensuring inclusion and interaction for everyone, regardless of their location (Saatçi *et al*., 2019).

Hybrid meetings present unique challenges that can impact the effectiveness and dynamics of the meeting. Common challenges in hybrid meetings include maintaining the attention of all participants, ensuring equal and effective participation, addressing technical connectivity and audio issues, and promoting interaction and collaboration between in-person and virtual members. A clear difference in the observation horizon between co-located and remote modes needs to be managed (Ågren *et al*., 2022).

During the interviews, the main challenges of hybrid meetings were identified as the adaptation of participants, the lack of adequate equipment, and the need to level the playing field for those participating in co-located and remote meetings. According to R08, "*the adaptation of participants is a challenge, especially when it involves different sectors*". R10 adds to the lack of adequate equipment as a possible obstacle, especially for non-IT teams. R08 also highlights the importance of having an adequate infrastructure for holding hybrid meetings, because without it, audio and visualization can be compromised.

Implementing appropriate communication technologies, standardizing a single tool for all hybrid meetings, offering training and technical support, defining clear rules of participation, and promoting an inclusive and collaborative environment for all participants, both face-to-face and remote, are strategies that can significantly contribute to the creation of a more inclusive and welcoming environment for holding hybrid meetings (Saatçi *et al*., 2019).

Connectivity issues: The lack of or poor connectivity quality can significantly impact virtual meetings, affecting productivity and communication effectiveness. Internet connection instability can cause delays in audio and video transmission, frequent interruptions, and loss of critical information, resulting in misunderstandings, frustration, and lengthening the time it takes

to complete meetings (Charalampous *et al*., 2022; Riva *et al*., 2021). Additionally, difficulties in maintaining a stable connection can hinder the participation of all team members, creating a sense of disconnection and lack of engagement.

Research indicates that the quality of the internet connection is a crucial factor for the success of virtual meetings. Low-quality connections can reduce attendee satisfaction and the overall effectiveness of meetings (Charalampous *et al*., 2021). Frequent technical issues can also negatively impact collaboration and decision-making during virtual meetings (Karl *et al*., 2022). One of the interviewees, identified as R15, commented:

> "*I can carry out my tasks with these digital communication tools, but in online meetings I feel difficulties when there are internet problems, when it crashes and falls.*" (R15).

To mitigate connectivity issues, our research confirms the importance of having efficient technical support and appropriate equipment (Degerli, 2022; Sani *et al*., 2022; Schmidtner *et al*., 2021). This can include implementing network infrastructure solutions, providing quality devices, and training and technical support to virtual meeting participants.

Team Challenges in Digital Communication

Table 5 presents the main challenges of agile teams in the use of digital communication in their daily lives, which were identified in this research: assessing criticality, availability of members and dehumanization of contacts.

Table 5

Team Challenges

	*Digital Communication Challenge Framework* (*DCCF*) Team Challenges		
Challenges	**Criticality**	**Availability**	**Dehumanization**
Problems and Consequences	Coldness of Digital Communication (1). Reduction of Non-Verbal Cues (2). Difficulty in Perceiving the Severity of Situations Reported through Digital Media (3).	Confusion between Personal and Professional Life (4). Lack of a Culture of Availability (1). Difficulty Contacting Colleagues (7). Delay in Obtaining Information (7). Delay in Decision-Making (7).	Reduction of Informal Communication (2). Reduction of Personal Contacts (2). Reduction of Non-Verbal Cues (2). Loss of Uniqueness (8). Reduction of Professional Identity (8). Weakening of Company Culture (2). Reduction in Knowledge Sharing (2).
Recommended Actions	Use of Visual Tools (6). Use of Visual Indicators and Colors (5).	Create Work Agreements (1). Definition of Availability Time Slots (1). Encourage a Culture of Availability (1). Encourage the Use of Cameras in Virtual Meetings (1).	Promote Personal Meetings (1). Provide Relaxation Moments (1). Use of "Mentors" for New Employees (1). Encourage Home Office Work Habits (9).
References	(1) Empirical data from this Research (2) Ågren *et al*.,2022; Sporsem and Moe, 2022; Viererbl *et al*., 2022 (3) Charalampous *et al*., 2022; Tanner and Naidoo, 2021 (4) Bao *et al*., 2022; Claro *et al*., 2021; Miller *et al*., 2021 (5) Eppler and Platts, 2009 (6) Bresciani and Eppler, 2009 (7) Raišienė *et al.,* 2020 (8) Riva *et al*., 2021 (9) Sani *et al*., 2022; Riva *et al*., 2021		

Source: Created by the authors (2025).

