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2022-10-05

Lokhtina , I A , Colombo , L , Amelia , C , Löfström , E , Tammeleht , A , Sala-Bubare , A , Jazvac-Martek , M , Castelló , M & McAlpine , L 2022 , ' Refining virtual cross-national research collaboration : drivers, affordances and constraints ' , Journal of Work-Applied Management , vol. 14 , no. 2 , pp. 302-315 . <https://doi.org/10.1108/JWAM-02-2022-0010>

<http://hdl.handle.net/10138/354757>

<https://doi.org/10.1108/JWAM-02-2022-0010>

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Refining virtual cross-national research collaboration: drivers, affordances and constraints

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Abstract

Purpose – The study aims to explore and explain the affordances and constraints of two-mode virtual collaboration as experienced by a newly forming international research team.

Design/methodology/approach – This is self-reflective and action-oriented research on the affordances and constraints of two-mode virtual collaboration. In the spirit of professional development, the authors (nine researchers at different career stages and from various countries) engaged in a joint endeavour to evaluate the affordances and constraints of virtual collaborations in light of the recent literature while also researching the authors' own virtual collaboration during this evaluative task (mid-January–April 2021). The authors used two modes: synchronous (Zoom) and asynchronous (emails) to communicate on the literature exploration and recorded reactions and emotional responses towards existing affordances and constraints through a collective journal.

Findings – The results suggest both affordances in terms of communication being negotiable and evolving and constraints, particularly in forming new relations given tools that may not be equally accessible to all. Journaling during collaborations could be a valuable tool, especially for virtual collective work, because it can



be used to structure the team supported negotiation and discussion processes, especially often hidden processes. It is evident that the role of a leader can contribute to an alignment in the assumptions and experiences of trust and consequently foster greater mutual understanding of the circumstances for productive team collaborations.

Originality/value – The findings of this study can inform academics and practitioners on how to create and facilitate better opportunities for collaboration in virtual teams as a rapidly emerging form of technology-supported working.

Keywords Virtual teams, Virtual collaboration, Two-mode virtual communication, Synchronous/asynchronous communication, COVID-19

Paper type Research paper

Introduction

Advanced technologies are becoming more accessible and widespread, with virtual communication increasingly focused on teaching, learning and research, especially in response to the COVID-19 pandemic (Sobaih *et al.*, 2020). Over the past two decades, a number of meta-analyses focusing on the use of technology in higher education have demonstrated a variety of benefits and challenges to teaching and learning in virtual environments (Bernard *et al.*, 2014; Kerimbayev *et al.*, 2020). Concurrently, expectations for researchers to engage in cross-national collaborations are increasing, with an implicit need for technologies to support long-distance interactions. For instance, the policy and funding emphasis in the European Union places value on and rewards researchers engaged in integrated projects involving multi-national collaborations (Lebeau and Papatsiba, 2016). Thus, academics are increasingly encouraged to adopt alternative engagement strategies using various digital devices and platforms to develop international collegial relationships (Lupton, 2018). Such collaborations can bring together culturally and linguistically diverse groups of researchers whose communication and cooperation rely on technology (Morrison-Smith and Ruiz, 2020). Yet, communication that does not address cultural differences and diversity may strengthen stereotypes (Karjalainen and Soparnot, 2010).

Communication technologies are increasingly critical for collaborative research (Stein and Sim, 2020), but failure to consider the nature of social and emotional aspects of interaction within virtual learning environments (see Henritius *et al.*, 2019) creates challenges for successful collaboration. Even though online environments may provide benefits, without addressing opportunities for equal participation and flexibility in information sharing (Dhawan, 2020; Parket and Chao, 2007), these benefits may not be fully enabled. For example, if not promoted sufficiently, equal participation can lead to social isolation (Yusuf and Al-Banawi, 2013).

