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Review Article

Multilayered Installation Design: A framework for analysis and design of complex social events, illustrated by an analysis of virtual conferencing

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ABSTRACT

Humans are social animals living in societies with most of their activities occurring in social settings, characterized by multiple actors, the crossing of individual behavioral paths, interactions between participants themselves and between participants and material (or immaterial) setting components. We theorize that virtual conferences, like physical ones, have a dual-space structure where the two types of activities (content transfer and social intercourse) intertwine. Understanding what happens in such complex social events requires minutely analyzing this complex intertwined structure of components and events.

This analysis is even more necessary when one wants to intervene in such settings, for example when designing supports or attempting to change behavior. Nevertheless, most methods of data collection and analysis are either centered on methodological individualism, looking at aggregates at macro or meso level, or looking in detail at only some aspects of the whole event (e.g., conversation analysis).

The paper offers, while illustrating with actual data, a Multilayered Installation Design (MID) method that facilitates focus upon the various perspectives of subjects, combines them into a single framework of Installations for activity that describes the setting in a systematic and structured way, and offers directions for design or intervention.

This paper (1) briefly situates the nature of the problem and some gaps in the current methodological landscape; (2) contextualizes the main theories underlying the MID method — Activity Theory and Installation Theory; (3) describes the new method per se; (4) illustrates the method on a specific case, the analysis of a conference in a virtual space; and (5, 6) lists some issues and limitations as well as future orientations.

Conceptualizing issues with the help of Installation Theory informs a structured and goal-oriented approach to design that improves on the usual design thinking approach by providing a robust analytic and idea-generating framework.

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1. The need for a method to analyze complex activity settings for design purposes

This paper describes Multilayered Installation Design (MID), an analytical framework to analyze complex social settings with the aim of improving them (e.g., for user experience, efficiency, or sustainability). It expands and improves upon current techniques (e.g., design thinking) by providing a robust theoretical framework, and a structured, systematic process: MID enables tracing the analysis and the rationale of design interventions. It further simplifies problem-setting, identifying potential pain points on the go. We illustrate the method with a real case, said analysis and the improvement of an Installation for Virtual Conferencing. Although the MID method has been applied successfully in some industrial settings, it is described in a full, formalized, and transferrable manner for the first time in this paper.

This paper (1) briefly describes the nature of the analytical problem, and some gaps in the current methodological landscape; (2) contextualizes the main theories underlying the method - Activity Theory and Installation theory; (3) describes the MID method per se (4) illustrates the method on a specific case, the analysis of a conference in a virtual space; (5) lists some considerations and limitations and (6) points to the next steps of using the method in the context of deep design (DD).

By applying the model to analyze the activity settings of a complex social event – a conference held in a virtual reality platform, this paper leverages perspectives from designers, developers, organizers, and participants to test the applicability of the model and its utility for redesigning toward better usability.

1.1. The problem and the research question

The specific empirical problem was to design a user-friendly, efficient setting to hold conferences in virtual spaces. Following 2020's travel restrictions, the author team set up a conference in a virtual space in November and December, where speakers and attendees participated as avatars. While participant feedback indicated that the conference was a success, we noted important shortcomings and decided to make a thorough analysis and to design improvements for furthering such venues.

The theoretical problem behind this specific case is to understand for design purposes the complex social environments of Installations for Virtual Conferencing (IVC), and more generally, complex social settings. The research questions are: *What method can we use to analyze such complex social environments in ways 1) accounting for all the activities occurring in such settings, and 2) enabling provision of useful design directions*. The solution offered in this paper is to combine Activity Theory and Installation Theory in a novel method that structures and expands design thinking—Multilayered Installation Design (MID). This paper details this combination as a process with successive steps. As shown in detail below, Activity Theory is used to break down any activity into manageable chunks for detailed analysis; Installation Theory examines minutely the different determinants of behavior in each chunk and highlights the relevant points for intervention in its various layers (to be explained below). Activity Grid analysis provides structure and scaffolds the steps of the method. This paper therefore presents MID as a systematic approach to designing and improving complex social settings, using IVCs as an empirical case.

Installation refers to the socio-technical system—more than the software platform—just as an in-person conference is more than the conference center housing it. IVC includes the material affordances of the environment in which activities take place, the know-how of users, and the institutional rules that funnel behavior, as per Installation theory (Lahlou, 2017; see below). An installation is constructed with three layers (see below), which facilitates the process and guides design intervention.

An ***action***, then, is a "consciously controlled move," in contrast to an operation, which is an automatic move occurring below the threshold of consciousness (Lahlou, 2017). Actions are the basic units of the analysis (e.g., enter room, respond to question).

A ***subject*** is a specific entity that acts with goals and experience. There may be other agents that act, such as machines, but these agents do not have a conscious representation of the goal. Every individual subject is different, but there are some generic ideal types (Weber, 1949, p. 43), coming with typified roles and statuses that can help with modelling what subjects do when filling in the activity grids. Below, these are referred to as *actors*, e.g., "presenter", "tech support", etc.

A ***transaction*** is a set of interconnected, interdependent actions. Typically, a transaction will involve an action by an actor and actions by other actors in response to that action; take for example, question and answer, greetings and salutations, and social exchange more generally (Blau, 1964). In a transaction, an actor acts in accordance with her role and is treated in accordance with her status. If the transaction produces value for other actors (e.g., by getting them closer to a goal or satisfying their motives) then it is considered satisficing in Herbert Simon's sense (Simon, 1956).

A ***virtual environment*** is:

> Any software-generated structure that is able to contain, or function as an environment for, software-generated objects and events, and human interactions with those objects and events. (Brey, 2003)

By ***virtual interaction*** we refer to exchanges between humans that are mediated by information technologies and which may include transformed social interaction (Bailenson et al., 2006), such as computers with visual and acoustic signals that are enabled by digital platforms and Internet connectivity. Virtual interactions in virtual environments are experienced as Virtual Reality (VR).

By ***design*** (and redesign) we refer to creating and testing prototypes, iterative refinement, and continuous evolution of the design (Anderson & Shattuck, 2012) which includes the objectives of facilitating collaboration between researchers, practitioners and users to improve the effectiveness of the experience (Barab & Squire, 2004). A significant requirement for such collaboration is a shared taxonomy for evidence-based claims, sometimes requiring scientific terms to "carve nature at its joints" (Plato, 2008).

We illustrate this novel method by analyzing actions that took place in installations with experiences gathered in a multi-day conference held in VR in November and December 2020, in order to produce more satisfying transactions in future IVCs.

1.2. The empirical case

The rationale for choosing this case to illustrate the method is threefold. First, opportunism: because the conference topic was "using Installation Theory for design" and was attended by senior experts in the domain, it was an opportunity to leverage their expertise for analyzing the event they attended, and several of them thus co-author this paper. This occasion also enables drawing on many years of experience at Stanford University which was the organiser and host of the conference, for virtual interaction design, and of MediaX, which co-organized the conference, for the development of the method. The second is that a conference is a small world that contains, concentrated in a short time and limited space, a coherent set of social and professional activities: a conference is therefore a good example of a complex socio-technical event. Finally, since conferences are a social venue well-known to the scientific audience, this will facilitate understanding the example and therefore the methodological approach.

As a side note, virtual conferences are now an emerging design problem, making the analysis useful for its design implications in the everyday world. Complex social events in platforms based on computer-mediated environments require the collaboration of their designers and developers. This collaboration is aided by a shared understanding of the goals of the social event by all actors and requires a shared language to discuss their various components. An explicit framework for this

understanding helps the actors plan, implement, evaluate, and continually improve such events—which are complex because they involve multiple layers. Hopefully, this paper will provide such a framework to analyze the activity and enable improvement with an approach that relies on components in the various layers of the Installation.

In general, conferencing, whether it is in the realm of professional meetings, congresses, workshops, or seminars, is a complex of cultural practices entailing knowledge transfer and acquisition of new skills. It does, however, also require an investment in social activities such as identity performances, knowledge and social networking, recreation, and the like (Ngamsom & Beck, 2000). These activities build social capital as well as cultural capital (Lin, Cook, & Burt, 2017; Bourdieu, 1980, 1986). Conferencing is therefore a learning experience and process relying on two different channels. The first is a formal channel: presentations, panels, workshops, and other formally organized information transfer. The second is an informal one: chats over coffee breaks, serendipitous occurrences, having a drink with colleagues, being introduced to new people by common friends, local visits, introductions to new circles of sub-communities, strengthening existing links, and the mere benefits of participation. These activities create the awareness of sharing a collective experience and creating common knowledge and, thus, belonging to a community ("I was there, too!"). More generally, learning is not a mere transfer of information, but also a social process that leverages personal relations and is affected by people's awareness that others are listening, too (Arias, 2015). As will become evident, the second aspect needs to be given more explicit attention in the design of virtual conferences. One recent study highlights this problem: In a report of a 2019 National Science Foundation funded hybrid workshop that engaged in-person and virtual participants, Fulcher et al. (Fulcher et al., 2020) found that "while all attendees reported gaining similar insight into the field and new resources, there was a split in their perceptions of networking. In-person attendees more often agreed that they had made connections with potential collaborators than did remote attendees ($P < 0.001$)."

We theorize that virtual conferences, like physical ones, have a dual-space structure where the two types of activities (content transfer and social intercourse) intertwine. As suggested in Barron's (Barron, 2003) analysis of small group collaborative learning, we conceptualize conferencing interactions as a dual-problem space comprised of a content space and a relational space:

> Collaboration might productively be thought of as involving a dual-problem space that participants must simultaneously attend to and develop a content space (consisting of the problem to be solved) and a relational space (consisting of the interactional challenges and opportunities). […] Information made available in the space from the self and from other's activities must be integrated. One needs to be able to monitor and evaluate one's own epistemic process while tracking and evaluating others' epistemic processes (e.g., Can I see how my partners are thinking, and do I agree with their reasoning?). The relational context is similarly complex and can be loaded with issues of identity related to both the self and one's partners. (Barron, 2003).

This problem relates back to an influential early paper, in which Hollan & Stornetta raised the question whether the remote-communication technologies which have evolved over the last 40 years will propel us into an age of 'beyond being there', where instead of trying to create a sense of "being there", we would use the new possibilities afforded by technology to enhance human communication (Hollan & Stornetta, 1992). Precisely, IVCs and VR technology have opened up new possibilities for digital collaboration, and as avatars we are empowered with amazing capacities, literally super-human and potentially transformative (Yee & Bailenson, 2007). But while the use of VR for various training purposes has long been studied and literature provides many valuable insights (Howard, Gutworth, & Jacobs, 2021; Moshell, 1993; Satava & Jones, 1996), the recent acceleration in the development of VR changes the perspective. With time, IVCs will become frequent, and possibly the new norm, beyond the tech community. To warrant the success of the activities embedded in IVCs, the Installation must facilitate both the development and sharing of knowledge and informal social interaction. Indeed, both the 'epistemic' (formal information transfer through presentations) and the 'relational' (informal transactions between participants, social work and networking) spaces (Yee & Bailenson, 2007) are crucial components of IVCs. A recent paper on IVCs concluded that current platforms provide reasonably good support for the "epistemic" aspect, but that the relational aspect was still underdeveloped (Lahlou et al., 2021). This underdevelopment could be attenuated if professionals also meet at in-person conferences. The problem is amplified, however, in a world where IVCs become the dominant format for many—a world that might be ours tomorrow as it has been throughout the pandemic.

The state of the art on IVCs is also, in a way, a diagnosis of the shortcomings of the current methods for analysis and design. While the technical aspects that relate to IT technology appear rather mature despite their complexity, it is the social aspects that lag. This "neglect" reflects the limitations of current techniques of designing for relational aspects. Indeed, the ontology and the language that is used among designers to designate the relational activities needs to be improved and better shared (Barab & Squire, 2004; Heitmayer, Russell, Lahlou, & Pea, 2021). As we shall see below, the proposed method, MID, brings some progress to this methodological blindness.

In the specific case used as an example here, as an alternative to the in-person meetings that were originally scheduled to take place in May 2020 on the Stanford University campus but had to be postponed because of the COVID-19 pandemic, the annual MediaX Global Innovation Leadership Program (GILP) was held in an IVC in November and December 2020. This IVC leveraged insights from a 2007 workshop on Building Effective Virtual Teams (Russell, 2007), research results, and the experience of several years of online instruction.

The conference took place over five weeks and comprised four events and research sessions with 32 participants from academia and leading industry experts from four different continents. Each week, the conference held a plenary session of 2 h attended by all in a large (virtual) auditorium (Fig. 1), along with parallel group sessions and social breaks in other spaces.

The participants were distributed in four working groups (Fig. 2) each of which developed a design project on a problem of their choice (i.e., how to limit the risks of COVID transmission in the hospital's staff break rooms; using AI to deal with student misbehaviors on a digital learning platform; designing online and COVID-safe physical merchandising strategies for small retailers; and encouraging course completion by online learners). Each group met in videoconferencing at times of their choice (accounting for their time zones and constraints). Each group had fixed office hours for specific training on the method that is developed in this paper. Finally, the last plenary session was dedicated to presentations of each working group's work, and general discussion. Given the limitations of this paper, the following analysis will only focus on the VR aspect of this conference.

The 'dual-problem space' of content and social relations in a multi-day conference including expert presentations, team working sessions with report-outs, and networking offered an opportunity to observe the situated activity and action pathways of this IVC, in the content space and the relational space, as defined above. The conference was therefore followed by a series of working sessions in which a team of organizers, facilitators, and attendees collaborated to prepare two academic papers describing their experience, one on the design requirements of IVC (Lahlou et al., 2021), and the present paper.

In addition to the organizers and technical support staff, the collaborators included the attendees of that IVC—scientists and professionals who are specialists of IT, education, UX, design, psychology and cognitive science, and work for some of the major actors of the IT and internet industry. They came from the Americas, Europe, Asia, and

Fig. 1. The main auditorium where plenaries took place (screenshot during a break).

Fig. 2. Working group in a parallel session (screenshot from participant view).

Africa, from very different organizations and therefore with very diverse cultures and perspectives. All were interested in practical implementation and were introduced to MID. As the topic of the GILP21 was situated activity and the design of distributed architectures (introducing Installation Theory), participants shared enough common theoretical and practical background for reflexive, collaborative analysis of the experience itself. Section 2 provides the theoretical background and presents the method and its phases.

2. Activity Theory, Installation Theory, and how they are combined in the MID method

This section offers a brief description of the theories and frameworks used for the Multilayered Installation Design – Activity Theory, Installation Theory and Activity Grid Analysis. When used in combination, these theories and tools provide a systematic structure scaffolding the analytic phase of the design thinking approach.

Often associated with the IDEO design firm but with many historical antecedents, design thinking is largely a set of heuristics for guiding team-based collaboration in a synthetic problem-solving approach used to create novel solutions to problems in a human-centered manner. While there are as many shades of design thinking as practitioners, its mindsets generally include need finding by empathizing with users, optimistic orientation, experimentation, iteration, creative confidence, and an embrace of ambiguity and failure in design processes. MID follows the same spirit; furthermore, it introduces a structured process that facilitates systematic investigation of issues and possible improvements, communication between stakeholders, and documentation for specification and future action.

