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Mediating boundaries between knowledge and knowing: ICT and R4D praxis

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Abstract

This article reflects critically on the use of a wiki as a data repository for knowledge transfer and as a mediating technical platform for social learning in the context of a multi-country programme of agricultural research for development. The wiki was designed to foster sustainable social learning and an emergent community of practice among biophysical and social researchers acting for the first time as co-researchers. Over time, the technologically mediated element of the learning system was judged to have failed. The article is based on an inquiry that asked 'How can learning system design cultivate learning opportunities and respond to learning challenges in an online environment to support research for development practice?' The article also considers the wider context and institutional setting in which the knowledge work took place.

Keywords

Boundary judgements, social learning systems, institutional constraints

Introduction

Contemporary practices, including research for development (R4D) and theory-informed practical action (praxis), are underpinned by the use of information and communication technologies (ICT). It is claimed that ICT provide incalculable opportunities for communication, knowledge sharing and social networking by collapsing time and space (Simons and Laat, 2002; Cummings and van Zee, 2005). Framing ICT this way implicitly or explicitly constructs a boundary around knowledge as reified, commodified – or at least able to be stabilized for a period of time (first-order knowledge). In this article, we offer critical reflections on the use of an online platform for collaboration (Confluence®, Atlassian Pty Ltd – hereafter, the 'online platform'), as a data repository and mediating technical platform in support of innovation in R4D. The key question addressed is: How can learning system design cultivate learning opportunities and respond to learning challenges in an online environment to support R4D practice?

We draw on the shift from first- to third-order knowledge/knowing concerns that has occurred in several fields, including technologically mediated, supported and open distance learning (Blackmore et al., 2014; Cook and Brown 1999; Laurillard, 2012; Laurillard, 2013). Klerkx et al. (2011) note that Knowledge Management for Development (KM4D) emerged in the knowledge transfer approach in which first-order knowledge management is conceived as a linear process: that is, knowledge is created by 'knowledge producers' and is managed by storing and retrieving knowledge for transmission to 'knowledge users'. The latest developments in KM4D have shifted the focus to 'situated learning' involving a diversity of people, groups and organizations, who have different roles, interests and positions of power, and who interact together to co-develop new and shared knowledge.

A shift from first- to third-order KM involves a boundary expansion, encompassing more elements, greater awareness that practice necessarily is situated, and explicit statement of participants' theoretical assumptions and of the operating conditions that shape knowledge/knowing practices. This shift tends to surface conflicts related to each individual's prior epistemological commitments, resource investment

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(time, effort, money) and preferred praxis. In online environments, it places greater value on participatory and collaborative co-creation of a virtual social life.

Co-researching

Co-researching is generally understood as a form of participatory or systemic action research (Ison, 2008) that positions academic researchers and host organization representatives (practitioners) as co-researchers who design, execute, analyse and author collaboratively throughout the life of a project (Hartley and Benington, 2000; Mathiassen, 2002; Ison, 2008). The Learning Project (LP) drew heavily on established traditions of systemic inquiry (Churchman, 1971; Checkland, 2002; Dewey, 1933; Ison, 2010; Ison et al., 2014). Churchman (1971: 17) articulated its essence as 'reflective learning in the literal sense: it is the thinking about thinking, doubting about doubting, learning about learning, and (hopefully) knowing about knowing'. Such inquiries facilitate a particular way of knowing which, when enacted, makes a difference; when explicitly drawing on systems understandings, they become systemic inquiries (Ison, 2010).

Co-researching can be difficult to enact because most mainstream institutional settings and incentive schemes are not designed to support collaborative work between researchers and practitioners (Lyytinen, 1999; Ison and Russell, 2011). Although instances of effective co-researching have been reported (e.g. Feldstein and Poats, 1989; Merrill-Sands and Kaimowitz, 1989), they have not been sufficient to prompt significant practice innovations (see Hoffmann et al., 2007; Klerkx et al., 2011; Hartley and Benington, 2000). The LP's approach was motivated by previous positive experiences of action research within Commonwealth Scientific and Industrial Research Organization (CSIRO; Carberry, 2001; Ison et al., 2012). It espoused openness towards the many and varied dimensions of learning through a series of self-determined learning inquiries (Ison et al., 2013). The challenge we sought to address was to co-construct a sustainable social learning process in emerging communities of practices involving a group of biophysical and social researchers who came together as co-researchers in 2011–2013. In practice, it was influenced by a set of predetermined project milestones that had implications for the overall design of the learning system that emerged.