Perception of Criticality: R09 highlights that digital communication reduces the ability to assess the criticality of situations due to the absence of non-verbal cues, potentially leading to

delayed or insufficient responses to crises. This aligns with Raišienė et al. (2020), who identified longer decision-making delays in remote work. Solutions include using visual priority tools like Trello or Jira, which categorize tasks by criticality, improving clarity and decision-making (Bresciani and Eppler, 2009). Additionally, standardized communication protocols (e.g., color-coded priorities) enhance the efficiency of critical information exchange (Eppler and Platts, 2009).

Availability*:* Managing team availability in remote settings is challenging, as delays in responses disrupt synchronization and increase asynchronous communication, causing focus loss (Charalampous et al., 2022; Claro et al., 2021; Tanner and Naidoo, 2021). Distractions at home and the lack of a "culture of availability" exacerbate these issues. R02 emphasized the need to cultivate this culture, especially for new employees, to ensure clarity about availability despite FWA.

Integration of Personal and Professional Life*:* The difficulty in separating personal and professional life while working from home was noted in pandemic-era studies (Bao et al., 2022; Claro et al., 2021; Miller et al., 2021). Interviewees also highlighted challenges in locating colleagues digitally, termed "digital concealment" in this research (Bezerra et al., 2021; Charalampous et al., 2022; Marek et al., 2021; Raišienė et al., 2020). Addressing this issue is crucial to maintaining collaboration and productivity.

Culture of availability in remote work: R02 emphasized the importance of cultivating a culture of availability in the company, especially for new employees:

> "*Especially for the newer people in the company, it is important to disseminate this culture of how important it is that people understand that their availability is there (at work), despite the work being flexible and remote. It's okay not be available, but not knowing (whether or not you're available) is something that is prejudicial.*" (R02).

Work arrangements and setting focus and availability time slots can help prevent or reduce this problem.

Dehumanization: Respondent R12 says:

> "*Communication happens, work progresses, but there is a loss of connection, of informal conversation. On Zoom we say what we have to say, but there are a lot of opinions, beliefs, or even that connection, companionship, which doesn't exist so much online*." (R12).

Cold communication and impersonality affect people new to the organization more (Ågren *et al*., 2022). Digital communication tools often diminish nonverbal cues, which can lead to the concealment of feelings and result in misunderstandings (Ågren *et al*., 2022; Charalampous *et al*., 2022; Matos and França, 2022; Riva *et al*., 2021). Due to this dehumanization, there may be an increase in misunderstandings and requests for help that require management (Santos and Ralph, 2022). R08, for example, says that:

> "*In general, the difficulty I have is the perception of how the team is doing, how it is feeling. It's a lack of eye-to-eye contact. There are some technicians who don't like to open the Camera and that leaves us a little in doubt. Depending on the subject we are dealing with. So, if the subject is more delicate (...) it's a little damaging. But for everyday discussions and for the agile method ceremonies there is no problem.*" (R08).

Our research identified the following aspects of dehumanization resulting from reduced human contact through digital communication: loss of uniqueness in meetings, erosion of professional identity, decline in informal communication, and reduction in nonverbal cues.

Loss of uniqueness and reduction in professional identity: The loss of uniqueness occurs because virtual meetings often lack slight variations, resulting in a uniform appearance (Riva *et al*., 2021). In addition to the feeling of repetition in meetings, working in a home environment can lead to a lack of a sense of place (placeness), which, in turn, contributes to the weakening of professional identity (Riva *et al*., 2021). This set of factors can interfere with company culture and collaboration. Our interviewee R09 found a way around this problem:

> "*So, you have to prepare a work environment in your home that has to have a corner, where there will be a chair, a table. And the ideal is, many times you get ready to go to work. Go there and sit in your office and work from there in the same clothes you wore to work in the company. And finish your working day there.*" (R09).

Establishing work habits can help with professional identity and *placeness*. Regarding the loss of uniqueness, R08 suggests a moment of relaxation at the beginning of the meetings:

> "*I think that one solution is to try to relax, try not to arrive directly at the meeting, going straight to the issues to be discussed, but try a calmer briefing. Talk a little bit about more random subjects, everyone can talk a little bit, laugh a little. Then yes, really begin the meeting.*" (R08).