We propose analyzing conferencing activities, and more generally complex socio-technical settings, with two frameworks that facilitate understanding participants' activities (epistemic and social) and the development of design recommendations for the Installation. First, Activity Theory, in its Russian version, enables breaking complicated and distributed processes into smaller, manageable chunks. The other, Installation Theory, describes how activities are "channeled" (supported and controlled) in each of these chunks by three layers of components, and how these components can be changed to modify activity and improve the quality of experience.

2.1. Activity Theory

From a theoretical point of view, learning theories informed by Activity Theory foundations remain significant anchoring-points for IVCs and collaborative learning processes, given the nature of VR environments (Stahl & Hakkarainen, 2020). Activity Theory comes in many

different shades (Mironenko, 2013; Rogers, 2008). We use the version developed by Valery Nosulenko and colleagues in line with Boris Lomov's engineering psychology at the Russian Academy of Sciences, and with Boris Ananiev's affiliation (Lomov, 1982; Nosulenko, Barabanshikov, Brushlinsky, & Rabardel, 2005). This version was gradually refined and simplified to be operational for redesign purposes (Lahlou, Nosulenko, & Samoylenko, 2012; Le Bellu, Lahlou, Nosulenko, & Samoylenko, 2016). Indeed, Activity Theory is a vast and diverse domain, and not all versions are handy and robust enough for such use.

Activity Theory considers activity as an oriented trajectory from a given state ("conditions given") to a consciously represented expected final state ("goal"), driven by internal motives (urge to reach some internal state of balance or satisfaction). Activity is pulled by the goal and pushed by the motive. The trajectory of activity is a succession of small problems to be solved ("tasks"), which can each be seen as reaching a local subgoal (Fig. 3). Activity is subject-centric, specific to a subject and performed from the perspective of the subject, in the context of layers of Affordances that provide action pathways. We analyze the conference activities as a series of typified tasks with subgoals, with attention to the affordances of IVCs.

The successive tasks in activity, each task corresponding to a subgoal, will be the chunks used in the analysis. As each step is itself decomposable in nested smaller substeps (as in Russian matryoshkas), it is possible to go down in detail as necessary (as the devil is in the details); but even smaller chunks will always be goal-directed, and relevant motives can be identified. That is essential, because the satisfaction of motives, by the attainment of goals, is what motivates the subjects and produces satisfactory experience; while failure to attain goals produces frustration and poor experience. The way Activity Theory enables us to cut the activity at its natural joints also yields the evaluation criteria adapted to evaluate the experience at a given task. This parsing provides directions for improvement. Table 1 provides definitions for the most important concepts in this operational version of Activity Theory.

Activity Theory is interesting in several respects. First, it describes activity with concepts that make sense for the subject, and it connects activity to goals and motives. It is therefore possible to obtain the goals and motives (the reasons for actions) by interviewing the subjects. This "natural" contour of the theories and concepts, fitting the native's common sense, facilitates investigation and interviews, as the *etic* and *emic* notions have similar contours. That is not always the case, as is well known from discussions on the connection between emic and etic (Haskell, Headland, Pike, & Harris, 1992; Jones & Harris, 1967; Lahlou, 2011; Pike, 1967; Young, 2005). Those who have been confronted with the problem of cutting a recording of natural activity into relevant chunks know that this issue is far from obvious unless one has a very strong theory. Activity Theory is precisely that theory.

Hence, using Russian Activity Theory to describe activity, the MID approach, 1) decreases the risk of loss in translation from the subject's perspective to the researcher's description, and 2) enables checking the validity of the researcher's interpretations by asking participants if they agree. Furthermore, as explained above, Activity Theory cuts activity at its actionable joints, thus providing chunks that make sense as a bundle for design.

Table 1
Definitions of the most important concepts of Activity Theory.

	Term	Definition
1.	Activity	Activity is driven by goals and pushed by the *motives* of the subject.
2.	Goal	A Goal is the representation of the final desired state. Goals are means to satisfy motives (e.g., getting a job done satisfies self-esteem, etc.) Different goals may serve the same motive; one goal may serve several *motives*. A final goal is reached through a trajectory of intermediate states, each corresponding to a *subgoal*.
3.	Task	Trying to reach a *subgoal* is a task (a problem to solve).
4.	Action	Doing a task is an *action*.
5.	Operation	Actions or parts of actions can become automatic operations: executed beyond consciousness (e.g., changing gear when driving a car).
6.	Subject	Subjects can be an individual or a collective.
7.	Motive	The driving internal force directing *action* from current state toward a more satisfying one.

2.2. Installation Theory

Installation Theory is a framework for analyzing *the determinants* of action. It states that for a given point of activity (e.g., attending a lecture), participant behavior is channeled by three types of system components: *local affordances* (e.g., chairs, tables, displays, notebook), *embodied competences* (previous knowledge and skills for interpreting and acting in the situation), and *social regulation* (institutions and local rules, e.g., stay quiet and listen). The combination of these three layers creates, by feedforward and feedback, a narrow tunnel of possible behaviors for the actor. This conjunction explains why people behave as expected. In turn, the fact that each actor behaves as expected enables cooperation. Installations are:

> "Specific, local, societal settings where humans are expected to behave in a predictable way. (…) The components are distributed over the material environment (affordances), the subject (embodied competences) and the social space (institutions, enacted and enforced by other subjects). These components assemble at the time and place the activity is performed." (Lahlou, 2017, p. 458)

Installation Theory is a global framework that combines into a pragmatic system a series of general theories of behavior, mainly ecological psychology (Barker, 1968; Gibson, 1979; von Uexk ü ll, 2010), situated and distributed cognition, intelligence and actants (Akrich, Callon, & Latour, 2006; Hutchins, 1995; Lave, 1988; Lave Etienne and Wenger, 1991; Pea and Salomon, 1993; Suchman, 2007), social constructionism (Berger & Luckmann, 1966), social representations (Gordon et al., 2015; Lahlou, 2021; Moscovici, 2008), and Activity Theory. Social settings are not only spatial places with affordances; they are populated with other actors or agents, and they are governed by institutions. Also, the collective embodied competences of the subjects themselves comprise an essential engine to process the situation and interpret it toward enactments of appropriate behavior.

The combination of these components is a cultural reactor that predictably produces "appropriate" behavior, a bit like a chemical reaction

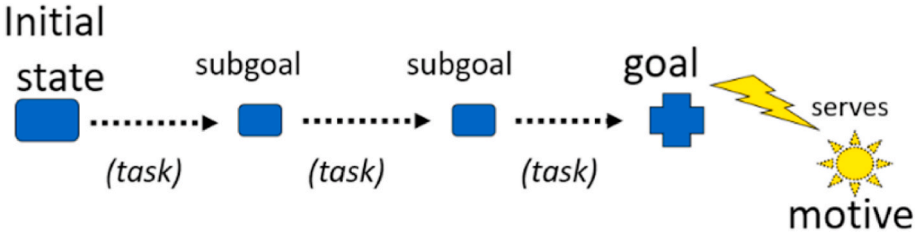

Fig. 3. Goal steps in Activity Theory: from initial state to goal by successive actions.

or a cooking recipe produces predictable results. This chemistry happens by simultaneously empowering and controlling participants, by scaffolding and guiding their actions: the Installation regulates behavior with feedforward and feedback loops. Installations are the natural settings that organize our behavior (e.g., a family dinner, a taxi ride, a wedding, an exam, etc.) An interesting aspect of Installation theory is its peculiar, transtheoretical, hybrid epistemology: Installations are compounds of elements of three different epistemic natures, that are usually considered to belong to incompatible philosophical approaches (realism, phenomenology, and constructionism); but it works in practice (Lahlou, 2017, p. 154).

The channeling power of Installations supersedes most classic explanatory variables (e.g., social class, gender, age, nationality, etc.). For example, all passengers present in a plane, a bus, or a religious service will behave the same, whatever their specificities, and even their deep motives. Installations are a necessary device for societies to enable cooperation by making participants' behaviors predictable. Interestingly, the status of will and freedom in such situations is ambiguous. We do act in a certain way because we want to reach the end-goal, but what we do to reach it we do not necessarily do happily (e.g., boarding a crowded train to reach the airport); also, we are free to think what we want, but not free to act as we would prefer.

In this channeled state, which is neither fully automated nor deeply reflexive, the question of free will is not so relevant; it is rather a means-end issue. The "decisions" in such a state are not merely an individual affair, but rather the result of a distributed process where society has framed the situation and guides individual choice along a narrow range of alternatives (Fig. 4). What individuals perceive as decisions in these instances is more about choosing a goal than the trajectory to reach it. This remarkable channeling power of Installations is leveraged in the MID process, to produce the desired actions and transactions.

Installation Theory provides a simple systematic grid to analyze the relevant components in the three layers, so as not to miss any. Often, some components in the layers are redundant. The distributed architecture of Installations, over three layers of components, is correspondingly resilient: if a component is faulty or missing in one layer, another component in another layer can take over to support the function. This systematic approach to analysis also offers a robust grid for design; it encourages us to think outside of the technological box of material affordances and to consider other ways of channeling behavior with embodied competences (instruction, training), or social regulation

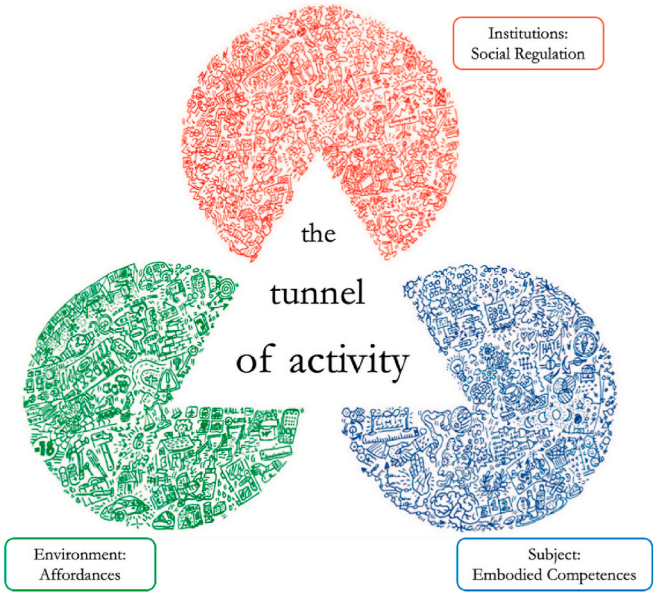

Fig. 4. The three layers of an installation simultaneously scaffold and constrain the behavioral path.

(rules, human support). This aspect is especially appreciated by practitioners and sponsors as it makes the ideation phase more systematic. Furthermore, it facilitates and guides creativity in a functional way by highlighting the nature of actions to be supported, the time and location of the process targeted, and even the motives that drive user experience.

2.3. The activity grid

To apply the theories into a systematic process, MID first breaks down activity into manageable chunks (e.g., steps, tasks) using Activity Theory. To do so, one should check the Installation quality by a walk-through tour of the activities one wants the Installation to support, checking at every step to ensure existing layers offer good-enough support for both content and relational space. To make this walk-through tour systematically, Activity Grids (see template in Appendix A; examples in Tables 2–4) are used. The lines of the Activity Grid are the tasks for which actions are performed. For one specific task, there may be separate Grid and a specific line for each of the actors involved in the task. For example, when a participant calls the technical helpdesk over the communication back-channel, there will be one line for the participant, and one for the support technician, as they have different goals, roles, constraints, and rewards. They also have different views of the situation, different contexts (e.g., the tech may have a waiting line to manage) and different affordances (e.g., different access rights). When a specific cell in the Grid is unclear, participants can be helpful to understand what the natural action steps in that tasks are for them. This is done by interviewing them, asking them to describe their activity, their actions, and asking them, at each step/at each task: what is your goal here?

The first Grid for cutting the activity into chunks proceeds chronologically and serves to identify the activity steps. Table 2 shows the

Table 2
A non-exhaustive list of activities while conferencing (adapted from (Lahlou et al., 2021)).

	Task	Activities
1.	Awareness	Getting info/invitation: there is a conference at this specific time and place, about these topics.
2.	Timetabling	Planning, booking, solving authorization issues (clearance from organization, funding).
3.	Preparation	Writing, reviewing, and editing paper, coordination with organizers and tech support.
4.	Onboarding	Travelling or exploration of the digital platform; may include getting and testing the display Installation (this phase is a bit different from in-person for IVCs because tests can start early).
5.	Orientation	Creating more detailed activity plans once more aware of resources on-site.
6.	Presentation	Speaker to audience, data display, moderation, speaker interaction in panels.
7.	Presentation Processing	An audience member may take notes or otherwise make records of things they considered noteworthy about the presentation, including questions or comments they may seek to produce during Q&A.
8.	Audience Interaction	A good presentation usually includes interaction with the audience to confirm transfer of content, e.g., Q&A, comments, discussions on key concepts, laughter, and applause.
9.	Breaks and Transitions	Social interaction, transfers between sessions, networking, physiological pause, keeping in touch with "normal work".
10.	Workshops	N to N participant interaction, producing collective outputs for proceedings.
11.	Visits and Socializing	Visits, tours, meals, and other activities and opportunities to meet like-minded people and to network.
12.	Disembarking	Changing settings, uninstalling software, and rearranging workstations.
13.	Follow-up	Storage/retrieval of material and contacts from the conference, sharing of material produced based on the conference for later publication.

Table 3
Activity Grid for networking during Breaks and Transitions from the viewpoint of a conference organiser.