Hoch and Kozlowski (2014) suggest shared leadership can help virtual teams to meet the challenges of collaborating across distances and time zones, managing dynamics and developing trust. Mach *et al.* (2010) note three conditions necessary for developing trust: (a) vulnerability in willingness to take risks, (b) interactions perceived as positive and reciprocal and (c) shared expectations regarding appropriate conduct. The mutuality and reciprocity embedded in trust enhance communication (Mach *et al.*, 2010), mediate the relationship between diversity and team effectiveness, enhancing team processes and satisfaction (Marlow *et al.*, 2017; Pinjani and Palvia, 2013). Frequent, timely and predictable communication also contribute to trust-building (Pinjani and Palvia, 2013), as does communication quality and attention to both task and relational communication (Marlow *et al.*, 2017), highlighting the role of emotional aspects in virtual environments (Henritius *et al.*, 2019). As for the task-specific considerations: the degree of complexity and the required team interdependence are important factors to consider (Pinjani and Palvia, 2013). Complex tasks demanding greater interdependence are more difficult to achieve in virtual teams due to a greater demand for effective information sharing and reduced opportunities for required

trust building conditions (Marlow *et al.*, 2017). Furthermore, diversity, while it can be positive, especially if perceived as valued (Akkerman *et al.*, 2006), also poses challenges for building trust (Curry *et al.*, 2012).

While studies of collaborative cross-national research have examined working with participants (e.g. Martinus and Hedgcock, 2015), rarely are the interactions within research teams explored (Tigges *et al.*, 2019), particularly the communication processes embedded within virtual collaboration (Kosmützky, 2018). Most studies, however, examine either face-to-face only or three-mode (face-to-face, synchronous and asynchronous) communication. There has been little discussion based on two-mode (synchronous and asynchronous) virtual communication. The importance of integrating different modes of virtual communication wherein technology is used to increase the involvement of culturally and linguistically diverse groups of researchers (Morrison-Smith and Ruiz, 2020) needs further consideration in a fast-moving technological world where virtual research collaborations occur as a growing requirement.

Having experienced teaching and research virtually due to the COVID-19 restrictions, we, a diverse group of academics from multiple countries, undertook a virtual collaborative study aiming to better understand how to refine our own virtual research collaboration and the more general use of virtual communication in academic settings. The broad issue guiding our inquiry was, in what ways do two-mode virtual collaboration create affordances and constraints? We viewed this question both in light of our own collaboration and literature on the topic, engaging simultaneously in reviewing research literature and reflective self-study of our real-time interactions and experiences. Thus, our specific research question was as follows: *What were the affordances and constraints of the two-mode virtual collaboration we experienced as a newly forming international research team?*

What is presented in the paper is the result of this double and intertwined process. We feel that it is important to share the results with others working in academia (e.g. supervisors, tutors and researchers) because we are gaining insights into how research can be used to impact and inform practices/approaches.

Group formation

The group was formed based on common research interests during an online meeting of the Special Interest Group on Researcher Education and Careers (SIG 24) of the European Association for Research on Learning and Instruction (EARLI) held in January 2021. In the spirit of professional development, nine of us engaged in a joint endeavour to evaluate the affordances and constraints of virtual collaborations in light of the recent literature while also researching our own virtual collaboration during this evaluative task. The participants, at different career stages, ranged from early career to senior academics from various geographical regions and countries, including Argentina, Australia, Canada, Cyprus, Estonia, Finland and Spain. English was the common language in the group.

Group dynamics and tools used at different stages of the research process

Given our interest in collaboration, we decided to explore the literature early on while also documenting our own processes and reflections. In our first meeting, we decided to track our own experience of completing this joint literature review through a collective journal, a tool that contributes to a growing sense of community and the valuing of diversity (i.e. Makaiiau *et al.*, 2015; 2019), with the expectation that the participants make at least one entry between meetings. In this way, we could also document our team formation processes since many of us had not previously worked together although most of us knew (of) each other. We used only two modes: synchronous (Zoom meetings) and asynchronous (email correspondence) to communicate on our literature exploration. We recorded our reactions towards existing

affordances and constraints through the stored collective journal in Google Docs. We mutually agreed on the choice of virtual communication channels (Zoom, emails and Google Docs) and based our decisions on preferences, convenience and prior experiences.