Another recommendation is to avoid very long virtual meetings or scheduling multiple meetings throughout the day, as the intensive use of videoconferences can lead to fatigue (Griffin, 2021; Riva *et al*., 2021).

Reduced informal communication and personal contacts: Many respondents highlighted the loss of informal communication and human contact in online interactions. A significant limitation is the lack of informal conversations and in-person connections during virtual meetings. The absence of informal communication can affect team cohesion, collaboration, and understanding colleagues' feelings and emotions. Other studies have already found the reduction in informal conversations in remote work (Ågren *et al*., 2022; Sporsem and Moe, 2022; Viererbl *et al*., 2022). Reduced informal communication can interfere with company culture, knowledge sharing, and company collaboration and culture (Ågren *et al*., 2022), weakening team members' bonds (Sporsem and Moe, 2022). This affects new employees. For R01 there is a difference between working with people who already know each other personally and with people who have never met. This difference even influences the perception of the value of what is being produced:

> "*It's one thing to be working with that team that you were working with in person before. Another is people who are born working remotely (...) So, there ends up being a colder cultural relationship with the institution as well. If it is very much oriented to that delivery and not necessarily to the value of the delivery.*" (R01).

Dissemination of business culture and knowledge: Many interviewees are concerned about the difficulty of disseminating the company's culture and sharing knowledge when the contact is fully digital. This is aggravated by new employees and younger employees. For R03, R05, and R07, a mitigating factor is the accompaniment of a "*sponsor*" (a more experienced employee) to accompany new employees at the beginning of their activities in the company.

Reduction in nonverbal cues in digital communication: The loss or reduction in nonverbal cues in digital communication can have several implications, especially in remote work contexts. These cues, which include facial expressions, body language, and tone of voice, play a crucial role in interpersonal communication, conveying emotions, intentions, and nuances of meaning that complement spoken words. When these signals are absent, whether in video calls or text messages, there is a reduction in the richness of communication (Riva *et al.*, 2021). This can lead to misunderstandings, difficulty in interpreting the interlocutor's tone, and lack of clarity in interactions (Ågren *et al.*, 2022; Charalampous *et al.*, 2022; Matos and França, 2022; Riva *et al.*, 2021).

Our interviewees perceived this difficulty in their daily lives. However, for most of the developers interviewed, this loss does not represent a big problem. For some, like R11, it is even an advantage because it made the demands more detailed:

> "*No, it doesn't get in the way at all. What's needed is to see communication differently (...). At first it seemed to get in the way, there seemed to be a gap (...) but now there isn't one (gap). (...) The fact that you cannot see the person, see the expressions, began to be replaced by the detailing of a task. And that actually makes it easier. It's something that I see as an evolution in the sense of working this way (...) for me, it came as an improvement*." (R11).

For all managers, however, there is a loss in digital communication in this regard. Exemplifying the view of managers, R02 says:

> "*I can't see their hand gestures. I can't see if the person is there swinging their legs (...). The person may be disguising their face, but other nonverbal cues are not so clear to me, so it's much harder to see what people are feeling*." (R02).

R12, on the other hand, talks about the importance of keeping the camera open during videoconferences:

> "*Within my team, people don't like to turn the camera on and I'm the opposite of that. I like to always have the camera on, I like the eye-to-eye contact. For example, now it will be for the process of delivering the end-of-year evaluations (...). In these specific cases, I have the camera on, I want people to see me and I expect the same, sometimes I ask them to have it on, but there are a lot of people who don't care (...). I see that this is very characteristic of the IT professional, not liking to have the camera on. In other areas of the company, people always have their camera switched on. So I try to deal with it.*" (R12).

A switched-on camera policy in virtual meetings seems like a good measure, but it's essential to understand the context of team members. R12 revealed feedback he received from a member of his team that can illustrate this issue: R12:

> "*One thing, once I was given feedback that, because I was always switching the camera on, I could be embarrassing other people, because not everyone has an office, with a beautiful bookshelf in the background (...). Some people don't have the camera on because they feel embarrassed by these aspects. I ended up slightly reducing this issue of entering every meeting with the camera already on after I had this feedback*." (R12).