We experimented with using wiki technology embedded in an online platform as part of the LP, conceived as an innovation system to support institutional learning (Hall et al., 2016; Ison, 2016). The LP was contracted to researchers from the Systemic Governance Research Program, at Monash University (SGRP) and as part of the Africa Food Security Initiative (AFSI), funded through Australian Government aid, and managed by CSIRO. AFSI was organized as a complex programme partnership between Australian, West African and East African researchers (Ison et al., 2014). The LP was funded by CSIRO as part of the CSIRO–DFAT AFSI. It mainly involved some15–20 geographically dispersed CSIRO staff positioned across the internal organizational matrix structure in Australia and five Australian university-based staff.

Methodology

The article draws on empirical evidence of activity within the online platform as well as email communications about the online platform. Further details of how the inquiry was executed are given in the process analysis presented in the following sections. We first outline and analyse the design process and LPs' attempts to create reflective interaction between participants' practices and theories. We then reflect on the adequacy of our designs and conclude by suggesting lessons for R4D practice and future co-researching ICT initiatives.

Learning system design

The design of the LP as a learning system is described in detail in Ison et al. (2012, 2014). The key elements were formalized in a negotiated contract that included: (i) the preparation of a theoretical framework as a basis for action and assessing impacts, (ii) a system for collecting, managing and analysing data to demonstrate learning, (iii) assisting participants to pursue emergent action research inquiries and documenting reflections at the time of action and (iv) reporting so that the effectiveness and efficacy of investment in R4D could be enhanced. In theory, these deliverables were to be negotiated collaboratively, with responsibility for delivery held jointly by Monash and CSIRO participants. However, the Monash participants' role in practice was to facilitate these activities in a situation in which the commitment of most CSIRO researchers to the initiative had not been built.

The designers throughout sought to be attentive to boundary issues, initially by clarifying who was involved, guided by the ethical requirement that participation would be voluntary. In the end, 5 Monash researchers, 17 CSIRO participants and 1 external consultant ($n = 23$) were involved, from approximately 40 who participated in the overall AFSI programme. A subset of those who 'signed on' became active participants and contributed to the framing, conduct and steering of the LP's research. A set of sub-inquiries emerged from the main inquiry (Ison et al., 2014) that can be understood as sub-systems of the overall learning system. These included (i) the role of 'Integrated Agricultural Research for Development' (IAR4D) and Innovation Platforms (IP) in the context of farming systems research, (ii) the relationship between good science and enhanced food security, (iii) the integration of social, economic and biophysical sciences, (iv) power relations and ethics within project teams and R4D and (v) this inquiry, which came to be regarded as an exploration of the systemic failure of an online learning sub-system.

Creating an online environment

Contract items (ii) and (iii) were interpreted by the Monash participants, and most of the active CSIRO participants, as

developing an online ICT environment as a tool to support data collection and storage, knowledge sharing and collaborative analysis. The CSIRO-based LP champions held that, in action research, all trips to the field, as well as group interactions, were potential sources of data and that the LP should facilitate collection, analysis and reporting based on reflections in and on these practices. This was not supported by all CSIRO participants and some indicated very early-on that they were resistant to the use of an online environment. In addition, from the start, there was no formal relationship between the LP and the monitoring and evaluation (M&E) components of the overall R4D program. We return to these issues later.

The active participants considered the essential design parameters for the online environment to be (i) it had to be hosted on a private and secure server, (ii) it needed to be password-protected, (iii) thus in effect the data could be hosted only on one of the participating research institutions' servers and (iv) individual users should have full control of the privacy settings for any information they posted (including the ability to create space for fully private content and information shared with a limited number of participants). The ability for participants to edit any fully shared content also was considered important, as was the desire that many types of content could be shared, including text, images, audio, video and embedded file formats and that content could be tagged and searched for research purposes.

The main design limitation was the need for private and secure hosting, and thus only the collaboration tools (wikis) hosted by the two research institutions were considered: a CSIRO-hosted instance of Microsoft SharePoint; a Monash-hosted instance of the Sakai Collaborative Learning Environment; either a Monash-hosted or CSIRO-hosted instance of Atlassian Confluence; and a shared Google Site, Group and/or Drive under a privacy agreement with Monash. After discussion, the Monash-hosted instance of Confluence (version 3.2) was chosen.