We felt our interactions became an instance of a virtual research team that mirrored the content being examined in our literature search. The initial purpose of our joint literature overview was to gain insights from research studies on the nature of virtual collaboration and communication and how these could help us refine and improve our own virtual collaboration in the context of forming new professional relationships during the pandemic. Adopting this approach, we aimed to critically reflect on our virtual collaborative work by continuously reviewing, evaluating and negotiating the purpose, the task complexity and team interdependence.

We explored the following areas: (a) focus (research/supervision), (b) the type of relationships (pre-existing/forming), (c) the mode (synchronous/asynchronous) and (d) affordances/constraints of using virtual communication tools for academic purposes. These themes emerged as a response to our task of understanding our virtual collaboration and its boundary conditions rather than a result of a systematic analysis of themes pursued in the literature. We first searched English language literature in two online databases (Scopus and Web of Science) as well as in Google Scholar. We used different keyword combinations: “virtual learning environment”, “virtual collaboration”, “research team”, “research online”, “social presence”, “synchronous”/“asynchronous” and “communication”. Our initial search resulted in 51 articles. Through our discussions of early findings and acknowledgement of the breadth of different disciplines and research traditions from which each article emerged, we agreed that we were not engaged in a systematic review of literature, but rather an exploratory review to identify research-based insights that could better inform our own choices, approaches and methods of engaging in virtual collaborations (Grant and Booth, 2009).

We decided to set aside research on online teaching activities and focus on virtual teams. In addition, the breadth of languages in our multinational group was an asset that enabled us to search pertinent publications in nine additional languages: Estonian, Finnish, French, Greek, Indonesian, Italian, Spanish, Portuguese and Swedish. As a result, 18 articles were added to the overview though adding “languages” was not entirely clear cut: one article in Estonian by Finnish authors; two articles by Estonian authors about Estonian context but in English and two articles by French authors in French contexts published in English.

At this point, seven literature sources on leadership were added as it emerged as an area of potential relevance for academic work and communication and the development of trust and cohesiveness among team members, especially in virtual teams (Alward and Phelps, 2019). Hence, the final body of literature that we utilised focused on academics and their use of online modalities in communication and collaboration for professional purposes and incorporated 21 articles. After three months and five meetings, we split into two groups: to complete an analysis of literature overview exploration findings (Group 1) and perform an analysis of the collective journal (Group 2).

Methods

Some of us engaged in the analysis of the collective journal. As we had, in parallel to writing the collective journal, reviewed extant literature with a thematic approach, we decided on applying thematic analysis (see Braun and Clarke, 2006) to the journal as well. In addition, we applied a hybrid approach (see Swain, 2018) involving both inductive and deductive phases (Braun and Clarke, 2006) (for process and outcomes, see Table 1). The thematic analysis took into account a chronological order of entries keeping in mind our meetings as a time-marker.

Table 1.
Intermediate tasks and
outcomes

Task	Process	Outcome
<ul style="list-style-type: none"> - Thematic analysis of the 10,475-word collective journal including 37 separate entries - From mid-January 2021 to the end of April 2021 	<ul style="list-style-type: none"> - Hybrid approach (Swain, 2018) - Involved both inductive and deductive analyses (Braun and Clarke, 2006) - Consisted of the following stages <ul style="list-style-type: none"> (a) to individually read the journal multiple times to gain a sense of its entirety (b) to discuss what we felt were common themes and distinct patterns (c) to define all concepts representing the themes to keep the focus on the subject of the analysis (Appendix) 	<ul style="list-style-type: none"> - The theme 'trust' was set aside since it seemed a second-order meta-theme - The theme 'process', was merged with 'task' - The analyses in relation to the literature overview resulted in three patterns across the themes <ul style="list-style-type: none"> (a) negotiating successive tasks/purposes (b) time as chronology, frequency and synchronicity (c) trust

Even though the journal entries represented diverse reflective points of the participants, not all contributed each time.