Thus, not all team members can have an appropriate place to work, which managers must consider (Griffin, 2021; Ralph *et al.*, 2020), and in addition, bandwidth and connectivity issues may force cameras to be off to improve transmission (Sani *et al.*, 2022; Riva *et al.*, 2021).

To promote personal contact through digital communication, it is essential to ensure the psychological safety of participants, thereby preventing concerns about being electronically surveilled. Our interviewee R05 expressed this concern:

> "*I have informal conversations with my colleagues normally through Teams, but I don't know if we are monitored, this is a big question. I have no knowledge if this happens*." (R05).

It is up to the managers who want to encourage interpersonal contact in their teams to take the necessary measures so that members feel comfortable maintaining informal contacts, without fearing that they are being monitored.

Management Challenges in Digital Communication

FWA work and the use of digital communication present challenges for management, as pointed out by several studies (Bao *et al.*, 2022; Claro *et al.*, 2021; Ozkan *et al.*, 2022; Teichert *et al.*, 2024). In addition to addressing technology issues and managing teams, this research identified two main categories of challenges: the need for more frequent alignment and feedback, and effective time management due to the extra demands managers face in the context of working in AFT. These challenges are summarized in Table 6.

Table 6

Management Challenges

	*Digital Communication Challenge Framework* (*DCCF*) Management Challenges	
Challenges	**Alignments**	**Planning and Time Management**
Problems and Consequences	Reduction of Direct Communication (2). Reduction of Non-Verbal Cues (2). Misunderstandings in Virtual Meetings (3). Increase in Management Activities (1). Increase in Necessary Controls (1). Impact on Managers' Time Management (4).	Need for More Feedback (5). Need for More Alignment Meetings (5).
Recommended Actions	Conduct Regular Individual Feedback Sessions (5).	Plan Alignment Meetings According to Team Maturity (5).
References	(1) Empirical data from this Research (2) Ågren *et al*.,2022; Sporsem and Moe, 2022; Viererbl *et al*., 2022 (3) Claro *et al*., 2021 (4) Miller *et al.,* 2021; Raišienė *et al*. 2020; Claro *et al*., 2021 (5) Matos and França, 2022; Oliveira *et al*., 2020	

Source: Created by the authors (2025).

Alignments: Teams working remotely, especially new members, generally require more alignment (Miller *et al*., 2021; Raišienė *et al.* 2020; Claro *et al*., 2021). The lack of proximity can generate difficulties in understanding (Claro *et al*., 2021), which becomes even more crucial with digital communication tools, as they reduce direct communication. Our interviews highlighted the importance of *feedback* and *onboarding* training. We also identified that the use of digital communication in remote work makes it difficult to pass on knowledge and assimilate the company's culture. This requires frequent alignments with teams and individual feedback, which can affect managers' time management.

R01 created rituals to carry out these alignments with the teams:

> "*So, we try to minimize this through some rituals. What are these rituals? These are the alignments. I have (...) a daily meeting with the project teams. For those projects that I understand are already more consistent, or those already more on track, I don't necessarily talk every day. I talk every other day*." (R01).

R02 expressed the need to increase alignment meetings, noting that holding only one per month, as he used to do in person, is insufficient in the remote context:

> "*If I try to do an alignment once a month, as I used to do in person... It is very little time. I don't see people every day. I don't know how they're feeling*." (R02).

It is recommended that the frequency of alignment and feedback meetings be adjusted according to the team's maturity. More experienced teams generally adapt better to remote work and require fewer alignment meetings (Matos and França, 2022; Oliveira *et al*., 2020). On the other hand, less experienced teams and new employees can benefit from more interactions of this type. Therefore, managers must manage their time to ensure availability for these alignments as needed.

Planning: Our research demonstrated that digital communication interferes with managers' time management, requiring frequent realignments and constant feedback. Realignments are necessary to eliminate potential misunderstandings, while feedback is essential to keep the team engaged. In remote work, maintaining motivation and engagement is more challenging (Claro *et al*., 2021). The lack of in-person contact can also affect collaboration and team dynamics (Claro *et al*., 2021; Miller *et al*., 2021; Riva *et al*., 2021). This impact is particularly significant for new team members (Claro *et al*., 2021), as it hinders the dissemination of company culture and knowledge sharing (Ågren *et al*., 2022; Sani *et al*., 2022).