Task	Actor's Motives and Goals	Contributions from Actor	Actor's Rewards	Installation: Affordances	Installation: Competences	Installation: Regulation
B&T-1 Agenda Plan and manage time for networking/social/ break	Excellent coordination of multiple actors with diverse goals within the conference time frame.	Provision adequate resource and personnel. Explicit recognition of content and relational goals for presenters and attendees. Pre-determine time reminders and other assistance for presenters. Pre-determine interventions needed from support and technical staff. Prepare fallback plan and resources.	Smooth, timely coordination of technical and support personnel. On-time launch, breaks, sessions, adjournment. Expressed satisfaction of presenters and attendees. Social recognition. Possibly financial reward or professional promotion.	Explicit timeline/run-sheet for distribution to technical and support personnel as well as presenters. Conference agenda and timeline to share with attendees – in multiple formats, updatable. Multiple communication channels with presenters, technical and support personnel.	Articulation of dual goals - content and relational. Communication skills to inform and manage guide session start and end. Knowledge of planning tools and software. Professional networks and accreditations.	Pre-conference testing of presentation media and logistics, audio/visual and navigation. Multi-channel announcements of timeline to attendees. Predetermined time reminders and other assistance for presenters. Accreditation for decision-making, budget clearance. Backup plans to accommodate time delays due to technical issues.
B&T-2 Space Plan & manage spaces for relational experiences during transitions and social breaks	Identified and sign-posted spaces for planned activities. Smooth avatar mobility between spaces for presenters and attendees. Respect privacy regulations, avoid leakage of personal data.	Communicate planned networking, breaks and transitions to support and technical staff. Instruct and supervise practice of avatar mobility and communication skills for all participants in onboarding process.	Manageable chaos during breaks and transitions. Expressed satisfaction of presenters and attendees. Observations of social interaction during breaks (for research and further improvement of the IVC).	Multiple communication channels for informational and relational exchanges with support and technical staff to support avatar flow. Provision of affordances for quick search/location and identification of other participants. Affordance for recording details and components of interaction for participants (e.g., exchange of e-business cards, note-taking).	Evaluate transition time required for presenters and attendees, to consider their navigational skills. Recognize avatar flow capacity of Installation in spaces intended for transitions, breaks, networking. Familiarity with multiple comm. channels available for various types of information and levels of intimacy. Skills to different avatars and spaces. Skills to start and stop, exit, or transition from conversations when appropriate.	Formalized VRtiquette (what formats and procedures are allowed/ recommended for interaction). Established registration ceilings. Ensure instruction and practice of avatar movement and communication skills during Onboarding process.
B&T 3 Content Collect, curate, disseminate, and confirm transfer of conference content	Promote Dissemination of conference content. Identify issues of content dissemination. Harvest early feedback on receipt and value of content.	Collect and curate content for dissemination. Disseminate pre-conference content. Disseminate content during conference. Provide information on availability of post-conference content. Receive and respond to content inquiries and content feedback from participants.	Expressed satisfaction of participants. Time savings from reduced requests for follow-up information. Impact of conference Reputation as organiser.	Vehicles for pre-conference content dissemination for presenters and attendees. Content capture mechanisms for conference-generated content. Content dissemination points in virtual spaces during conference. Vehicle for post-conference dissemination of content. Analytics on accessed digital content and its value.	Familiarity with content. Clarity on content ownership and permissions. Familiarity with presenters' preferences. Communication skills to monitor participants' epistemic processes and utilize feedback. Relational skills to collect on time and chase laggards.	Explicit understanding of IP issues and/or dissemination/ use constraints for all content, including formal presentation rules. Explicit understandings with all participants regarding collection, curation, and dissemination of content during conference. Signed release forms from presenters and participants, where applicable.
B&T-4 Relational Culture Create ambience and environment appropriate to networking and social relational goals of the conference	Deliver high value and memorable relational experiences for presenters and attendees. Encourage social interaction among participants - directly or via encouragement from support staff or presenters.	Provide friendly support to participants during onboarding process. Become familiar with relational goals of presenters. Approach others and be available to start and engage in conversations. Make introductions for presenters and attendees. Seed conversations with greetings and introductions.	Expressed satisfaction of presenters and attendees. Observations and reports of social interaction during transitions and breaks.	Designated spaces, events, and settings for avatar groupings of various sizes. Availability and receptivity of avatars for interaction. Support staff availability for navigation and communication prompts. Name tags for all participants. Provision of exchange (upload/download), search and retrieval affordances for all participants.	Competence for creating a socially magnetic milieu for participants to network with one another. Social 'radar' for noting when mingling is not working 'just right' and regulatory norms (see rightmost column) dictate acting to promote a more dynamic mingling than what is occurring spontaneously without organiser intervention.	Regulatory norms and VRtiquette seek to strike a balance for promoting openness of new connections yet move participants along to meet others if they freeze up other participants in a manner disallowing a continuous flow of new connections.

(*continued on next page*)

Table 3 (*continued*)

Task	Actor's Motives and Goals	Contributions from Actor	Actor's Rewards	Installation: Affordances	Installation: Competences	Installation: Regulation
B&T-5 Professional and social capital building	Expand personal network and fulfil own professional motives.	Pre-conference communications with presenters, attendees, support, and technical staff. Post-conference communications with presenters, attendees, support, and technical staff.	Reconnecting with acquaintances. Make new acquaintances.	Affordance for storage and retrieval of new connections and links with the previous social capital (address book, agenda, mailing lists etc.). Specific space/dedicated channel to meet with other stakeholders.	Self-description of interests. Curiosity about participants' interests. Conversational fluency of relevant interests.	Institutional cover and accreditations.
B&T-6: Biological	Periodic physical relief from sitting and screen-based interactions. Replenish energy with food and beverage. Replenish focus with periods of relaxation. Other biological needs.	Plan periodic bio-breaks for all participants, including support and technical staff. Inform staff colleagues if exceptions to the schedule are required.	More comfort and less stress during conference.	Explicit plan for staff bio-breaks. Catering for support staff.	Multiple communication channels for urgent messaging.	Mechanisms for addressing deviations from plan.

template filled at a high-level example for conferencing in IVCs in its entirety. This high-level discussion must be subsequently broken down in more detail, (see Table 2).

The next step of analysis is interested in the Installations that channel the individual tasks, and the transactions that take place in them, using an Activity Grid (Table 3) to analyze them. The Installation should support satisficing transactions, to facilitate task achievement. A portmanteau of 'satisfy' and 'suffice', the term 'satisfice' was introduced by economist, psychologist and Nobel Laureate Herbert Simon (1956, p. 129) as a way to express the concept of 'satisfying the minimum requirements'. Therefore, participants are asked about which goals they perceive as relevant in that action, taking great care to also collect their evaluation of the experience. In doing so, pain points are surfaced that are opportunities for improvement. e.g., training and onboarding of novices. What works well and should be maintained and fostered also becomes evident (Dieckmann et al., 2017). Full activity analysis should consider all participants and relevant stakeholders who use or have an input into a particular activity in the Installation: In this case, participants in their various roles were included (from audience to presenter, colleague; but also organizers, tech support, facilitators, planners, onboarding assistants, student helpers, security officers, publishers, etc.) This approach is a novel and robust way of making problem-setting systematic: every task is considered a local problem to be solved by the users/stakeholders involved; the designer's job is to make sure the installation facilitates solving that local problem. Some tasks are well supported by the current installation. Others are not, and these pain points become design problems. This is the classic spirit of design thinking, but our framework makes it systematic; it provides a well-traced process with the activity theory walk-through. Furthermore, it points at three potential layers of design intervention for each local problem (the three layers of Installation Theory).

Redesign with Installation Theory starts with listing the pain points as they arise along the activity pathway (see Table 4 below), making explicit what kind of dissatisfaction, errors, or frustrations they cause, and which actors are stakeholder(s). Then one looks for what causes pain points and problems (proximal and root causes), searching for which components in each layer of the Installation are lacking or faulty. At this stage, it becomes clearer what is easy to fix, and what less so, which allows making a priority list of issues for re-design. Finally, the redesign of the Installation itself is done by targeting some specific components for change, specifying the change, and implementing it.

An added value of Installation Theory at this redesign step of MID is its prediction that the Installation can be fixed by addressing opportunistically *any* of the layers, thus providing more degrees of freedom for design and intervention. For example, one may supply a missing function (e.g., microphone check) with a software affordance or with human support; one may provide social support or train participants to compensate for a missing affordance or competence (e.g., how to approach a person to chat with during coffee break). In terms of regulation, one can either provide technical safeguards such as making certain operations impossible or very costly by programming the affordances, or by empowering some participants as regulators in charge of enforcing the rules (e.g., mute audience during presentation). This multi-layered approach is handy, as different stakeholders have different levels of agency for modifications. For example, an organiser may not have the possibility to introduce major changes in the software platform and will then have to rely more on regulation.

Overall, this systematic MID approach has more "process" than classic design thinking (Brown, 2008, 2009), and therefore may appear somewhat cumbersome; nevertheless, the approach systematicity ensures that all the fundamental aspects of the activity are considered.

Section 3 describes the use of the Activity Grid in IVCs. Section 4 exemplarily details this process for Activity 8 from Table 2, "Networking During Breaks and Transitions in IVCs" from the viewpoint of one specific Actor, a conference organiser. It furthermore provides illustration of how the identification of missing affordances, competences, and rules in the analysis of the GILP21 prompted re-design recommendations that were implemented in a subsequent IVC for a conference at Stanford University.

3. Activity analysis in IVCs

Activity Theory applied to the trajectory of a user of an IVC will deliver a succession of tasks with their subgoals. Ideally, this is obtained by empirically following and recording real activity, and then interviewing the user while replaying the recording to capture reflections on their intentions and actual experiences (Lahlou, 2011; Theureau, 2003; Von Cranach, 1982). For IVCs, this need is easily met since most platforms offer a recording option. Table 2 shows at an aggregate level the activity of a presenter, as analyzed in (Lahlou et al., 2021). Let us note that, at the stage of experience collection, the moments of trouble, snags, frustrations, and satisfaction are especially interesting for the designer, as the former point at "pain points" where the Installation could be re-designed for improvement, while the latter point at what should likely be kept as-is.

For an action to be successfully performed, one wants the goals of the

Table 4
Re-design and implementations of Installations for social facilitation of breaks and transitions activity for conference organizers.

Task	Actor's Motives and Goals	Contributions from Actor	Actor's Rewards	Installation: Affordances	Installation: Competences	Installation: Regulation
B&T-4 Relational Culture Create ambience and environment appropriate to networking and social relational goals of the conference.	Encourage social interaction among participants - directly or via encouragement from support staff or presenters. Deliver high value and memorable relational experiences for presenters and attendees.	Provide friendly support to participants during Onboarding process. Become familiar with relational goals of presenters. Approach others and be available to start and engage in conversations. Make introductions for presenters and attendees. Seed conversations with greetings and introductions. ***Establish VRtiquette conventions, instructions, and governance.*** ***Curate VRtiquette guidelines into the Handbook for participants.*** ***Review VRtiquette with ALL participants in Onboarding process.*** ***Provide explicit networking instructions and tasks for participants during breaks.***	Observations and reports of social interaction during transitions and breaks. Expressed satisfaction of presenters and attendees.	Designated spaces for avatar groupings of various sizes. Availability and receptivity of avatars for interaction. Support staff availability for navigation and communication prompts. ***Name tags for all participants.*** ***Name tag extensions: Accessible identity and interest information personalized for each avatar.*** ***Communications between support and technical staff for acoustic controls and adjustments.*** ***Spatialized acoustics.***	***Some familiarity with participants' backgrounds and interests – to support personalizing their avatars.*** ***Monitoring of spatial and acoustic issues by support and technical staff.***	***Assistance in populating name tag extensions during Onboarding process.*** ***VRtiquette for starting and stopping conversations.*** ***VRtiquette for encouraging introductions and connections.*** ***Interventions on spatial and acoustic issues by support and technical staff.***
B&T-5 Professional and social capacity building	Expand personal network and fulfill own professional motives.	Pre-conference communications with presenters, attendees, support, and technical staff. Post-conference communications with presenters, attendees, support, and technical staff.	Reconnecting with acquaintances. Make new acquaintances.	***Name tag extensions: Accessible identity and interest information personalized for each avatar.***	Self-description of interests. Curiosity about participants' interests. Conversational fluency of relevant interests.	***Name tag extensions during Onboarding process.*** ***VRtiquette for starting and stopping conversations.*** ***VRtiquette for encouraging introductions and connections.***

actor to be "satisficed" with minimal undesired efforts.[1] Users want, if they must contribute, that the psychological contract (Argyris, 1960; Coyle-Shapiro, Costa, Doden, & Chang, 2019) be balanced so that they get some reward for their effort: the rules of social exchange (Blau, 1964) within that specific community must be respected. Usually, reaching the goal is rewarding enough; but that may not always be the case. Activity analysis lists in the grid the actors' *goals* and *motives* for each task in the activity (e.g., Social Greeting during Breaks), what *contribution* is expected from each actor, and what *reward* does each get in return.

Designers using MID need to ensure that these contributions/rewards are adequately supported by at least one of the Installation's three layers. For example, if the actor is a presenter, her goal is to appear in the right room at the right timeslot, to deliver her presentation, and to get good feedback from the audience. The rewards are to get there easily without stress, to get feedback on the audience's reactions and questions to confirm content transfer, to be able to capitalize on some good connections with other participants, etc. The designer asks, for instance: does the VR platform and the VRtiquette (social etiquette within the VR system) as the attendees engage in it provide "good enough" on-the-fly feed-back from the attendees to the presenter? Similar analyses can be done for other tasks, and for other actors—attendees, tech support, facilitators, etc. Such a process of continuous evaluation of the actors' goals and satisfactions is routine procedure for the GILP21. Evaluation questionnaires and feedback + lessons-learned sessions were planned by MediaX - their material contributed to this paper as well as to the design of the next event.

As one evaluates, for each task, whether the IVC's components do indeed channel the desired activity (viz. to scaffold, guide, constrain, control), the cells containing information on the components involved are being filled in the Grid. Artefacts and processes (e.g., digital maps transferring the avatar to the right room, check-in process, file repository, control screen …) as well as rules (e.g., schedule, registration,

[1] The literature around when an action can be considered "successful" is contentious and complex. We cannot engage in this discussion within the scope of this paper and use this lean, operational conceptualisation, but direct the reader's attention to (Inzlicht, Shenhav, & Olivola, 2018) for an alternative point of view.

chairing role distribution) are components of the Installation which, together with embodied competences (e.g., how to move one's avatar, presentation skills, knowledge of the topic), enable the presenter to play her role and reach her goals with the scaffolding of the presentation Installation—the latter being the bundle of all these components that assemble at the time and place of delivery to produce "a presentation", with contributions balanced by rewards.[2]

In practice, Activity Grids are co-constructed with participants, step by step, trying to answer the above questions (what the goals were, what elements helped or hindered). The level of Grid detail (the size of chunks) is variable and depends on the focus and current degree of smoothness of the activity. It is not necessary to go into detail in the steps that already flow well and where participants feel satisfied. But when a pain point is spotted, one may go into further and further detail until the reason for the problem is understood; often the devil is in the detail. As an example, the onboarding process, even though complex, seemed rather straightforward to participants, as it combined familiar sequences of registration of in-person conferences and classic online IT support. So, there was no need to get into detail. But the approach of another participant to engage in informal interaction appeared problematic and required doing so. We focus here on the social facilitation component of the dual problem space.

3.1. Social facilitation during a VR-conference

Social interaction and networking are important aspects of conferencing. IVCs hold many opportunities, but also pitfalls when it comes to connecting participants with one another. Physical conference Installations, capitalizing decades of experience, scaffold the creation of opportunities to socialize and foster serendipitous encounters. Social interactions, networking, and the simplicity of the experience are often less easy to transfer into virtual spaces than content exchange because they rely on bodily cues. Virtual conferences then need to *design* informal spaces for social interactions between participants. So, while virtual spaces may be more 'time-efficient' in terms of transmitting information, the relative absence of informal spaces and opportunities, especially for socializing outside of the main program and 'venue', should be carefully assessed and addressed by design.

General practices of in-person conferencing include activities such as queuing for lunch, discussing coffee quality, but also going to a bar after the conference or bumping into fellow participants in the hotel lobby. These are but a few examples in which small talk can spark great conversations and perhaps lead to new connections, innovation, and projects. Additionally, affordances that result in crowd-stirring effects (such as random seat allocation) may encourage serendipitous encounters.