Even though the participants from both groups had been involved in different tasks, all of us were guided by the same main research aim of the study. We agreed on using a form of methodological pluralism (Barnes *et al.*, 2014) to take advantage of the diversity of the team and the complementarity of distinct individual approaches. Regardless of diversity (e.g. disparate ways of representing the results (more empirical to more narrative (Riessman, 2008)), our prolonged engagement with the text and researcher triangulation allowed us to increase the credibility of the analysis (Lincoln and Guba, 1985). We maintained constant communication, tracking progress and sharing intermediate results. In addition to the journal, the participants from Group 2 also contributed to the theoretical exploration of the literature in relation to virtual collaboration and communication; thus, our own recollections of the issues and themes in the literature were reviewed.

The self-reflective nature of the study did not require ethical approval in our respective institutions. We all joined this mutual endeavour voluntarily. After discussing anonymity, we agreed not to report individual journal entries in an identifiable form. Given journal entries were analysed by team members, many may have restrained the expression of, for instance, negative emotions, especially if targeted towards the responses of other team members. However, we see such restraints as an integral part of negotiating the collaborative space, and in that sense, the nature of the expressions of emotions becomes part of our research focus. We present the results and discuss these in light of the literature overview in the following section.

Results

Negotiating successive tasks/purposes: complexity and interdependence

During our collaborative research study, we engaged in at least four decision-making points when we (re)negotiated the purpose and thus the complexity and interdependence (Pinjani and Palvia, 2013) of the task.

The first decision was about whether we wanted to move beyond the original commitment to two workshops that initiated our interactions during an online meeting of EARLI SIG 24, which was facilitated by a designated team member. As part of the workshop invitation, the facilitator asked participants to come up with at least one study that could inform us on ways to modify our online engagement strategies; these subsequently became the initial collective journal entries. Continuing our interactions was crystallised by invitation to present workshop insights at a symposium within the upcoming EARLI conference in August 2021. The decision to accept the invitation led to many implications: (1) commitment to a more complex task; (2) greater team interdependence over a six-month period; (3) developing a consistent database for documenting our reading (adding new criteria and themes); (4) agreeing on the extent of the overview and (5) distributing tasks. Consequently, we agreed that before proceeding, we needed to verify whether all participant academics wanted to continue being involved in the project (one academic decided to withdraw from the project; thus, all journal entries of this academic were deleted). Other issues such as agreeing on meeting times (Kosmützky, 2018), communication frequency (Webster and Wong, 2008) and leadership (Mittness and Barker, 2007) were negotiated as we progressed.

The next decision point was the potential publication of our work. We recognised the greater complexity of this task and postponed discussion until after the symposium and review of related feedback. We considered our participation in the symposium an opportunity to enrich our virtual collaboration and increase engagement (Wang and DeLaquil, 2020).

The fourth decision-making point occurred after the symposium when we received the feedback of the discussant and were ready to continue working on our paper, which involved agreement on how we proceed as a team. This decision required further commitments to stay with the project. This raised questions around what constituted authorship: negotiating lead authors who would assume first-author responsibility and agreeing on minimum involvement for authorship, i.e. periodically reviewing the text based on the guidelines of the leading author(s). Over the six months, we moved through a series of tasks of varying complexity. We constantly engaged in reviewing goals and processes, distributing tasks for meeting the commitment to present our initial findings at a symposium and further insights into our virtual collaboration through publication. What emerges from the analysis is the chronology of the project and how task complexity and team interdependence shifts when new decision points occur and require negotiation.