Therefore, managerial actions are necessary to integrate new employees and foster knowledge sharing. Moreover, managers need to focus on training and standardizing digital communication tools (Tanner and Naidoo, 2021), avoid decisions being delayed due to hold-ups

in obtaining responses (Raišienė *et al.*, 2020), and foster a "*culture of availability*" (R02), ensuring that technicians are accessible when needed, even in remote environments.

Academic and managerial contributions

Considering the relative scarcity of studies on the impact of digital communication on agile teams working remotely or hybridly (Cucolaÿ and Russo, 2023; Ozkan *et al.*, 2022), the academic contributions of this study can be summarized in four items: 1. Proposition of the *Digital Communication Challenge Framework* (*DCCF);* 2. Identification of the causes and prescription of treatment for "Digital Concealment"; 3. Identification of the need to develop a "Culture of availability"; and 4. The differences in the vision of leaders and subordinates about the "dehumanization" generated by digital communication.

1. The *DCCF framework*: This framework provides a perspective on the primary challenges encountered by agile teams utilizing digital communication in FWA. In addition to presenting mitigating measures to address these challenges, it generates both an academic contribution, improving scientific knowledge on the subject, and a managerial one, delivering solutions in a prescriptive way.
2. "Digital concealment": Previous studies had already identified the difficulty of contacting colleagues working remotely (Bezerra *et al.*, 2021; Charalampous *et al.*, 2022; Marek *et al.*, 2021; Miller *et al.*, 2021; Raišiene *et al.*, 2020), but these studies did not deal with the causes in depth and did not propose solutions. The current research identified the main cause of "digital concealment" as the difficulty of separating personal and professional life in the domestic environment. It proposed the adoption of time slots for availability, where team members would be required to be available for occasional contacts.
3. "Culture of availability" is another long-term measure to address "digital cloaking." It involves making team members aware of the problems caused by the difficulty of contact and establishing institutional mechanisms to prevent the issue.
4. Difference in vision between leaders and subordinates about the dehumanization of digital communication: the reduction in non-verbal language, informal conversations, and conversations outside teams has been found in several studies (Ågren *et al.*, 2022;

Charalampous *et al*., 2022; Deshpande *et al*., 2016; Matos and Franca, 2022; Raišiene *et al.,* 2020; Sporsem and Moe, 2022). However, these studies did not analyze the differences in the views of managers and their subordinates regarding the same problems. Current research has identified a clear dichotomy between the views of leaders and their subordinates. While managers view this as dehumanization and coldness in digital communication, many team members consider it an advantage, preferring more detailed and asynchronous written interactions, which interfere less with their concentration and focus on activities.

From a managerial perspective, this research's primary contribution lies in mitigating the actions prescribed by the DCCF. These actions will generate insights and strategies tailored to each reality, enhancing productivity and employee satisfaction in agile teams operating in FWA.

Conclusion

The current research has revealed findings about digital communication in agile teams operating remotely or in a hybrid manner. The data analyzed highlighted the importance of digital communication in the efficiency of these teams, boosting productivity and employee satisfaction. The empirical results indicated that the teams adapted well to daily digital communication, with minimal changes to their current agile practices. The *prescriptive* DCCF was proposed. In general terms, it is concluded that digital communication does not hinder the performance of agile teams operating in remote or hybrid environments. On the contrary, in certain aspects, such as the increase in formalism and the availability of time for focus and concentration, an improvement was observed with digital communication.

The research agenda based on the results obtained includes: 1. Conducting longitudinal studies to monitor the evolution of digital communication in agile teams, comparing the performance of digital communication in different contexts (remote or hybrid); 2. More in-depth studies on the causes and treatments for "digital concealment" and its effects on productivity and collaboration; 3. Investigations into the influence of digital communication on organizational culture and its effectiveness, as well as evaluations of the impacts of digital communication on the

well-being of employees in agile teams, focusing on knowledge transfer and the consolidation of the company's culture; 4.

Further investigation into the differences between leaders' and subordinates' views on digital communication is crucial, given the significant impact these perceptions can have on the effectiveness and efficiency of agile teams working remotely or in a hybrid setting. Understanding divergent viewpoints can provide valuable insights to adjust communication and leadership practices, promoting greater harmony and alignment between team members. Furthermore, this investigation can help identify potential solutions to enhance internal communication and foster trust and collaboration within the group.

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