A wiki is a website that allows editing of content and control of access to a series of 'pages' via a web browser, that is, a collaborative online environment in which there are several different platforms. The chosen wiki supported all of the desired design characteristics. Access was made available in three phases. First, Monash researchers logged in to the wiki using existing institutional credentials, created a set of pages and set them to 'private' among Monash participants. The initial content and structure of the wiki, as designed by Monash researchers, was a simple landing page with a photo-grid listing participants and the latest posts in a blog, which at the time included a short welcome message and a link to the outcomes of a previous workshop. Second, a workshop was held with a subset of AFSI participants on 5 October 2011. In advance of the workshop, access rights were granted to enable these external participants to use the wiki. A short workshop session demonstrated the wiki's features and enable participants to test them. Finally, accounts were created for all remaining and additional participants as they opted-in to the LP.

Inquiry results and analysis

The overall result can be summarized as a systemic failure. The inquiry team noted how the research community was encouraged from the outset to visit and use the wiki as part of a regular practice of reflection and collaborative learning and could feed into M&E of the overall R4D initiative. The Monash researchers regularly visited the wiki to update pages and monitor the frequency of usage and authorship of any postings. However, based on 18 months' observation, it became evident that most LP participants were not storing, posting or sharing their personal reflections or learning experiences, and that there were evident disparities between original intentions, design and actual experience (Barab et al., 2012). The Monash researchers sought feedback from the LP membership on this outcome during a workshop in February 2013, following a presentation from the wiki administrator. The discussions provided several clues as to why the wiki had failed to generate an active online learning community. Towards the end of the LP, the AFSI email correspondence was collated and analysed, including comments made about the wiki. All data were coded. The final analysis drew on these continuous observations, email correspondence and workshop feedback, using an adapted grounded theory approach (Charmaz, 2008). The remainder of this section summarizes the four main themes emerging from the inquiry.

Designing and establishing a collaborative online platform. The requirement for an online platform was established through the contracting process, involved a limited number of mainly CSIRO staff and surfaced tensions between different perspectives on the perceived value of a LP. Despite initial effort to scope how the wiki could be used in research situations (discussed for instance, at a workshop involving all AFSI participants, held in late 2011), CSIRO staff perceived themselves at the start to hold limited stakes in the wiki. In committing, or being committed to the AFSI project, they had not signed up for either the LP or its constituent elements. Thus, the initial starting conditions were not favourable and explained much of what happened subsequently. Further workshops and training opportunities, including provision of written instructions, video-based tutorials and over the phone or face-to-face training, did little to overcome these starting conditions. The uptake of individual training was low, and phone-based tuition sessions did not translate into the regular use of the wiki as a repository for personal learning reflections or as a communication tool.

Encouraging participation within ethics protocols. The LP was approved as a low-risk project by a human research ethics committee (initially at Monash and then also in CSIRO). To further satisfy the Monash ethics procedures, the LP had to be designed to engage those involved in AFSI on a voluntary basis so as to avoid participation through coercion, although it was accepted that it was important for CSIRO to learn how to improve use of online environments to interface between research and practice, and how to

engage stakeholders located at multiple locations and within different organizations. The invitation in the first instance to CSIRO researchers was in the form of an email issued by a senior manager to AFSI members:

Please note this email makes no assumption about your participation, though of course we in the AFSI management team see many advantages that can flow from involvement (AFSI LP Member 12).

Unfortunately, potential CSIRO participants were not seen as co-researchers in the ethics protocols but were framed as research subjects in a Monash research project. The project's ethics protocols required ongoing participant consent to share research data with others involved in the project. This created a lingering perception that data (in the form of reflections, etc.) were being transferred from participants (CSIRO) to researchers (Monash), although the intent was that data would be for the collective use of all participants:

If we are doing action and co-research, then we need ethics protocols that work to engender trust and open communication among co-researchers. Elements of the Monash protocol (especially around confidentiality and anonymity of CSIRO and Australian Affiliate AFSI participants) presented barriers to trust and open communication, truncated the 'data' potentially available to the LP 'researchers' and to participants (from CSIRO and affiliates working in AFSI) for shared learning and thus compromised the very aim of the learning project. (AFSI LP Member 12).

When institutional arrangements such as these reinforce organizational boundaries and research praxis stereotypes, designing and enacting a joint inquiry between collaborating organizations is problematic. In the event, only a few trip reports, experiences, emails or documents were posted. In line with reflexive practice, the Monash team liaised with their Human Research Ethics Committee and AFSI LP members to clarify the situation. The strongly supported view that emerged was that the LP was designed to be a social learning experience and that, as long as individual identities remained anonymous in publications, emails and other documentation, they should be understood as shared resources and accessible across the AFSI LP membership (AFSI LP member 7). The Human Research Ethics Committee confirmed that such material should be treatable as research data once LP members agreed to these conditions. However, we acknowledge that if all conversations, personal reflections and email correspondence are framed as potential data, people may be less inclined to engage with each other openly, fearing that these interactions could become potential sources of conflict, undermine trust and be subjected to differing interpretations during data analysis processes.