Time as chronology, frequency and synchronicity: from communication to collaboration

Time emerged in different forms in the analysis, only one of which we had noted in the literature: frequency/timeliness of meetings (Pinjani and Palvia, 2013), which functioned well in our project. Time was evident in the challenge around synchronicity for enhancing participation, a concern expressed by a number of members. This challenge involved achieving synchronous opportunities for all to meet, given time differences around the globe and our busy schedules. There was a common goal, not always succeeded in, to choose a consistent day and time to meet, prioritising those who missed a prior meeting and would, in principle, be able to attend the next one. This was achieved by sending follow-up emails, sharing the minutes of the meetings and using an online voting system to create polls for forthcoming meetings. As presence was shifting, these tasks were performed by different team members based on availability. Even though members who did not attend meetings could comment on the recordings by adding to the collective journal, we agreed that we had to make sure that the members who were not present at one meeting could attend the next meeting in order to enable synchronous participation.

Looking at the chronology of our meetings, it is evident that emotions shaped the practices of our collaborative work. The first two meetings were important for establishing a sense of community and defining a common purpose. We mostly shared our positive emotions and described our excitement of being part of the group, “*feeling less like outsiders*” and appreciating “*how [the process] was organised and facilitated*” (journal entries). We were trying to find common ground by sharing our stories (both successful and unsuccessful) about our literature search and our research practices using common concepts and categories. These initial steps contributed to developing a shared sense of purpose and allowed us to maintain commitment to the overall goal.

The forthcoming meetings brought more mixed emotions. We became stuck while negotiating new purposes and tasks, prompting questions on how to promote trust and collaboration. There was much discussion of virtual communication, not surprising perhaps given this was the impetus drawing us together initially: how to communicate our progress and organise it among us (e.g. which tools/methods to use). What became evident in these discussions were individual perceptions of both strengths and weaknesses within different modes of virtual communication. As time passed, we felt more comfortable disclosing our challenges with the research task and were ready to share and discuss our concerns about the topic.

It was evident that the leadership was shifting and emerging naturally as team members were enriching their collaborative experience and assigning more tasks (Mihhailova, 2017). For example, leadership shifted from the facilitator of the initial SIG 24 workshop to one of the organisers of the SIG event and then to the members who were preparing the symposium

contribution and subsequent publication. Some members were involved in leading the team at different stages of the project, playing an important role in shaping the team's spirit (Zakaria and Yusof, 2020). Agreeing on and then collaborating on the different tasks showed that a shared purpose was important for people working together, "*teamwork was getting much smoother and we were on good track*" (journal entry). At this point members felt connected and enjoyed the synergistic effects of this way of working, which they perceived as raising their level of performance (Zakaria and Yusof, 2020). Clearly, the chronology of the project itself was a prominent theme intertwined within definitions of tasks, roles and responsibilities.

Trust: the influence of the journal

Power distribution in the relations was at the core of the interaction experience in terms of forming and sustaining relationships. Agreement on the task and ability to perform requires a high level of team trust (Garro-Abarca *et al.*, 2021) and robust communication among us had to be developed and retained.

Building trusting relationships was a learning process as we began our virtual collaboration. We did not have prior experience together as a team. In the shift from working with a designated facilitator to working on a collectively defined task, team members individually decided how they were best able to contribute. At specific points in time, different team members intuitively took turns sharing the leader's role based on the tasks that were collaboratively discussed and mutually agreed on (Mihhailova, 2017) (e.g. leading the groups, preparing for the symposium, finalising the paper, etc.). This reduced power differentials, contributed to shared understandings and facilitated team interactions.