Software for online or virtual conferences tends to emphasize delivery and reception of content. Thus, Installations are often well-equipped for participants to collaborate and coordinate in that *content* space. But there is ample room for improvement in IVC platforms regarding the *relational* spaces, spaces that facilitate and reinforce social interactions between the various participating actors in their various roles. IVCs have the potential of establishing opportunities to integrate into online spaces some of the affordances for spontaneous social exchanges that conferences in physical spaces offer naturally, and also to create new ones; as suggested by Hollan & Stornetta (1992). Relational affordances are still not realized in most IVCs, and while some offer spaces to meet (e.g., a lounge or hallway to the auditorium), these are not full-bloomed Installations equipped with behavioral rules and competence-building facilities. To illustrate in the following, the specific case of an organiser's activities during Breaks and Transitions at a VR-conference is analyzed, and issues with the Installation used during the GILP21 are identified. This will also demonstrate how MID can lead to concrete improvements.

To design the Installations, it may be handy to use the notion of roles and status as defined by Stoetzel (Stoetzel, 1963; author's translation). The ***Role*** (of a person) is the set of behaviors that others can legitimately expect from that person. The ***Status*** (of a person) is the set of behaviors that person can legitimately expect from others. These clarify for the designer which transactions that one user is allowed to perform and those from which they expect to benefit. There are multiple roles in the IVC. Each comes with permissions and the capacity to perform specific types of transactions. For conferencing, such roles include, but are not limited to, attendees, presenters, facilitators, tech support, and organizers. For example, the presenter and the attendees will not have the same access rights to presentation documents during a plenary: the presenter can change slides, the attendees cannot. In the onboarding phase, an incoming person will become a fully-fledged "conference attendee" with access rights to the conference premises only once they have been registered by the organizers. But there can be more subtle details, such as the fact that someone tagged as a "colleague" by an attendee may have continuous updates of that attendee's current position in the VR space while non-colleague attendees will not have access to that information. In computer programming for IVCs, this means that the access rights to various data or functions will differ with roles; so even for the same user account, access rights will be situated and vary with time and situation according to current role and status. That is a consequence of the transposition of face management and face work (Goffman, 1959, 1963) in virtual environments.[3]

Some implications for design are that: an attendee who is also a presenter must at some point of the onboarding process have their user account tagged as such, and this tag should also include the setting (e.g., time, location …) in which this "presenter" role can be activated: the user's avatar in a way embodies this competence. Conversely, the local setting (here, the presentation session) should be equipped with an

[2] As a side note, IVCs have a different activity list than in-person conferences or online meetings: for an IVC, several lines in Table 2 differ from activities of in-person conferences. For example, there is an onboarding phase that will familiarize the participants with the IVC space, checking they have the right system on their terminal, and customizing their avatars. This phase replaces the "travelling to the conference site" and the "disembarking" replaces "travelling back" of an in-person conference. Onboarding will start long before the orientation phase that would happen on arrival at the site of an in-person conference. More generally, since the constraints on space are different in an IVC, time constraints are loosened: some things that were usually performed "on site" (such as checking one's presentation runs smoothly in the plenary room) can be done in advance and remote. That is why it is necessary to do an activity analysis anew with the specific possibilities and constraints of virtual environments, rather than transpose slavishly the processes of an in-person conference into the IVC. For example, the presentations themselves can even be decoupled from the Q&A as is now common practice for remote conferences: for CHI 2021, short video presentations were pre-recorded; for WPRN2021, the live sessions include Q&A based on papers and video presentations made available beforehand.

[3] Let us provide a concrete illustration: an IVC can permit one given person to perform in different roles at different moments and places through self-imposed changes, sometimes including their avatar appearance. For example, a participant might be an audience member in the opening session, then a presenter the next day in her own session, she might also be a moderator in a roundtable; she might be a colleague to some, but not to others, etc. What matters is that any user can adopt the appropriate role and be given the "face" (Goffman, 1959) matching it to facilitate interaction while respecting comfort and privacy. Providing the matching face to the user for each transaction, and no more than what is strictly needed for the transaction at hand, is called the 'privacy razor' (Lahlou, 2008); this avoids irrelevant information to leak in the transaction. With some roles comes the ability to empower or acknowledge other participants with roles. For example, organizers have the power to name presenters (by accepting their presentation), to name panel chairs, etc. Designations signaling the role may be used, as for in-person conferences, providing a badge or ribbon on the avatar to indicate the role that one is performing at a given moment, for example 'session chair'.

authentication system that does *afford* access as presenters to those, and only those, who have the relevant presenter tag and have *competency* to use those affordances. Finally, there should be a central control system that records and *regulates* who is a presenter when and where; that is key if there needs to be an exertion of control in case of problem, ambiguity or simply change of planning. Installation theory is therefore a framework for matching analysis directly to adapted design, and it provides very precise directions for this matching with these three layers of the functioning Installation.

This example shows how the analytical approach of MID, although grounded in theory, is very much tuned towards design applications. The next section looks more deeply at the opportunities and pitfalls encountered during the GILP21. It is detailed, more generally, regarding how some current Installations for virtual conferencing do, or do not, produce a positive environment for successful content and social learning. Drawing on this empirical foundation, then, concrete design considerations and enhancements for IVCs are derived and presented, focusing especially on the social activities for Networking that are currently under-designed, or not designed with the necessary adaptability to the context in many IVCs, although they are essential motives for participating. The analysis of this use case of course remains incomplete; design is always work in progress, IVC design is still in infancy, and this paper only allows space for a few illustrations.

4. Use case: Networking during breaks and transitions in IVCs

Breaks and transitions during conferences create a series of problems and opportunities. Typically, it is in these moments that many social connections are initiated or transformed. They have two aspects: the first is a functional transition of the user from one Installation to another; this means re-installing components in three layers, which can pose challenges. The second is that, because these are liminal spaces between more formally channeled activities, they offer opportunities for serendipity and initiatives for participants. Participants of in-person conferences usually know the conventions around exchanging business cards, or 'queueing' in front of the lectern to engage directly with the speaker. In IVCs, transitions are subject to several complications. For presenters, technical issues with slides and media formats become overshadowed by microphone, camera, connection, or firewall issues. As a result, these technical issues tend to "eat" break time and leave less time for encounters.

Second, transitions between sessions in physical conferences also serve an important function for the relational space, in allowing participants to mix and mingle, discuss upcoming sessions, and for 'happy accidents' in general to occur, meeting old friends or making new ones. Transitions need to be considered carefully and tailored to the IVC so that they can fulfil their overt purpose and enable the conference to run smoothly, as well as facilitate the important social and networking functions they provide in physical environments. In short, Installations for transitions must be *designed*.

Regardless of a participant's background or motives, and which roles are taken during a conference, the participant's activities at a conference will require taking breaks and transitions between different areas. Thus, breaks and transitions are relevant for all conference actors and are orchestrated by conference organizers. And although some details might differ among these actors, challenges and issues largely overlap between the roles. A presenter must visit the restroom just as an attendee does. An organiser will often have to transition to another lecture hall, akin to somebody involved in facilitating a panel discussion or a group work session.

The following illustration of Activity Grid analysis focuses attention on the activity, Networking During Breaks and Transitions, and specifically on the actor's role of Conference Organiser. Table 3 presents some of the activities associated with the conference organiser's role for breaks and transitions during the GILP21. Naturally this analysis must be done for all actors and all activities.

As anticipated in a dual-problem space, participants attend a conference to "learn" something from listening to talks and taking part in workshops, as well as to enjoy the "serendipitous" events that happen during breaks and transitions (B&T): the people encountered, the illuminating side conversations, the places visited, the food eaten. Well-planned and managed B&Ts are essential for conference success. In both in-person and virtual conferences, they often receive less attention from organizers, designers, and facilitators than, for example, onboarding or plenary activities. Over multiple experiences, in-person conference organizers and participants have developed knowledge of, or understand intuitively, how to 'navigate' B&Ts, in terms of the physical spaces, as well as their social functions (where walking through corridors or meeting in the restroom might facilitate serendipity). In fact, participants usually need to adapt their behaviors to the Installation and experienced in-person conference-goers can "read the room" and adapt as necessary. But for IVCs, B&Ts are still in their design infancy, are less well-directed, and activities that usually take place in B&T, such as soft onboarding, resting, using the washroom, smoking and meals, reflection, figuring out what to do next, and socialization, have eluded centralized planning and design.

Installations for virtual conferences require a higher level of explicit attention and self-regulation due to differences in presenters' and attendees' knowledge of IVR affordances and rules, as well as their respective embodied competences. Thus, the IVC Installation should be designed based on intended participant behavior—requiring foresight and design strategies that are not yet evidenced in IVCs.[4]

4.1. Issues identified for Networking During Breaks & transitions

A complete Activity Grid analysis of the tasks, motives, contributions, rewards, and Installations for each activity and for each actor provides the key elements of the Deep Design (DD) process enabled in MID by the combination of Activity Theory and Installation Theory. Otherwise certain to be too lengthy for this paper's purpose, the authors have chosen to illustrate MID and its application on only one discrete and thin slice of activity, for one particular set of actors: *Networking During Breaks and Transitions for Conference Organizers*. This analysis is augmented with the inclusion of issues identified from observations and from participants' feedback in post-conference interviews.

As shown in Table 2, the Activity Grid analysis identified six essential Tasks in the B&T activity for conference organizers: Agenda, Space, Content, Relational Culture, Professional and Biological. The IVC used for the GILP21 included Installations to support conference goals and organiser's motives for four of the six activities: B&T-1 Agenda, B&T-2 Space, B&T-3 Content, and B&T-6 Biological. Installations were found to be inadequate or missing for the B&T-4 Relational and B&T-5 Professional tasks of the conference organizers in the B&T activity and revealed to us that the current state-of-the-art IVC solution enjoyed vast opportunities for improvement.

The detailed articulation of these omissions provided a shared understanding of the redesign challenge for the conference organizers and technical staff. Expectations and conventions were developed to create a

[4] Take, for example, one of the activities that has been described as essential in both physical and virtual conferences: networking (see Table 2, Activity 8). B&Ts are one of the main moments in which these types of activities are realized, usually (in physical conferences) in an almost natural manner and without much direct planning and intervention from organizers and facilitators. Nevertheless, such interactions in IVCs require complex and well-conceived affordances to work well. IVCs, especially with high avatar density, require multiple levels of information, communication channels, privacy, and avatar mobility to allow people to interact effectively in both large and small groups. Additionally, requirements may differ across actors' roles for the specific objectives of individual conferences. For example, a participant may need more time and conversation to reflect on what was learned, whereas a speaker may be occupied with planning the next presentation.

VRtiquette for subsequent conferences, and these were articulated into specific affordances, competences, and rules to promote the media literacy of participants. The articulation provided direction for the technical staff to use in code enhancements for the digital platform; it also provided direction for the support staff to use in augmenting the Onboarding Handbook for participants. A refreshed Activity Grid, completed following these changes, is shown in Table 4. Redesigned elements are shown in ***bold italics***. As noted previously, some Installations serve more than one task, and this was the case for VRtiquette as well as the name tag extensions. In the complete Activity Grid, benefits of these improvements accrued also to Presenters, Attendees, Support staff, and Technical Staff.

As previously noted, the full Activity Grid analysis was complemented by observations and participant feedback. Participants reported several limitations that constrained their experiences and their ability to make new acquaintances and foster social interactions. Secondly, and possibly even more importantly, conference organizers noted that the current design specs of this IVC did not realize the potential or the advantages of IVCs over physical environments. Some issues around the Activity of Networking During Breaks and Transitions that were identified using observations, participants' feedback in post-conference interviews, and from the full Activity Grid analysis are listed below. These activities and their Installations concern a variety of IVC actors, including presenters and attendees.

Time management and scheduling: Managing the duration of different activities and providing the right affordances to fix technical problems are both essential for ensuring that the crucial activities typically taking place during B&Ts can indeed take place. As can be observed in Appendix B, which provides a transcript of communication back-channel interchanges at the GILP21, technical and operational bugs do occur and require time to remedy. From experience, these 'bugs' occupy much more time than anticipated and accordingly significantly reduce the available time during breaks. Facilitators often planned to prepare for the next sessions during a break but found themselves instead connecting attendees having technical issues through an intermediary platform (e.g., Zoom, WhatsApp, phone, etc.). If not managed correctly, this pattern can severely limit the time available and enthusiasm for attendees, facilitators, and speakers to engage in networking, rest, and organization activities (see Table 3, Task B&T-1). *The training and equipment checks during pre-onboarding reduce the number of transactions related to communication queries and problems. This is especially true for issues with sound and microphone, requiring specific training of* support *staff regarding frequent issues with parametering specific terminal/OS environments to facilitate problem-solving on the fly*.

Informal conversations: Another factor for successful networking concerns informal conversation, which helps create connections with new acquaintances or reaffirm them with old associates. In physical interactions, participants can easily modify the reach of their voices. *The redesign process partially addressed this issue with spatialized acoustics (fading or fixing the reach of speech based on proximity) - see* Table 4*, B&T-4*. Yet such a constraint limits the opportunity for two conversations happening in parallel when many avatars are close to each other. Participant feedback indicated that this situation creates problems when multiple groups of participants in the same space desire concurrent, independent discussions; the issue becomes even more salient when exchanging hearsay or discussing the work of other participants. It was often difficult to know who is currently listening in a virtual space, and this had the potential to lead to the illusion of a private conversation, when there is really a much larger audience. Affordances that allow for communication targeted to specific people can be reintroduced by design (received selection by click, *sotto voce* speech-to-text messaging, etc.), but it is important to keep in mind that various options have very different consequences for social interaction and the decision for implementation may be guided by the composition of attendees and their objectives. Ongoing considerations revolve around making explicit visually which avatars are in capacity of hearing the user for a given setting, and therefore signaling (e.g., with an aura) the "effectivity" of another participant. Effectivity, as defined by Turvey and Shaw (1979, pp. 205–206) is the action capabilities that an organism has in a particular environment. Effectivity complements the notion of affordances—it is what actions the current environment affords the subject to do, in this case hearing, so an avatar talking to another can easily see who is hearing her. In some environments (e.g., Teemew), such zones of hearing are located visually on the floor: all those in the marked zone can hear each other; but these zones are spatially fixed, and not mobile and centered on the speaker.

Enhancing non-verbal interactions: Physical gestures available to avatars at the GILP21 leveraged movement of limbs - handshaking, saluting, dancing, etc. In-person interactions benefit from important cues delivered with more subtle facial gestures. Current technologies can integrate Automated Facial Affect Recognition (AFAR) systems that can map the real expressions of a participant to their avatar's faces to afford non-verbal tacit communication (Niinuma, Jeni, Onal Ertugrul, & Cohn, 2019).

> "I recall when I first landed in the reception area for networking, my microphone setting was on max volume, unbeknownst to me, and after speaking a few words to a poker-faced emotionless looking avatar, I was asked by a technician to turn my mic volume down because everybody in the conference could hear me", (P16).

The Activity Grid confirmed this issue in B&T-2 relational culture and B&T-4 relational experience and for the re-design, procedures for communication with technical staff for interventions for such issues were specified (see Table 4, B&T-4.)

Distractions and rest: Conferences are demanding. In fact, they often trigger a state of constant cognitive overload for participants. Attendees of the GILP21 reported that the new content was very fun and inspiring. Yet, mixed with the various stimuli emerging from the new environment in the IVC, they often struggled to sufficiently reflect on and resonate with that knowledge. Furthermore, the digital proximity of affordances for routine work, such as email and other digital platforms, tempts an attendee's attention away from conference participation, especially from discussion and reflection during B&T.