Facilitating online learning practices. Some AFSI LP members did prompt others to use the wiki to foster online learning. The AFSI LP Member 14, for instance, encouraged the use of the wiki in real time during a scheduled telephone conference but this did not eventuate. The AFSI LP Member 13, in the role of wiki administrator, proposed a template for participants to record their reflections, uploaded to the public space and advised them how they could use the template to share their contributions or keep such reflections private (Ison et al., 2013). The reflective space for shared reflection, although sparingly used, in one instance was used to share trip notes (initially recorded in email correspondence and CSIRO researchers' reports about fieldwork with African research partners). The notes provided material for discussing the realities of researching for development, for example:

My further travels through Burkina last week were very busy and fruitful . . . . One of the [research] sites is very close to the Ghanaian border . . . . At the site, I had a good chat with the farmers about what traits they liked from the trials they had witnessed and whether they would buy seed from what they had seen. Encouragingly, many farmers would buy seed of the improved varieties, although at the moment, seed is subsidized by the government, so that will skew any thoughts. The conversation was quite long, because we have to translate from English, through French to the local language and back again, so I may well have been asking them what their favourite colour hat was (AFSI LP Member 19).

The AFSI LP Member 12 considered such content a prime example of how AFSI LP members might record and share learning experiences:

Great report and material for the Learning Project . . . . Also thanks for your serious adoption of the need for documenting our experiences and reflections – this is [an] excellent example of what we as a team need to do (AFSI LP Member 12).

However, this wiki posting did not receive any further comments or lead to any online discussion. The wiki in actuality was used primarily as a repository for email communications, AFSI newsletters, AFSI LP administration documents and AFSI LP meeting minutes, and as a common area to display the evolving structure of the LP's inquiries. Planning how the wiki could be used more actively in the project's intended second phase was shaped by asking: *How do you make it part of daily/integrated practice?* (Confluence, entry 20120309 – reflection meeting). This question acknowledged that using the wiki had not yet become an embedded, everyday practice. In the event, because of political changes in Australia's development assistance programme, the second phase did not take place.

Barriers to institutionalizing online learning practices. Towards the completion of the LP, it was generally recognized that only 5 of 22 had contributed actively to the wiki. A range of possible social and technical reasons for this were identified during an AFSI LP workshop (January 2013) that provided important insights into the experience. The high transaction costs involved in creating and maintaining an additional login to access the Monash-based wiki site (an external site for the CSIRO-based researchers) was identified as a key issue. It also became apparent that CSIRO participants' time was mapped to other projects and they also had variable time commitments so conversations needing to engage multiple members mostly did not happen,

however, keen one participant might have been. The AFSI researchers also expressed privacy concerns associated with openly sharing opinions, ideas and research data in a collaborative, online environment that was also accessed by senior managers and colleagues. It was clear also that the success of the LP learning environment was dependent in part on the self-efficacy, motivation and ability of community members to self-regulate their practice and behaviour in an online environment. No doubt 'digital natives' will be more adept in future ICT-based learning situations but efficacy will, we suggest, still require conducive institutional and technical arrangements. For instance, Internet connections in some countries are intermittent and not conducive to working online; this was the case for AFSI researchers when outside Australia. The online platform itself was sometimes unstable or unreliable and did not always receive adequate attention from technical support staff (AFSI LP Member 13).

In response, AFSI LP Member 13 suggested that if the LP were to transition into phase 3 of the AFSI, migrating the wiki pages to an internal system already operating at CSIRO, using existing authentication procedures, could be helpful. A further attempt to engage the LP membership was initiated by AFSI LP Member 4 through the provision of access to a CSIRO-hosted web application platform (Sharepoint). This platform supports document and file management, online collaboration and social networking, and intranet portals. However, as with the Monash-based wiki, the web application was primarily used as a repository for relevant CSIRO-based documents, that is, as an information source rather than a place to interact and co-generate knowledge.