Both synchronous and asynchronous modes of communication were useful in supporting negotiation and discussion processes, especially often hidden processes, preventing conflict and improving trust (see Morrison-Smith and Ruiz, 2020). Notably, integrating efforts within informal discussions had a greater emotional impact on us in a virtual collaborative space (Zoom). Informal talks at the beginning or the end of our formal meetings (e.g. about the professional background and work–life balance issues) became an avenue for building trust. Interestingly, at the beginning and in the middle of our collaborative journey, informal talks evidently encouraged some participants to get a "sense of being with another" (Biocca *et al.*, 2003, p. 456). Later, such discussions took us to the next level – "*strengthening our research collaboration*" (journal entry), for instance, when sharing common challenges related to our literature search. Additionally, in many journal entries, we expressed, and thus gave visibility to, what usually goes unnoticed or unvoiced in academia: emotions experienced by researchers. This dialogue space "humanised" the task of bringing the researcher in and allowing us to build some trust and feel more connected to each other. It is evident that we were "*getting to know each other more than before*" (journal entry), which positively impacted our engagement.

Commitment, completing individual tasks and meeting deadlines, openness about challenges, common tasks/purposes, a sense of inclusion and satisfaction all emerged within our journal entries. These demonstrated conditions necessary for trust: vulnerability, positive and reciprocal interactions, and shared expectations (Mach *et al.*, 2010) despite the challenges of virtual-only collaboration. We wonder to what extent the journal served as a mechanism for trust-building through continuing dialogue. The journal allowed introspection into other people's accounts of events and shared comprehension of tasks, while also facilitating descriptions of our emotional responses (respecting the extent to which individuals felt comfortable doing so). In this way, we could see where, when and how we faced similar obstacles and challenges while conducting the literature search. We noted, for instance, that there was at least one referral to a contribution each of us had made, either in a meeting or in a

journal entry. We interpret this practice as allowing us to reduce the time invested in various formal stages of team development (Germani *et al.*, 2013) and contributing to binding team members together into a more cohesive unit (Zakaria and Yusof, 2020).

Lastly, the time of each journal entry influenced what people wrote about. Before meetings, when individuals may have had more uncertainties or were worried about their progress, entries were often about “*where are we, what are we going to achieve*” (journal entry). After the meetings, descriptions often contained more emotional responses referring to what happened and how team members felt. Despite writing in past tense and often focusing on what we had done, the journal functioned as a means of both looking backward and thinking forward.

Conclusion

Our study aimed to answer the research question: what were the affordances and constraints of the two-mode virtual collaboration we experienced as a newly forming international research team? It did so through a self-reflective case study in which we documented our experience to increase awareness of affordances and constraints that exist when collaborating in this way.

It is noteworthy that time became a prominent issue, i.e. taking time to establish rapport and grounding the collaboration to “pay off” in later stages of group functioning (Calamel *et al.*, 2012; Germani *et al.*, 2013). Time is not only invested in “tangible” aspects, such as developing ideas together and writing text, but also in getting to know how other team members think and act (Crites *et al.*, 2020; Mitteness and Barker, 2007). This feature becomes emphasised the less familiar the team members are with each other, which is very much applied to our team. Mitteness and Barker (2007) argue that the reason individuals are willing to commit to such investments of time is because they believe that they have something to gain in the long run. In our case, one of the premises for engaging in this joint endeavour was related to our own professional development and the desire to understand the acceleration of changing circumstances brought on by the global pandemic. For some of us, the collaboration process itself was an important aim, while some of us wanted to reflect on and improve research practices, and others desired increased sharing of knowledge on virtual collaborations or a combination of these aims. While individual motivations are relevant, we certainly were encouraged to continue by the symposium invitation and the prospects of publishing together. As highlighted in the results, these instances turned out to be points of negotiation for further goals, requiring new commitments and additional time investments.

Trust is built over time as a negotiated exchange between team members, and its role in collaborative research cannot be overestimated (Garro-Abarca *et al.*, 2021; Zakaria and Yusof, 2020). Often leaders of collaborative research assume greater trust than members perceive (Mitteness and Barker, 2007). In our case, leadership changed depending on the phase of the collaboration process, and this may have positively impacted the evolving experiences of trust by team members. It is evident that the role of a leader can contribute to an alignment in the assumptions and experiences of trust and consequently foster greater mutual understanding of the circumstances for productive team collaborations. Trust counteracts hierarchies (Fullagar *et al.*, 2015), and our dynamic leadership might also have been a consequence of a sufficient level of trust and mutual respect.