> "With notifications from work and social media popping up in my conference screen and no one watching if I was checking my phone instead of paying attention, it was sometimes difficult to resist the temptation to use breaks to answer work emails or do other activities instead of interacting with other conference participants" (P3).

The flexibility to allocate portions of the conference time to other activities is a task of the conference organizers (see Table 3, B&T-1 and B&T-6). Affordances and rules in the Installation can remind participants that time has been allocated for routine work and encourage them to limit these activities during break times (see Table 2, Activities 2, 5 & 8). Reminders to use B&T for in-IVC networking, and strong auditory signals for calling back participants to the IVC after offline breaks to cater for biological needs are advised. Automatic muting of the participants' microphones when they are away from keyboard (afk) avoids irrelevant sound leakage from participants' homes, as was sometimes experienced during the GILP21.

Parking Avatar: At a physical conference, when someone is taking a break, departs for the restroom, is on a phone call, or is taking a nap on the sofa (see Table 2, Activity 9), their state is clearly visible to others. In a virtual conference, an avatar may simply be left unattended. IVCs rarely offer dedicated places to 'park' an avatar or indicate that the owner is absent for engagement. If a participant has unsuccessfully approached several 'afk' avatars, the initiation of new conversations will likely be diminished:

> "I approached someone and introduced myself. It is already a bit weird in this new context to do that. It got even weirder when there was no response. Did she not hear me well? Is she not interested to

talk? Or maybe not even there? That experience really made me unsure about when it is ok to approach someone." (P2).

Clarifying which interactions one can have with an 'afk' avatar, and social rules around them, are important design choices and meeting facilitation activities. Making such rules explicit in the VRtiquette for a conference and including that in the onboarding process can better inform the system's social regulation layer. More generally, the conventions for informal interactions in IVCs may not yet be well understood. The development of social relations during break and transition periods will benefit from rules with affordances that facilitate requests for contact (as developed in social/dating apps), supporting interest information, and communication skills (See Table 4, B&T-4).

As can be seen from these short extracts from the analysis, MID brings up a vast series of points for improvement, some of which can be addressed immediately with technical improvements, with training and instructions, or with rules. But MID also highlights issues that would require substantial effort to solve, as in the above example of affording and signaling the audio effectivity of participants in a moving zone centered on each user. At a minimum, MID provides the activity rationale of the problem and points at possible intervention paths in the various layers of the Installation.

5. Insights and issues from Multilayered Installation Design (MID)

This section provides some generic insights emerging from the use of this new structured approach of designing Installations, then lists a series of deep-design issues to be solved that were exposed using the method.

5.1. Insights

As a preamble, Installation Theory was found to be a useful tool for uncovering systemic issues that are consequential for IVC participants' experiences across material affordances, embodied competences, and social regulation—the 3 layers of Installation Theory that collectively assemble in the moment to channel behaviors. After analyzing IVCs using this structured approach, it is possible to ideate solutions that address the problems to solve the root cause issues across all 3 layers. Other methods in popular practice tend to focus only on the surface-level issues, and do not address the underlying issues within the Installation and its components. Although this example focuses on IVCs, the approach and findings serve as an example use case highlighting how MID, rooted in Activity Theory, can be applied in other contexts, yielding a new perspective on how to break down, understand, and improve an experience within an Installation. Lastly, the Activity Grid provides a tactical framework for exploring and understanding an Installation, uncovering areas for improvement, innovation, and fundamental change.

Trying to reproduce in VR the current way of doing things appeared a myopic approach; it is retrospective design thinking rather than taking advantage of the new possibilities of VR to perform rewarding activity and realize new human-machine configurations. Hollan and Stornetta's 1992 paper 'Beyond Being There' observed that:

> *"a belief in the efficacy of imitating face-to-face communication is an unquestioned presupposition of most current work on supporting communications in electronic media …. The general telecommunication problem seems to be to create a system that affords us the same richness and variety of interaction that we have when we are physically proximate, even when we are physically distant. (…) Any system which attempts to bring those that are physically distant into a physically proximate community by imitating physical proximity will always keep the former at a disadvantage. This is not because of the quality of the systems, but because of what they attempt to achieve. If we ever hope to solve the telecommunication problem, we must develop tools that people prefer to use even when they have the option of interacting in physical proximity as they have heretofore. To do that requires tools that go beyond being there. To create such tools, we suggest framing the problem in terms of needs, media, and mechanisms. The goal then becomes identifying needs which are not ideally met in the medium of physical proximity, and evolving mechanisms which leverage the strengths of the new medium to meet those needs"* (Hollan & Stornetta, 1992).

The MID approach combining Activity Theory and Installation Theory elaborates a specific methodology in the spirit of their recommendations, with special emphasis on IVC user *needs*.

In general, designers, developers, educators, orchestrators should ask themselves Deep Design questions, about which *motives* their Installation serves, what *goals* the users want to achieve, and what the *values* are they want to socially engineer throughout the design process. This approach goes beyond a focus on media and mechanism; it does not dwell on the surface design questions of "how to". While DD issues (e.g., building social capital) will remain, the components to support and channel these conferencing activities will evolve with technology, VR culture, and the norms and regulations of the general culture (e.g., privacy rules). As users become more familiar with these IVCs, competences and VRtiquette will become common grounds. IVCs will gradually become something more and more different and more specialized than in-person conferences, rather than being viewed as a diminished (or augmented) substitute.

Although they require high bandwidth communications for implementation, IVCs exist in a medium that is leaner than the richness of in-person presence. IVCs are still in their infancy; a series of issues arise from the fact that the VR platform's material affordances rendered in software were given more attention than the embodied competence and social regulation layers. The issues and insights listed below were more specifically targeted in the specific GILP21 IVC and provided here as an illustration of what can be done with the Activity Grid, using Activity Theory and Installation Theory. In several newly developing VR environments, these issues have begun to be dealt with, or are on the design roadmap.

The point here is that the central task should not be to design "VR platforms" that enable conferences. The focus should rather lie on designing *Installations* for Virtual Conferencing, and therefore there is a need to analyze the human activities and the actors' motives, which are a crucial part in these events. The Activity Grid provides an intuitive and effective tool for accomplishing this task. What is true for the specific example of IVCs is true in general: technology, practices, and regulations evolve: they are a means to an end; but the motives and goals of human activity change relatively slowly; these are the deeper, stable elements of the system and therefore those that should be taken as the basis for design efforts. This is what MID does, and it precisely aims at improving these means to reach ends in a more efficient and satisfying way.

MID's Activity Grid analysis provides lines (actions, seen from an actor's perspective) that are lasting DD entries which will find different solutions in different Installations, depending on the values and objectives of the IVC, the state of technology, and the culture of its users. These lines remain as long-term structural deep design guides for the design of the IVC Installation, even as the content of the cells changes. This approach enables one to capitalize on the work done at the time of systems thinking and design thinking, and to update it constructively as new solutions emerge, e.g., as new technologies appear to address the issue, and as needs evolve. For example, a presenter will always benefit from audience feedback, but the way such interactive and conversational resources are provided and the context for challenge will vary.

For now, this paper shows how design analysis structured by MID can produce guidelines for specifications, and the same method will of course be re-useable for future improvements to IVCs. This paper is a first-hand account of how a systematic analysis, rooted in Activity Theory and Installation Theory, can guide researchers and practitioners in design processes. Specifically, MID follows three steps that can be

flexibly applied to the analysis and design in other contexts:

1. Analyze the specific processes of the Installation with a two-pronged approach focusing on Activities ('the time dimension') and the Installation itself ('the system component dimension').
2. Cut the global activity "at its joints" into thematic activity chunks that warrant a coherent analysis in more detail. For this paper, several chunks in 'Breaks and Transition' were selected for illustrative purposes (see Section 4). However, the selection of chunks is flexible and should be done in a way that supports the respective needs of the installation, i.e., different relevant break points will emerge naturally when analyzing the activity of cooking an omelette or seeing a patient for a general health check-up. Here, chunks in B&T were selected because they created the most immediate implementation opportunities for the focal problem.
3. The activities within the layers are examined by filling in a structured "Activity Grid" and analyzing the associated activities (Appendix A). Importantly, the tasks and their funneling Installation layers for each activity are identified for each set of relevant actors and stakeholders. This differentiation is important for most design specifications, as various actors might have different motives and actions within the same layer of a chunk, according to their respective role and status.

MID analysis is complemented by identifying specific issues that constrain the actors in satisfying their motives (see section 4.1). Again, Installation Theory is applied to explore these issues. As participant practitioners in the GILP21 have noted, conceptualizing issues with the help of Installation Theory informs a structured and goal-oriented approach to design that improves on the usual design thinking approach by providing a robust analytic and idea-generating framework.

One important determination will be to decide what affordances, competence assists, and rules will be implemented as code in the VR platform, and which degrees of freedom will be left to participants, and to artificial agents (which may be part of the system or embodied as avatars). As an example, for the case above, the presenter's need for feedback could be solved by the system, independent of attendees' deliberate actions of feedback. Questions could be generated and sent to the presenter, or they could be sent to the chair who edits and transmits them. However, the obvious question is whether this design choice will address the presenter's need, or whether live feedback from humans is warranted. Such issues—the tradeoff between efficiency and social fabric of a group—will be more and more apparent with the increasing use of AI based on articulation of affordances, competences, and governance. The notion of the *semantic Rubicon* becomes relevant here: "The semantic Rubicon is the division between system and user for high-level decision-making or physical world semantics processing. When responsibility shifts between system and user, the semantic Rubicon is crossed" (Kindberg & Fox, 2002).

The next section offers a non-exhaustive list of current considerations with IVCs underlying a series of actions, describing the way they appear now, but also depicting the underlying Deep Design issues. These issues are provided as food for thought, and as a reminder of the requirement to do social engineering of the values the community holds and wants to foster. These problematic issues derive directly from the specific problems identified in Section 4. Usually, these points can be addressed by a redesign of components in one or several layers of the Installation. This MID process focused on points with an impact on the layer of physical affordances because these are the most limiting factors currently. Based on experience, when an affordance layer is functioning effectively, rules and embodied competences tend to develop more easily. Nevertheless, it should be clear that the most important aspect to be targeted is the rules. IVC design is about social engineering of the values of the community, which are expressed in the members' behaviors; affordances as well as rules are accessories to that effect. This is expressed in the five subsections below.

5.2. Deep design

The term 'Deep Design' (DD) refers to issues that are generic problems for activity support. For example: "providing social feedback during interaction"; "providing record of transaction". A Deep Design issue is a functional problem, and ideally it should be addressed with some generic design principles that will be adapted to local situations. Here are some we encountered:

5.2.1. Clarify the nature of installations by spatializing them

Because affordances, roles and rules may vary from activity to activity, it seems advisable to "situate" in space the various Installations by establishing specific zones for specific activities when organizing the physical world in what Barker (Barker, 1968) calls 'behavior settings' in his ecological psychology. This creates a situated framing for behavior, putting participants in the adequate mindset, and setting their expectations, their role and status, thereby suppressing possible ambiguities and feeding forward participants' behavior. Plenaries should take place in auditoriums, meetings in hallways with welcome booths, and private conversations in "enclaves'' that can be specifically signaled for their suitability for that purpose by the type of furniture in place. The zone of reach for speech, or of restricted access, should be signaled by visible borders (marks on the ground, color of air, etc.)

The architectural message is simple: make affordances for activity visible; and situate specific activities in specific zones. VRtiquette will thereby be easier to learn and enforce. That is what is usually done in real world spaces, and Christopher Alexander provided a catalog of architectural 'patterns' for the design of such specialized physical spaces (Alexander et al., 1977), an approach that can be generalized to design augmented or virtual spaces (Jan 2001). Digital design provides multiple and new ways to do so in VR. Humans will remain spatial animals, even in VR. Spatial cues remain a fundamental element of memory and action (Miller, 1993) for all animals, as they are moving creatures, unlike trees.

5.2.2. Signal role and status to support social interaction

Another crucial element in the social space (in general and in IVCs in particular) is to fluidly manage encounters between participants. While Augmented Environments have added information to interactive objects, useful descriptions of people (bios, keywords, shared contacts, etc.), as implemented in gaming and social environments, are yet to be integrated smoothly into IVCs. These affordances could take the format of click-and-save photo-bios, wearable tag clouds (Steinbock, Pea, & Reeves, 2007), multimedia journaling tools, or conversation scheduling functions. These badges and their content can be used to search, match, and exchange information. Nevertheless, one should seek designs respectful of digital privacy (Lahlou, 2008) and compliant with regulations such as the GDPR (European Commission, 2016). Thus, their consultation may be conditioned by situational rules; these should be specified in the VRtiquette, and likely have some implementation in coding of the platform. Another option would be to customize the avatars using photos of participants (see e.g., the Teemew platform), or by making avatars customizable "by hand" to some extent to approximate the complexion of their users (as was the case for the GILP21). Nevertheless, customization options do not usually include the exact stature, posture, and gait; consequently, identification is not always easy, and badges remain needed.

5.2.3. Enable exchanging documents

During and after encounters in virtual environments, IVCs also need to ensure smooth exchange of documents and contact information, integrating calendars and appointment features, as well as automating the exchange of contact details outside the platform. Nothing is easier than providing means of exchanging and storing data (if you don't have

to engage with it afterwards). But multiplying what is exchanged produces clutter and cognitive overload. What should be exchanged? How should it be symbolically or mentally indexed, so users know what they have, and be able to retrieve it on demand? Should documents be indexed by content, or by social connections, or by spatial locations? Or some combination of these? Or perhaps associated with goals as metadata? Do the data need to be transferred, or is a link to a repository sufficient? Again, one needs to clarify data policies for what purposes, and as part of which actions data are being exchanged. Such clarity on DD issues will facilitate further retrieval and use. These *rules* can be explicitly communicated to participants as part of the VRtiquette and embedded in the affordances.

5.2.4. Foster serendipity

Serendipity is a key aspect of IVC. The reasons to participate in the IVC are to learn something useful and derive useful connections. But participants don't know exactly which (knowledge, connections) in advance of the conference. So, the facilitating issue for encounters is to produce a mix of meeting the people you want to meet (and know already) and some people you assume would be good to know, but also people whom you are not yet aware that they would be good to know, given your interests and affiliate networks. In this respect, good signaling of role and status is essential.

Facilitating these serendipitous social encounters in IVCs is therefore a complex DD problem, especially since "good to know" may mean different things. Clarifying the rationale, the trade-offs and the processes chosen are all necessary before designing the Installation. Have these DD questions been addressed explicitly in your current design? As detailed above, these questions can be addressed by any, or several, of the three layers. There is not one single answer, rather opportunistic compromises between efficacy, access, comfort, resilience, and costs.

5.2.5. Communicate social norms (VRtiquette)

This is "the way we do things around here" (Schein, 2010). Social norms usually are tacit rules that can be picked up by observation (Tomasello, 2016), or they are taught to junior mentees by senior members of the community. But social norms that are valid for physical conferences do not necessarily translate readily to IVCs. Moreover, in IVCs, the opportunities and channels to obtain such information are different and scarcer than in face-to-face settings. It might therefore be useful to make at least some of these rules explicit more than one would for physical conferences. Organizers cannot assume that all participants will be "naturally" aware of the local conventions, and must put in place very explicit onboarding instructions, as, for an official ceremony, the person in charge of protocol would make sure with each guest that they have understood the rules and know how to perform their part. They may even have rehearsed for high-stakes transactions (see e.g., a wedding, a TED talk, an award).