Discussion

Systemic challenges. The biggest technological constraint was the requirement for CSIRO staff to use an external login to access the space. However, we argue that it was not the technology per se that failed but the 'institutional ecology' in which it was deployed. By institutional ecology, we mean the given arrangements, rules, contracts and the LP project's elements, as well as the historical practices and arrangements that researchers brought with them from their own organizations. It meant that from the start there were design tensions and concerns about purpose, such as (i) on returning from the field, all CSIRO staff were expected to submit trip reports and fieldwork management reports but no provision was made for sharing these with the new wiki augmented data – at least not until 2015 after the termination of the AFSI programme (McMillan et al., 2016); (ii) no CSIRO staff were available to manage the online platform. Had staff been available, this would have presented access problems for Monash researchers; (iii) ethics protocols were new to many within CSIRO, lagged behind on-the-ground developments, and, as discussed, were not well suited to co-researching data that, according to Monash University Human Research Ethics protocols, could not be freely shared among AFSI LP members without prior consent; (iv) no institutional links were created between the wiki and AFSI's formal M&E requirements; (v) use of the wiki by AFSI researchers was voluntary; (vi) AFSI participants, with varying managerial responsibility and seniority considered the online space as unsafe for maintaining confidentiality; (vi) the learning context was challenging, requiring two organizations with different learning cultures and practices to jointly use an online platform, with few incentives; (vii) CSIRO researchers had to deal with different line and project managers, time pressures, diverse performance metrics and an overall tension within the organization over researching for development rather than researching for research. Workshop participants affirmed that collaboration and learning did emerge but did so outside the boundary of the wiki, in offline situations. Collaborative practices evolved through email correspondence, telephone conversations, face-to-face meetings and the co-authoring of research papers – which was the principle practice of the group (Wenger, 1989). Figure 1 summarizes the overall learning outcomes of our inquiry.

Epistemic struggles. We identify an additional level of systemic failure that pertains to understandings about how the co-production of knowledge happens, or could happen, and thus the practices upon which co-production rest. Cook and Wagenaar (2012) explain how it is in real-world practice that knowledge and the knowledge context are evoked; each practice is performed within unique constraints, enablers, histories and futures:

> [I]t is commonly said that knowledge is applied in practice. Professionals can be distinguished from lay people in that they have acquired through training a body of tested and proven specialized knowledge that enables them to resolve problems in their given field .... Numerous writings have brought us valuable insights into the importance of practice and have done a great deal to erode the Received View of practice as explicable wholly in terms of applied knowledge. However, our understanding of how exactly practice, as a distinct phenomenon, generates knowledge and how knowledge functions within practice is underdeveloped. (Cook and Wagenar, 2012: 3).

Ison and Russell (2011) show how the Received View underpins enduring commitments to the linear knowledge-transfer model; knowledge was framed from the start of the LP in terms of this view. Budgetary and staffing constraints in addition precluded more active processes of 'knowing management'. Klerkx et al. (2011) might not go as far as Cook and Wagenaar (2012) in seeing 'knowledge production' and 'knowing enabling' as a duality, albeit one in which the received view dominates the other, but they do indicate that knowing/knowledge managing is more than a negotiation process that brings together different knowledge interests.

Understanding knowledge communities metaphorically. Two prominent metaphors can be used for further exploration of knowledge communities: communities as a physical place and communities as a network. In an online