Our themes are strongly communication-related, especially trust, leadership and relationships (see also Collins *et al.*, 2017; Fullagar *et al.*, 2015; Garro-Abarca *et al.*, 2021; Hanebuth, 2015; Jaakson *et al.*, 2019; Johnston *et al.*, 2020; Mihhailova, 2017), which thematically align with areas of collaboration. Support and feedback emerging as a collaboration-related theme are applicable and relevant in many knowledge-building settings, e.g. importance of gaining feedback on one’s work and receiving peer support

and mentoring increases engagement (Wang and DeLaquil, 2020) and satisfaction (Kozar and Lum, 2015). As the issue of trust emerged as crucial, future studies may address how leaders can promote trust and how trust-building emerges in collaborative processes characterised by various forms of distributed leadership. Also embedded in these questions is how individual team members might work towards building trust through varied technologies and modes of communication, such as in our own work.

Our virtual collaborative study emerged in the moment and was not intentionally planned. Nevertheless, it provided an opportunity to analyse collaborative processes from within as the collaboration unfolded around the reading of literature and contributing to a reflective journal. A notable challenge was the difficulty of clarifying distinctions between communication and collaboration within the research literature, especially regarding leadership. This was relevant to our questioning while simultaneously analysing and making sense of the research evidence and examining our own teamwork processes.

Further, there was little on the role of researchers' collective journals within *collaborative projects*. Our experience suggests journaling during collaborations could be a valuable tool, especially for virtual collective work within academia, e.g. among researchers, tutors, supervisors and doctoral students. We suggest future studies should explore collective journal use within virtual teams from the perspective of what works and what does not work to further evidence best practices and impacts. Finally, given the evolving nature of leadership in our project, we believe future research specifically examining the nature of dynamic and distributed leadership models within academic research could inform the ever-evolving nature of academic work.

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Appendix

Theme	Definition	Sub-themes
Trust (<i>a priori</i>)	Assured reliance (mutuality and reciprocity) on the character, ability, dependability or truth of someone (Mach <i>et al.</i> , 2010)	N/A
Emotions (emergent)	Multidimensional constructs comprising affective, psychological, cognitive, expressive and motivational components	<ul style="list-style-type: none"> • Positive: pleasant emotions • Mixed (pleasant and unpleasant) • Negative: unpleasant emotions
Leadership (<i>a priori</i>)	The act or an instance of guiding the actions/thinking of others; may be formal/informal and temporary/long term	<ul style="list-style-type: none"> • Direction • Delegation • Decision/agreement • Power
Communication (<i>a priori</i>)	A process by which information is exchanged between individuals through a common system of symbols/signs/behaviour	<ul style="list-style-type: none"> • Synchronous/asynchronous • Virtual/online • Tools/medium
Collaboration	A situation of two or more people working together to create/achieve the same thing	<ul style="list-style-type: none"> • Inclusion • Sharing • Engagement • Teamwork
Social presence (<i>a priori</i>)	The subjective experience of being present with a "real" person and having access to his/her thoughts/emotions (Biocca <i>et al.</i> , 2003)	Present/absent
Task/process (emergent)	The work done to achieve the research goal (i.e. searching and sharing what has been learned from face-to-face and online communication)	<ul style="list-style-type: none"> • Search • Reflection • Analysis • Teaching
Constraints of virtuality	A quality/property of an object that limits its possible value or use	<ul style="list-style-type: none"> • Work/life balance • Tools • Infrastructure • Time-zone difference
Affordances of virtuality	A quality/property of an object that defines its possible uses or makes clear how it can/should be used	<ul style="list-style-type: none"> • Work/life balance • Tools • Infrastructure • Geographically spread

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