Indications of what is typical/acceptable to do during different IVC activities (both breaks and transitions and others) can help reduce participant's anxieties, channel participants' actions towards serendipitous connections, or ensure that participants take proper breaks which allow them to fully engage with the remaining activities. This aim can be achieved either by creating affordances that help participants figure things out or that make more salient what others are doing (such as self-check facilities accessible prior to the conference or the afk notification discussed above), or by giving participants direct tidbits of information and encouragement integral to the cultural practices of the community that is convening (e.g. "in this break most people chat informally, but some go afk, so don't feel discouraged if some avatars don't respond to you at first"). Onboarding processes play, of course, an essential role in setting these expectations, but the conference expectations and protocols should also be continuously reinforced during the whole conference schedule. It is moreover likely that some participants will need human (online) guidance by facilitators regardless, and so planning for support roles and capacities accordingly is necessary.

From the previous discussion of material affordances, for example, communication in IVCs is not a matter only of affordances. Social norms and rules relating to VRtiquette also determine the success of a conference. When should attendees ask a question? How do they signal that they want to ask a question? Who selects the questions and determines their order? In IVCs, one has a much larger choice of options than in-person conferences, as for example questions can be written by the audience during the presentation and sorted in parallel, etc. Should the presenter be given a choice over these options? That is a DD question for organizers. At the same time, with multiple channels the options to "make a mistake" and disrupt the flow of the conference increase. A similar tradeoff between choice and control exists in anticipating which participants will engage with each other outside of the plenary. Some prominent members of the community might be overburdened with unwanted attention while others find themselves alone yet surrounded by unresponsive, afk avatars. It is thus important to bear in mind that the mere presence of avatars in a social space provides limited information about how many of them are listening to conversations or are afk, and when/how it is appropriate to approach them.

The general framework described by Yamin and colleagues (Yamin, Fei, Lahlou, & Levy, 2019) provides a useful guide to understand and design behavioral determinants based on social norms. The range of intervention mechanisms that can be used to communicate normative information to participants can be described along two axes: (1) one describing in-world versus out-world channeling/information, (2) the other describing group summary information messages (e.g., "most people do this") versus making visible the actual behaviors and opinions of people. Although findings regarding which types of interventions might be more effective are not yet conclusive, evidence suggests that providing affordances across the four dimensions might be a good idea to leverage the advantages of each. Early results also suggest that intervention mechanisms implemented in the same context where behavior happens and that make visible other people's behavior and opinions might be especially powerful. For IVC conferencing, providing real-time indications of what other participants are doing or are planning to do (especially during breaks and transitions where serendipity might happen) can be especially generative as a channeling mechanism.

5.2.6. Record, store, and tag experiences

Another social norm design question for DD attention is the capacity for recording, which raises many privacy questions. What matters here are the values that the organiser wants to foster: these will be implemented in the rules and in the affordances. What may appear to be simply technical choices are in fact suffused with ethical and philosophical issues that will shape the IVC's cultural milieu: designing of these IVCs is social engineering of the values of the community and accordingly, orchestrating the behaviors likely to take place in them. For this example, the very fact that it was possible to use the logs of this backchannel for the GILP21 raises interesting questions: how much of what happened in an IVC should be recorded? That "what happens in Vegas stays in Vegas" is precisely the reason that enables Las Vegas to be the place it is (no moral judgment involved here by the authors). If IVCs are fully recorded—and that recording might include private conversations—they might become terribly dull and politically correct venues. Chatham House rules are a condition for some candid exchanges and trust building. There are many dimensions to the complex tradeoff space for what the community might positively and constructively learn in aggregate from recording and analytics of IVC recording content and the potential detrimental effects of privacy loss and diminished participatory exchanges.

5.2.7. Go 'beyond' physical conferencing

IVCs may currently still struggle with providing some of the features that participants expect and are 'used to' from physical conferencing. However, the focus of designers should go beyond trying to approximate "what we are used to" as closely as possible, as advised by Hollan and

Stornetta. There are desirable things that digital systems can do which would be impossible in non-digital interactions, which will allow us to boldly rethink the very ways in which conferencing takes place. IVCs can make recommendations for whom to interact with based on common interests and can even be architected to explore differences in opinion. They can also smoothen communication barriers across lines of hierarchies, cultural differences, and personality types, and even introduce controls and preferences for how much randomness and serendipity participants will experience during a conference. Finally, IVCs offer a major opportunity for inclusivity. While a lot of effort has been made in recent years to broaden diversity and inclusive participation, physical conferences are far from being inclusive, particularly for participants with special needs. As many assistance tools to decrease participation barriers can be natively and seamlessly integrated into IVCs, ethnographic considerations of opportunities for people with special needs will be instructive for designing IVC spaces (Drax, 2018; Boellstorff, 2008).

5.2.8. *Some interesting concepts*

There is a wealth of work in the HCI community literature on the design and use of virtual reality environments for learning (Markowitz, Laha, Perone, Pea, & Bailenson, 2018), professional development (Roswell et al., 2020), and meetings (McVeigh-Schultz & Isbister, 2021). During the MID process carried out for this paper, it became apparent that several emergent concepts already studied in different contexts may deserve a more detailed look, as they could aid with making explicit, and possibly measurable, the quality of the social interactions found to be underdeveloped in current IVCs. Given the focus and spatial limitations of this paper, however, only a brief description is provided below.

"**Layered Presence**" refers to the nuanced meanings of presence in activities situated in IVCs. In physical environments, participants make choices about the transparency of their activities, referred to as front-stage and back-stage activities, in the context of a person's personal sense of presence and their transparency to others (Goffman, 1959). Activities that are situated in IVCs, on the other hand, have multiple layers of transparency and privacy. To participate in a browser based IVC platform, the participant sits or stands in front of a computer screen and a camera, often with additional digital devices (tablet, phone, etc.) which may also connect the participant to other interactions with people or information resources. Their sense of presence and the balance of front and backstage behaviors in each creates a personal context of layered presence. With the sequential shifting of attention that characterizes multitasking (Ophir, Nass, Anthony, & Wagner, 2009), each participant establishes a rhythm of front-stage and back-stage behaviors that filters their perception and responses to the IVC conference's affordances.

"Interaction of physical objects and their virtual counterparts" in harmonizing virtual worlds with physical ones has included both content and social context explorations. Based on the premise that social transactions through first person presence facilitate building trust among team members and seeking to reproduce the expressive media of the human body, software-*as*-a-service platforms have emphasized social interaction and collaboration in virtual spaces (Smith, Kay, Raab, & Reed, 2003), adding functionality for social interaction and collaboration in the relational space through drag-and-drop file sharing, VoIP and text communications, spatialized acoustics, and avatar finger pointing and head turning to reflect and direct attention ("pointing as a lightning rod for sociability and attention", (McDermott & Pea, 2020, p. 101). Shared presence in a persistent space has been the main design objective for these innovations; yet, their affordances were experienced differently by participants meeting for the first time for networking purposes than by participants with similar backgrounds, prior relationships and an established work agenda (Djorgovski et al., 2010; Hut, 2007, 2008; Farr, Hut, Ames, & Johnson, 2009).

Recent studies have explored spatial presence and neuropsychological effects (Chen, Shohamy, Ross, & Wagner, 2008) novel learning architectures with sensors and other measuring and tracking devices (Bailenson et al., 2006; Fox, 2010; Fox and Bailenson, 2009, 2010). They have addressed the broad influence of computer technology on human communication with an emphasis on technology interdependence and coordination in the layering of knowledge work (Bailey, Leonardi, & Chong, 2010). Prior to engagement in the virtual space, the incorporation of physical objects (such as workbooks or snacks for consumption during breaks) and activities in the physical world (the preview of a recorded video or collection of data from a physical location) into the conference experience can augment content to be shared and amplify resources for relational contexts (e.g., conversation starters). The Activity Grid analysis can be extended to the physical world of IVC actors to inform such extensions of the experience.

"**Resonance**" is a term proposed by Hartmut Rosa (Rosa, 2014; Rosa & Schiermer, 2016). He argues that life in modernity is driven by a 'triple approach': individuals strive to make the world more available, attainable, and accessible to them to live a 'good' life. IVCs are one such tool that enable us to do more and more quickly. Rosa formulated resonance as "a way of encountering the world, that is, people, things, matter, history, nature and life as such" (Rosa & Schiermer, 2016).

The state of resonance is characterized by four qualities:

1. Affection: a feeling of being emotionally, cognitively, and even bodily moved or touched by something or someone.
2. Emotion: a feeling of self-efficacy, close to 'answering a call', when reacting to the other side, and a feeling of touching the other side as well.
3. A feeling of being transformed in this process of touching and being touched or transforming oneself(selves) in the sense of co-production.
4. An element of elusiveness that makes it impossible to *guarantee* a resonant experience (Rosa, 2016).

"**Ba**" (場), which stems from the Japanese word for "place". It was originally a logical and ontological concept advocated by Japanese philosopher Kitaro Nishida, and later adapted by Ikujiro Nonaka to explain organizational knowledge creation as a dynamic spiraling process of interactions between explicit and implicit (or tacit) knowledge. It starts with the individual, then grows in a shared space where there is shared context and intersubjectivity is established. These shared spaces can be physical, virtual, mental, or a combination of them, and are generally specified as "shared context in motion" that result in a sharing of "here-now" relationships (Nonaka & Konno, 1998). *Ba* is further specified as "interpenetration of environment, structure and individual" (Nonaka & Nishihara, 2017). It includes the platforms, places, and spaces where knowledge is created and experienced. In IVCs, Breaks and Transitions—by affording the exchange and sharing of tacit knowledge, information, and experiences—foster the sharing of knowledge within a community. IVC organizers are advised to design an effective socialization environment to afford the experience of "being here now learning together" that Ba can refer to for all.

6. Progress and new frontiers

This paper introduces Multilayered Installation Design (MID), a new approach for analyzing and understanding the social environments in which we meet and work with others, and for improving them. It is based on Activity Theory, Installation theory, and the Activity Grid. Activity theory guides a detailed step by step analysis, enabling a systematic and structured problem-setting. Outcome is made explicit and

documented using the Activity Grid. Installation theory offers a threefold, detailed, and situated set of avenues to address each and every design issue opportunistically. This paper argues this methodology, by empowering design thinking in a robust theoretical framework and providing a clear implementation process, adds value for scientists and practitioners alike. MID is illustrated here with the example of Installations for Virtual Conferencing.

This illustrative analysis is limited in scope, depth, and space, and some resulting suggestions may soon be outdated by technological and cultural advancements. It should be noted that the main points to be made are not about specific design recommendations, which are by nature transient. Rather, the paper advocates, and illustrates, the MID-way to improve current Installations, and to do "Deep Design", a functional approach that can address even the challenges of designing for situations that are fundamentally different from previous experiences.

Following Hollan and Stornetta, we advocate for designing "beyond" the replication of classic, in presence experience, therefore exploiting the augmented affordances possible with VR. This should be done gradually because introducing new Installations is easier if users can rely on existing embodied competences, as in the "design for cognition" approach (Lahlou, 2009). In this approach, it is recommended that novice users should be able to perform at least some minimally satisfying actions in the new system with their pre-existing set of competences, and gradually learn new competences and affordances of the system as they peruse it. During these transitions, onboarding and support will remain essential.

The outlined approach goes beyond the issues that become immediately visible when environments fail, because it is *goal-* and *activity-focused*. Especially the use of the Activity Grid prompts users of this approach to make the goals and values behind each task explicit and to check whether the actor receives the intended reward—and this for each actor and activity. MID therefore pushes designers to go beyond the usual "how can we do it" design questions, and into the DD issues of which activity and functions they want to foster with their Installations, to fulfill which motives, and which values they consider important (e.g., get feedback on contributions, build social capital, discover relevant connections). The analytical strategy further makes salient: 1) which action is causing the problem, 2) in which layer it is located (physical affordances, embodied competences, social regulation), and 3) which layer's revisions can best address the issue.

From the collective experience with the GILP21, the MID approach proved to be not only powerful but also accessible, and as such was introduced partially, in an incremental way, so that novice users could immediately apply it to create valuable insights. The ability to address an identified issue with solutions in three different layers has proven especially valuable during the research process for this paper. This possibility of partial and incremental application of the method compensates for its main limitation, which is the relative intensiveness of the technique, that requires analyzing the activity and the current setting in a systematic way. This intensiveness is an inevitable counterpart of the fine-grained, comprehensive, and extensive character of the method.

As a mixed team of researchers and industry practitioners, speakers, facilitators, and attendees, the authors provide an overview of the workflow of using Installation Theory and Activity Theory to analyze an environment in which they worked and had a conference together. Focusing exemplarily on Networking During Breaks and Transitions, issues that were encountered have been discussed and design suggestions for future improvements of activities specific to this context, and for conferencing in IVCs in general were provided.

Specifically, current IVC design has focused primary attention on content transfer but neglected the complementary social interactions; those efforts were made to create affordances in the platform rather than to construct rules for behavior and to grow competences of users. It turns out that in IVCs, social networking, social capital building, serendipity, and participation are all consequential matters. To address these, and the way they will present novel DD issues in VR environments, with cognitively empowered navigation and bodily challenged avatars, additional candidates as operational concepts come from other fields of social science, such as Ba, serendipity, resonance, and presence.

The motives and goals of current IVCs are defined in the current context of efforts to fulfill content (knowledge sharing, insightful discoveries) and relational (serendipitous encounters and interpersonal exchanges) objectives for professional development and learning in virtual worlds. The complexity of these motives, occurring in multiple layers of the IVC, presents challenges. Meeting these challenges requires a multi-level understanding of the social event by its many actors—designers, developers, organizers, facilitators, and participants. In Multilayered Installation Design, the Activity Grid analysis process of the Installation Theory framework provides tools and processes for insight-producing dialogues by collaborators.

Beyond the illustrative example of IVCs, the MID approach presented can be applied generally to any type of activity, but it will show its advantages most in complex, multi-party social settings which are more difficult to address with classic, less-structured, and less-systematic design approaches.

CRediT authorship contribution statement

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Appendix

A MID Template.

Task	Actor's Motives and Goals	Contributions from Actor	Actor's Rewards	Installation: Affordances	Installation: Competences	Installation: Regulation
Step 1						
Step 2						
Step 3						

B BACKUP CHAT EXAMPLE

Below is the chat history of two full days of conferencing from the **[anonymized event]** taken from one of our backup channels (WhatsApp).

Day 2.