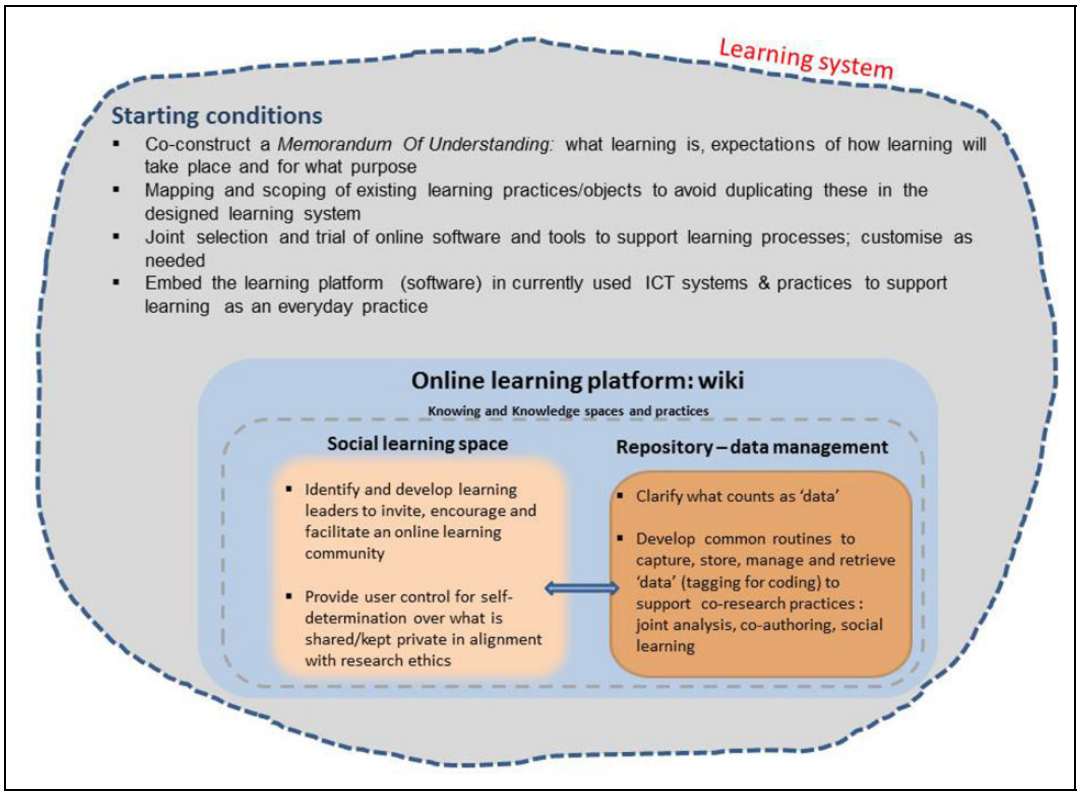

Figure 1. Learning system design features with online elements for enabling R4D as co-research: creating the starting conditions for designing an online learning system. R4D: research for development.

community represented as a physical place, people inhabit infrastructure, interact with others, express meaning through their practices and objects and are shaped by their context. The 'place' metaphor for the wiki emphasized ties among a stable set of individual AFSI members, working in spatially dispersed sites in Australia and East and West Africa. They no doubt were constrained by the functional reliability of the technologies available, and by their marked preference for those, they were familiar with and prepared to use. However, a community is not created simply by providing the infrastructure; it emerges from combining infrastructure, people, objects, meanings, relationships and other variables. Generating 'content' in an online space is like furnishing a home with material artefacts. In many ways, this was the main motivation for pressing ahead with the wiki, in expectation that online content generation would provide visible evidence of active shared learning (Hemetsberger and Reinhardt, 2009).

In an online community represented as a network, interactions are said to transcend location, allowing people to connect across space and time at multiple scales and intensities. Online relations are described as spontaneous and particularized, creating dynamic, heterogeneous communities of interest that have variable longevity. However, network theory highlights ties between individual actors (Postill, 2008), disregarding the potential for digitally enabled communities to become capable of taking collective action and forming powerful social identities (Gurstein, 2001). In retrospect, we suggest that perhaps there was insufficient focus on strengthening the ability of individual AFSI LP members to connect and network through their existing professional communities and identities. A network approach to understanding the LP's wiki experience tends to direct attention away from these cultural and inter-subjective dimensions of social relations (Yuan, 2013).

Conclusion and future directions

Designing online spaces for collaboration is a complex process; there can be great disparity between original design ideas and what eventuates in practice. An obvious way to reduce the disparity is to include users in the design process, including also external research organizations, project recipients and collaborative partners. In the experience discussed above, this was only partly achieved and began with what can be now understood as the wrong institutional ecology and conceptual understanding, with unexpressed prior epistemological commitments. We recommend agricultural researchers nonetheless dedicate time to critically assess and customize online technologies to facilitate a shared learning environment, and reflect on how design choices influence whether or not online participation becomes a part of everyday research practice. Collaborative negotiation of ethical protocols would seem a necessary collateral undertaking, to situate ethical practice appropriately and to learn about designing an ethical framework aligned with researching principles and praxis. Knowledge management practices to enable joint analysis, tagging data, and analysing project narratives also would

need to be established at the outset. It would also seem helpful to avoid a predetermined structure and engage facilitators to offer their interpretations back to the community for discussion, mentor adoption of online roles displaying diverse collaborative and learning capacities, and nurture social relations to build trust online and offline as part of a 'seamless' learning system, rather than framing the online environment as a differentiated space disconnected from offline research practices and social relations. The virtues associated with open source collaboration, emergent communities of practice and self-organising inquiries requires innovative capacity building efforts (Hall et al., 2012), as part of learning to learn how to mediate between knowledge and knowing in ICT-supported R4D.

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