[13:14, November 16, 2020] Tech Support 2: We've been encouraging ppl to go to the auditorium.
[13:16, November 16, 2020] Administrator 1: Thanks! Is everyone there?
[13:16, November 16, 2020] Tech Support 2: Yes.
[13:16, November 16, 2020] Administrator 1: If not, send everyone [Tech Support 1]!
[13:17, November 16, 2020] Tech Support 1: Everyone is there.
[13:17, November 16, 2020] Tech Support 2: Yep!
[13:19, November 16, 2020] Administrator 1: [Tech Support 1], during the presentations I'll put the presenter on stage, plus the rest of their team …
[13:20, November 16, 2020] Tech Support 1: Ok.
[13:48, November 16, 2020] Administrator 2: Are the group presentations supposed to be 15 min or 30 min?
[13:48, November 16, 2020] Administrator 3: 15 + 5. this one ran over a bit but we still have some puffer.
[13:48, November 16, 2020] Administrator 3: as in spare time i mean.
[13:49, November 16, 2020] Organiser 2: Yep.
[13:53, November 16, 2020] Administrator 1: Yes, let's not time limit them …. some will be longer, some shorter!
[13:54, November 16, 2020] Organiser 2: Our 1st goal is their satisfaction.
[13:54, November 16, 2020] Facilitator 2: yes … some might be less confident than others in doing presentations.
[13:55, November 16, 2020] Facilitator 2: good not to put pressure.
[13:56, November 16, 2020] Tech Support 2: [Administrator 1], are we missing more ppl than those we were expecting? Is [Participant 9] here?
[13:57, November 16, 2020] Facilitator 2: I know [Participant 7] is presenting for group 3.
[13:57, November 16, 2020] Tech Support 1: [Participant 7] is the only one from his group here.
[13:58, November 16, 2020] Facilitator 2: I see …
[13:59, November 16, 2020] Facilitator 2: I just sent the whole group an email to ask them to be all there on time.
[14:00, November 16, 2020] Tech Support 2: I'm stepping off for a minute for the break, brb
[14:00, November 16, 2020] Administrator 1: [Participant 9] is not here … [Participant 8] is.
[14:01, November 16, 2020] Tech Support 1: Shall we call a break?
[14:01, November 16, 2020] Administrator 1: Thanks [Facilitator 2]!
[14:01, November 16, 2020] Administrator 1: They are breaking now … just call them back at 6:10 please!
[14:01, November 16, 2020] Tech Support 1: Ok.
[14:03, November 16, 2020] Facilitator 2: sending a message to [Participant 7] now I saw him in the auditorium.
[14:06, November 16, 2020] Organiser 2: Good.
[14:08, November 16, 2020] Administrator 1: Thanks [Tech Support 1]!!
[14:09, November 16, 2020] Tech Support 1: Yup.
[14:45, November 16, 2020] Administrator 2: [Administrator 1], let's just go with you sharing.
[14:47, November 16, 2020] Tech Support 2: Maybe Advance [Administrator 1]?
[14:47, November 16, 2020] Tech Support 2: No you got it.
[15:02, November 16, 2020] Tech Support 2: [Organiser 1] and I were going to go to [Participant 16] and [Participant 17]'s group during the breakout session, but should one of us go to [Participant 7][Participant 18] and [Participant 8]' group?
[15:03, November 16, 2020] Administrator 3: yeah, if we can spread out a little bit that would be good.
[15:04, November 16, 2020] Administrator 3: we have one animator per group, with [Organiser 2] jumping between group 3&4, and me between 1&2.
[15:04, November 16, 2020] Tech Support 1: [Participant 13] and [Participant 4] are having trouble logging back in.
[15:04, November 16, 2020] Tech Support 2: Apparently [Participant 14] is here too from that group.
[15:04, November 16, 2020] Tech Support 1: [Organiser 2] also - spinning cubes.
[15:05, November 16, 2020] Tech Support 2: Can [Participant 11] or one of the [IVC software Company 2] team members help?
[15:07, November 16, 2020] Tech Support 1: [Organiser 2] please clear cache and cookies and try to log in again.
[15:07, November 16, 2020] Tech Support 1: How do I get in touch with [Participant 11]?
[15:08, November 16, 2020] Tech Support 2: I would send her a chat and then meet outside the auditorium.
[15:08, November 16, 2020] Tech Support 2: I'm looking for her.
[15:10, November 16, 2020] Organiser 1: [Tech Support 2] - good idea for you and me to go to diff groups. Which do you want?
[15:10, November 16, 2020] Tech Support 1: Just chatted her.

[15:11, November 16, 2020] Tech Support 2: K I messaged [Participant 10] too.
[15:12, November 16, 2020] Tech Support 1: Ok.
[15:12, November 16, 2020] Tech Support 2: @[Organiser 1], I'm happy with either. If you don't have a preference, I can go with [Company 1].
[15:14, November 16, 2020] Tech Support 1: [Participant 11] and [Participant 10] are not responding.
[15:14, November 16, 2020] Administrator 3: shall we skip the group discussions? timing wise we're at the time of the group discussion now according to the schedule.
[15:15, November 16, 2020] Administrator 3: i think the discussion is going well quite naturally.
[15:15, November 16, 2020] Administrator 1: [IVC software Company 1] told me that the cubes are caused by the user's insufficient memory …
[15:15, November 16, 2020] Administrator 1: We can do …. just send them to break?
[15:15, November 16, 2020] Tech Support 1: I asked them to clear cache and cookies in chrome.
[15:15, November 16, 2020] Administrator 2: Yes. We need a break.
[15:15, November 16, 2020] Tech Support 2: I think the break is at 7:30?
[15:16, November 16, 2020] Administrator 3: yes, the break is planned for half past.
[15:16, November 16, 2020] Tech Support 2: So 15 min of group discussion?
[15:16, November 16, 2020] Administrator 3: let's wait until this discussion dies down.
[15:16, November 16, 2020] Administrator 1: Is it worth it?
[15:16, November 16, 2020] Administrator 3: i think it's better to stay in the plenary.
[15:16, November 16, 2020] Tech Support 2: Agreed.
[15:16, November 16, 2020] Administrator 1: Group discussion can happen here!
[15:16, November 16, 2020] Tech Support 2: Yes, I meant full group.
[15:33, November 16, 2020] Administrator 1: Time to break?
[15:33, November 16, 2020] Tech Support 1: Yes.
[15:33, November 16, 2020] Administrator 3: yes, if there's no more questions now.
[15:33, November 16, 2020] Administrator 3: maybe we ask for a final question and then go.
[15:33, November 16, 2020] Facilitator 2: good.
[15:34, November 16, 2020] Administrator 1: I've just sent a message to [Organiser 2] …
[15:34, November 16, 2020] Facilitator 2: I have decide to write an email to my group to give them a feedback.
[15:35, November 16, 2020] Facilitator 2: i feel sorry for not having had the time to talk to them.
[15:35, November 16, 2020] Facilitator 2: hope it makes sense.
[15:35, November 16, 2020] Administrator 3: That is a great idea bit please don't do that just yet!
[15:36, November 16, 2020] Facilitator 2: ok.
[15:36, November 16, 2020] Administrator 3: we can discuss this here or after the session; if you send this email the other groups also need to receive one.
[15:36, November 16, 2020] Administrator 3: so this can only work if the other animators took notes as well that enable them to give feedback to the groups.
[15:37, November 16, 2020] Facilitator 2: good idea - i am not sending the email to my group until we decide to do that with all groups - make better sense.
[15:37, November 16, 2020] Tech Support 2: Depending on how long the lecture goes, if we end up with extra time at the end we can go to breakout room.
[15:37, November 16, 2020] Facilitator 2: good idea.
[15:42, November 16, 2020] Administrator 3: yeah, that could be a nice wrap up for the day instead of another general session. so shall we make up for the missed group sessions by dropping the final mix and mingle?
For that to make sense, we would have to move into breakout rooms with groups at 8:40 at the latest i would say, with animators spreading out as originally planned. Would that work for everybody?
[15:43, November 16, 2020] Facilitator 3: Sounds good!
[15:43, November 16, 2020] Administrator 1: Sounds good to me …. people can still hang out at the end …
[15:44, November 16, 2020] Organiser 2: Ok with me! Please tell them that after the few q&a after my talk, if i forget just step in.
[15:44, November 16, 2020] Administrator 3: will do!
[15:45, November 16, 2020] Facilitator 2: fine with me!
[15:48, November 16, 2020] Administrator 1: @[Tech Support 1] do you want to do an alert that break is over?
[15:49, November 16, 2020] Administrator 3: yes that would be good.
[15:49, November 16, 2020] Tech Support 1: Ok.
[15:49, November 16, 2020] Organiser 2: Please.
[15:50, November 16, 2020] Administrator 1: I'm ready to teleport them if they don't go themselves!
[15:52, November 16, 2020] Administrator 3: can someone maybe mute all participants?
[15:56, November 16, 2020] Administrator 3: [Facilitator 2] can you mute yourself?
[15:56, November 16, 2020] Tech Support 2: Now we can't hear [Organiser 2].
[15:56, November 16, 2020] Tech Support 1: I can hear [Organiser 2].
[15:57, November 16, 2020] Tech Support 2: Oh ok maybe it's just me?
[15:57, November 16, 2020] Tech Support 1: [Tech Support 2] you might need to log out clear cache and come back.
[15:57, November 16, 2020] Administrator 2: [Tech Support 2]. Teleport out and back in.
[15:57, November 16, 2020] Tech Support 2: I went out and in and can hear.
[15:57, November 16, 2020] Administrator 1: I can hear him …. log back in see if that works.
[15:57, November 16, 2020] Administrator 1: I tried the 'mute all' but it obviously didn't work …
[15:58, November 16, 2020] Facilitator 2: it is muted …
[15:58, November 16, 2020] Tech Support 2: I'm good. But I can still hear background noise.

[15:58, November 16, 2020] Administrator 3: maybe you need to get out and back in.
[15:58, November 16, 2020] Administrator 3: because your avatar is showing that it's making sounds [Facilitator 2].
[15:58, November 16, 2020] Facilitator 2: ok.
[15:58, November 16, 2020] Tech Support 1: Clear cache and cookies in chrome.
[15:59, November 16, 2020] Facilitator 2: i am really sorry.
[15:59, November 16, 2020] Facilitator 2: i left keeping it muted.
[15:59, November 16, 2020] Administrator 3: sound is gone now.
[15:59, November 16, 2020] Tech Support 1: Sorry about that.
[16:00, November 16, 2020] Tech Support 1: If you cannot hear it's possible that clearing cache and cookies in chrome will fix it.
[16:23, November 16, 2020] Administrator 2: Can't hear the audio [Administrator 1].
[16:44, November 16, 2020] Administrator 1: I forgot to change the audio from my AirPods to display audio! There's very little sound on it though! Sorry to all for that faux pas!
[16:45, November 16, 2020] Tech Support 1: Welcome to the club!
[16:45, November 16, 2020] Administrator 3: I believe it will be too late for group work now, what do you think?
[16:45, November 16, 2020] Administrator 3: there will probably a lot of questions following the lecture.
[16:46, November 16, 2020] Facilitator 2: I agree.
[16:46, November 16, 2020] Facilitator 3: Yes.
[16:46, November 16, 2020] Administrator 3: a bit of plenary will probably be more useful than rushed group work.
[16:47, November 16, 2020] Facilitator 2: exactly.
[16:47, November 16, 2020] Tech Support 2: There's no hw assignment tonight, right.
[16:47, November 16, 2020] Administrator 1: No homework!
[16:47, November 16, 2020] Facilitator 2: yes.
[16:48, November 16, 2020] Tech Support 2: Great!
[16:50, November 16, 2020] Administrator 2: Perhaps we circle back to [Facilitator 2]'s idea of emailing her group and continuing the discussion. From past workshops, we know that group work is an important piece of the puzzle.
[16:51, November 16, 2020] Administrator 3: agreed.
[16:52, November 16, 2020] Facilitator 2: yes, I think it is good to follow up with groups.
[16:54, November 16, 2020] Facilitator 2: let's discuss how to address that perhaps via email tomorrow among facilitators.
[17:21, November 16, 2020] Facilitator 1: Yes, I was about to send an email to my group but I transferred to the facilitators to make sure that we are on the same page.
Day 3.
[12:06, November 20, 2020] Administrator 1: Remember everyone, Firefox browser to access sinespace today!
[12:55, November 20, 2020] Administrator 3: hey all, i can't hear you.
[12:55, November 20, 2020] Administrator 3: and i can't log in on firefox, the screen just goes black.
[12:55, November 20, 2020] Administrator 1: Update your Firefox ….
[12:56, November 20, 2020] Administrator 1: Edge also works …. but Chrome doesn't at the moment!
[13:05, November 20, 2020] Facilitator 3: Same here! Now updating Firefox and downloading edge.
[13:12, November 20, 2020] Administrator 1: Thanks [Facilitator 3]!
[13:14, November 20, 2020] Administrator 2: FYI … The stand up button is missing for me now, but I have 6 stop gesture buttons without doing a gesture.
[13:14, November 20, 2020] Facilitator 2: same of me.
[13:15, November 20, 2020] Tech Support 2: Yep.
[13:16, November 20, 2020] Administrator 3: you'll have to log out again.
[13:17, November 20, 2020] Facilitator 2: ok.
[13:17, November 20, 2020] Administrator 3: these glitches keep on happening when too many people play gestures at the same time i think.
[13:17, November 20, 2020] Tech Support 2: So I need to log out to be able to stand up?
[13:18, November 20, 2020] Administrator 2: If you go out to Palm Circle, you can gain walking access again.
[13:18, November 20, 2020] Tech Support 2: K.
[13:18, November 20, 2020] Administrator 2: But once you sit again, you can not stand back up.
[13:20, November 20, 2020] Administrator 1: [Participant 11] tested it and she got the stand up …
[13:20, November 20, 2020] Administrator 1: Twice …
[13:25, November 20, 2020] Tech Support 2: [Administrator 1], how are we on attendance today?
[13:25, November 20, 2020] Tech Support 2: It seems light.
[13:26, November 20, 2020] Administrator 1: I've just taken a screenshot of the friends list to show who is here - not good … I'll email it to us all.
[13:34, November 20, 2020] Administrator 2: Does everyone have their mic off?
[13:35, November 20, 2020] Administrator 2: I'm hearing some more background noise?
[13:35, November 20, 2020] Tech Support 2: I hear it too, mines off.
[13:35, November 20, 2020] Administrator 1: I've just hit the quiet on button …. your mics will be greyed out.
[13:35, November 20, 2020] Tech Support 2: K.
[13:36, November 20, 2020] Facilitator 2: 👍.
[13:36, November 20, 2020] Administrator 2: Sounds better now.
[13:44, November 20, 2020] Administrator 2: [Administrator 1]. Can you mute everyone again.
[13:46, November 20, 2020] Administrator 1: I did but it seems someone's microphone is still active.
[13:46, November 20, 2020] Administrator 2: Sound now gone.
[13:47, November 20, 2020] Administrator 2: I guess they figured it out and muted their own mic.

[13:47, November 20, 2020] Administrator 1: It may take a minute to take effect …. or it may depend on the audio device they are using …
[13:47, November 20, 2020] Administrator 1: Or yes, they did it themselves!
[13:48, November 20, 2020] Organiser 1: Six "stop gesture" buttons appear on my screen but no "stand up" button. Any suggestions to remedy?
[13:49, November 20, 2020] Administrator 3: you'll have to log out and back in again.
[13:49, November 20, 2020] Tech Support 2: We all have it.
[13:49, November 20, 2020] Administrator 1: [Participant 11] has sent that issue to the tech guys. Could be a Firefox issue … she was using Microsoft Edge and got the standup button ok …
[14:08, November 20, 2020] Facilitator 2: I've just received an email from [Participant 7] - he cannot login using firefox … Any advice for him? thanks.
[14:08, November 20, 2020] Administrator 1: Has he updated Firefox? That seems to be an issue!
[14:08, November 20, 2020] Facilitator 2: yes he did.
[14:09, November 20, 2020] Administrator 1: I'm not sure why he can't login then … if he has Edge, ask him to try that browser.
[14:10, November 20, 2020] Facilitator 2: ok.
[14:10, November 20, 2020] Facilitator 2: thanks!
[14:15, November 20, 2020] Tech Support 1: Clear cache and cookies before logging in.
[14:15, November 20, 2020] Tech Support 2: Could he hear before? He was in at some point I thought.
[14:15, November 20, 2020] Facilitator 2: thanks!
[14:16, November 20, 2020] Facilitator 2: he told me he could not access today …
[14:17, November 20, 2020] Administrator 2: Let's make sure we get our break in before the breakouts sessions.
[14:17, November 20, 2020] Administrator 3: agreed.
[14:18, November 20, 2020] Administrator 3: do we have an overview of who's there today? Will we have enough people to work in every group?
[14:18, November 20, 2020] Facilitator 2: it was my thought as well.
[14:19, November 20, 2020] Organiser 1: [Organiser 3] has a question.
[14:19, November 20, 2020] Administrator 1: I've just asked [Organiser 2] to go to break. We have [Tech Support 2] and [Organiser 1] joining a couple of the lighter groups …
[14:20, November 20, 2020] Organiser 1: Thanks [Administrator 1].
[14:20, November 20, 2020] Facilitator 2: [Administrator 3] can you remind what the groups are expected to do after the break …
[14:21, November 20, 2020] Administrator 3: i checked, the groups are all there except for group 3 which is wholly absent it seems.
[14:21, November 20, 2020] Tech Support 2: Can [Participant 7] try Edge? I've never used, but [Participant 11] did.
[14:21, November 20, 2020] Administrator 3: so we can have groups 1,2, and 4 as normal.
[14:22, November 20, 2020] Administrator 3: i'll ask [Organiser 2] to explain the exercise.
[14:22, November 20, 2020] Facilitator 2: fine with me I can link with my group via email for instructions.
[14:23, November 20, 2020] Administrator 1: I just emailed the groups to you all.
[14:23, November 20, 2020] Tech Support 2: [Participant 7] is trying to get back in, and I think [Participant 8] was here at some point.
[14:24, November 20, 2020] Administrator 3: ok good!
[14:24, November 20, 2020] Tech Support 2: [Administrator 1] or [Tech Support 1], is it worth trying to call [Participant 7] on the phone? Or zoom?
[14:25, November 20, 2020] Administrator 1: I don't have a number for him … I'll send him a quick email and ask him.
[14:26, November 20, 2020] Administrator 3: i just emailed the sample slide to the facilitators again for your reference.
[14:28, November 20, 2020] Facilitator 3: Got it! 👍.
[14:30, November 20, 2020] Facilitator 2: got it thanks.
[14:38, November 20, 2020] Administrator 1: I just copied [Facilitator 2] and [Tech Support 2] on [Participant 7]s response ….
[14:39, November 20, 2020] Administrator 1: [Organiser 1], does [Organiser 3] want to join you in your breakout? Or is there another group you want him to visit?
[14:40, November 20, 2020] Tech Support 1: Looks like he left the region.
[14:40, November 20, 2020] Administrator 1: Actually, he left ….
[14:40, November 20, 2020] Administrator 1: 👍.
[14:41, November 20, 2020] Organiser 2: Ok.
[14:42, November 20, 2020] Organiser 1: What group should I go to?
[14:42, November 20, 2020] Administrator 2: Should we send a message for the groups to meet?
[14:43, November 20, 2020] Administrator 3: we're already meeting.
[14:43, November 20, 2020] Organiser 2: Group 1 is working -red.
[14:43, November 20, 2020] Administrator 3: wherever you want to join!
[14:47, November 20, 2020] Organiser 1: I'll join [Participant 17] and [Participant 16]. I've been with them before.
[14:48, November 20, 2020] Tech Support 2: [Participant 7] is still having issues, but we others ares getting started.
[14:48, November 20, 2020] Administrator 3: So the groups we are working in now are just working groups for today, yeah? because otherwise we will have to completely rearrange facilitators again for the final exercise.
[14:50, November 20, 2020] Administrator 2: What is the new time of arrival back in the main auditorium for the report back session?
[14:51, November 20, 2020] Administrator 3: we should be back in 9.
[14:53, November 20, 2020] Administrator 1: The groups are all the same as previous - [Participant 4] is the only participant who has moved and will stay in his new team for the final exercise.
[14:55, November 20, 2020] Administrator 3: ah ok, sorry for that then!
[14:56, November 20, 2020] Administrator 1: Ok!
[14:56, November 20, 2020] Tech Support 1: [Administrator 1]: should we reach out to [Organiser 3] and see if he needs help coming back?
[14:57, November 20, 2020] Administrator 1: I told him to re-login via in-world email …

[14:58, November 20, 2020] Tech Support 1: Is he still in-world?
[14:59, November 20, 2020] Administrator 1: He said he was in 6 but he wasn't … the system says he left a while back, which is why he felt 'trapped'.
[14:59, November 20, 2020] Administrator 1: His avatar was not responding, teleport buttons not working, so he needs to log back in!
[15:01, November 20, 2020] Tech Support 1: Do you see a new tab in the chat - click it says "time report".
[15:03, November 20, 2020] Administrator 1: I'm not seeing it!
[15:04, November 20, 2020] Administrator 2: Logging back in.
[15:05, November 20, 2020] Administrator 1: Ok!
[15:05, November 20, 2020] Tech Support 1: I think [Organiser 3] made it back.
[15:07, November 20, 2020] Administrator 1: Yes!
[15:08, November 20, 2020] Administrator 1: My AirPods have just run out of juice so I'll have to rely on messaging to hear for a while …
[15:08, November 20, 2020] Administrator 2: I missed the start of this session as I was logging back in. Back in now.
[15:08, November 20, 2020] Administrator 1: Ok!
[15:09, November 20, 2020] Tech Support 2: [Participant 8] and I should both go to the stage for our group.
[15:10, November 20, 2020] Administrator 1: Ok. Logging back in.
[15:10, November 20, 2020] Facilitator 2: thanks for doing that!
[15:10, November 20, 2020] Facilitator 1: Is it normal that I see the nurse patient ppt?
[15:10, November 20, 2020] Administrator 3: yes.
[15:10, November 20, 2020] Tech Support 2: Yes.
[15:11, November 20, 2020] Facilitator 1: Ok.
[15:11, November 20, 2020] Tech Support 2: [Participant 16]s group didn't make a ppt.
[15:11, November 20, 2020] Facilitator 1: Thank you.
[15:13, November 20, 2020] Organiser 1: I cannot get my mike on in the auditorium.
[15:14, November 20, 2020] Administrator 1: Mine is also greyed out … [Tech Support 1], did you activate the quiet button?
[15:14, November 20, 2020] Tech Support 1: No.
[15:14, November 20, 2020] Organiser 1: please - someone-add that there is a person running the AI.
[15:15, November 20, 2020] Tech Support 2: Yes.
[15:15, November 20, 2020] Facilitator 2: Is it possible to record today's workshop? some participants in my group could not really hear or could do that only intermittently.
[15:15, November 20, 2020] Tech Support 1: Do you want me to toggle the quiet onoff
[15:15, November 20, 2020] Administrator 1: [Administrator 2] has been recording it (as far as he can).
[15:16, November 20, 2020] Administrator 1: Not while others are talking …
[15:16, November 20, 2020] Administrator 2: All of the main sessions are recorded. We do not record the breakout rooms.
[15:16, November 20, 2020] Facilitator 2: very good.
[15:16, November 20, 2020] Facilitator 2: ok I can follow up with them next week.
[15:17, November 20, 2020] Tech Support 2: I think we need to move on to get back on schedule.
[15:17, November 20, 2020] Administrator 1: Just thinking that …
[15:18, November 20, 2020] Administrator 1: Are you up next for report back?
[15:18, November 20, 2020] Administrator 2: [Organiser 2] can you stop sharing your screen?
[15:18, November 20, 2020] Facilitator 1: I'll reboot, can't get my microphone and screen share to work.
[15:19, November 20, 2020] Administrator 1: Ok.
[15:19, November 20, 2020] Facilitator 1: Just in case, I sent the ppt to you [Administrator 1] as well as my group.
[15:19, November 20, 2020] Administrator 1: Ok.
[15:20, November 20, 2020] Organiser 1: I've been out and in 4 times - still have no mike, so please do not call on me.
[15:20, November 20, 2020] Administrator 3: That's really annoying. if you want us to say something on your behalf i'll keep the chat open.
[15:20, November 20, 2020] Administrator 2: I think the mics have been muted at the admin level?
[15:20, November 20, 2020] Tech Support 1: [Organiser 1] try to clear cache and cookies before logging back in.
[15:20, November 20, 2020] Administrator 1: I just toggled quiet and my mic came back.
[15:20, November 20, 2020] Tech Support 2: And [Administrator 1], you have no sound because your headphones aren't working?
[15:21, November 20, 2020] Organiser 1: Ok - on now.
[15:21, November 20, 2020] Administrator 1: Right, but I was relieved that the internal speakers would activate in Firefox, so I can hear now!
[15:22, November 20, 2020] Tech Support 2: K.
[15:22, November 20, 2020] Administrator 1: *relogged
[15:23, November 20, 2020] Administrator 1: [Organiser 1], is your mic button now blue?
[15:23, November 20, 2020] Organiser 1: Yes.
[15:23, November 20, 2020] Administrator 3: I think we're fine on time because we have a lot of time allocated to free group work at the end. let's do the final group, 5 min break, then the final lecture.
[15:23, November 20, 2020] Administrator 1: Ok, it's all gone quiet …
[15:23, November 20, 2020] Administrator 1: Great!
[15:24, November 20, 2020] Organiser 2: Ok.
[15:26, November 20, 2020] Administrator 1: Can people hear [Organiser 2]?
[15:26, November 20, 2020] Administrator 3: yes.
[15:26, November 20, 2020] Administrator 2: It would be great to not short the group/breakout time in this session. We've learned over the years that group time is super valuable.
[15:26, November 20, 2020] Administrator 3: but [Participant 16] seems to have started talking already.
[15:27, November 20, 2020] Administrator 2: We also want to make sure they all understand the critical next groups steps as we won't meet again

as a whole until Dec 7.

[15:27, November 20, 2020] Tech Support 2: How do I stop share?

[15:28, November 20, 2020] Administrator 3: we have 45 more minutes of input and 5 min of break planned.

[15:28, November 20, 2020] Administrator 1: Won't it turn off?

[15:28, November 20, 2020] Tech Support 2: I don't know how.

[15:28, November 20, 2020] Organiser 2: Click again.

[15:28, November 20, 2020] Administrator 3: this should give us enough time for the group work.

[15:28, November 20, 2020] Administrator 1: I think it will stop when you leave the stage.

[15:29, November 20, 2020] Facilitator 1: No microphone working here.

[15:29, November 20, 2020] Facilitator 1: Sound comes and go.

[15:30, November 20, 2020] Administrator 1: I guess no one can hear me!

[15:30, November 20, 2020] Tech Support 2: I had to leave the auditorium to get off. Not having a stand up button is a major issue. My group won't be able to do much bc of tech issues.

[15:30, November 20, 2020] Administrator 1: Who is presenting for group 4.

[15:30, November 20, 2020] Facilitator 2: we can hear you [Administrator 1].

[15:30, November 20, 2020] Facilitator 1: I guess we could ask [Participant 5] or [Participant 15].

[15:33, November 20, 2020] Administrator 1: I'm logging back in, left by mistake.

[15:33, November 20, 2020] Administrator 1: Luckily, I see it shared …. sorry!

[15:34, November 20, 2020] Tech Support 1: Ok your mic was on and [Participant 16] was talking sorry bout that.

[15:34, November 20, 2020] Administrator 1: I couldn't hear some people … but could others …

[15:35, November 20, 2020] Tech Support 1: I know it's very strange.

[16:37, November 20, 2020] Administrator 2: We should probably move on to explaining the final exercise and getting to groups.

[16:37, November 20, 2020] Tech Support 2: Yeah.

[16:37, November 20, 2020] Facilitator 2: good idea.

[16:39, November 20, 2020] Administrator 1: I'll broadcast to [Organiser 2] in case he doesn't see this message.

[16:47, November 20, 2020] Organiser 1: I must leave for another meeting. Kudos for the calm troubleshooting teamwork today!!!!

[16:53, November 20, 2020] Tech Support 2: Room 4 is clear. Our group is done bc [Participant 8] was the only one left.

[16:53, November 20, 2020] Tech Support 2: So they'll meet via zoom at a later date.

[16:54, November 20, 2020] Tech Support 2: [Administrator 1] we can't find you? Are you still logged in?

[16:56, November 20, 2020] Administrator 3: found her.

[16:57, November 20, 2020] Administrator 3: she's in room 2 having a conversation with [Participant 15].

[16:57, November 20, 2020] Administrator 3: can't really interrupt now.

[16:57, November 20, 2020] Administrator 1: I'm with [Participant 15] in 2 …. he's not happy.

[16:57, November 20, 2020] Administrator 3: i'll leave you alone.

[16:58, November 20, 2020] Administrator 1: Thx!

[17:00, November 20, 2020] Administrator 3: group 2 has asked whether [Participant 1] and the other members from the company are still part of the group, just wanted to clarify this for them.

[17:01, November 20, 2020] Administrator 1: I think we can assume not.

[17:01, November 20, 2020] Administrator 3: kk thx

[17:02, November 20, 2020] Administrator 1: [Participant 3] and [Participant 2] never came in, [Participant 1] was their interpreter, and his wife got sick, so I can't see him coming back in now.

[17:03, November 20, 2020] Tech Support 2: I thought [Participant 1] was here today.

[17:03, November 20, 2020] Tech Support 2: At one point.

[17:04, November 20, 2020] Tech Support 2: We might need to regroup again 🤦‍♀️.

[17:05, November 20, 2020] Administrator 1: I've just forwarded [Participant 15]'s email …

[17:08, November 20, 2020] Tech Support 2: [Administrator 1] let us know if we are going to have a mtg at some point.

[17:08, November 20, 2020] Tech Support 2: Or if the **[anonymized]** team should have one first and then reconnect with everyone.

[17:08, November 20, 2020] Administrator 1: We should … facilitators, in 5 min? In 5 as [Participant 15] is in 2.

[17:09, November 20, 2020] Administrator 3: perfect, will do.

[17:30, November 20, 2020] Facilitator 2: sorry I cannot attend I am in another meeting now.

[17:30, November 20, 2020] Facilitator 2: please let me know what agreed. Thanks.

[17:31, November 20, 2020] Facilitator 1: What happened with [Participant 15]? I required a teleport but he didn't came to the breakout session.

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