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Demosthenes Akoumianakis

Technological Education Institution of Crete, da@epp.teicrete.gr

George Ktistakis

iSTLab in TEI of Crete, ktistak@gmail.com

Konstantinos Michailidis

TEI Crete, mikonprog@yahoo.gr

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REMEDICATION BY DESIGN: NEW LINGUISTIC DOMAINS FOR CHANGING ORGANIZATIONAL PRACTICES

Demosthenes Akoumianakis, George Ktistakis, Costas Michailidis

Department of Informatics Engineering, Technological Education Institute of Crete, Greece

da@ie.teicrete.gr; ktistak@gmail.com; mikonprog@yahoo.gr

Abstract

The paper examines the impact of novel linguistic vocabularies on the remediation of practices. As linguistic vocabularies we consider inscriptions into social technologies such as tagging mechanisms, word clouds, scented widgets, etc., that invoke recurrent co-engagement of users in designated communication acts, as well as the material agency of these technologies, especially provisions for digital trace data management and public APIs, which establish a new digital materiality for human routines. On the other hand, remediation is conceived as an evolving state of flux where certain practices are improvised (and re-configured) on the basis of certain linguistic vocabularies to work differently, thus enabling new possibilities for action. In this vein, the paper investigates the mechanics of such re-configurations and proposes a conceptual model and a scaffold for remediating organizational routines. The proposed model and scaffold are discussed by reflecting upon an empirical case covering online calendaring and enterprise (Internet) search in the context of a virtual alliance.

Keywords: Linguistic domain, Digital materiality, Remediation, Practice

1. Introduction

For more than a decade now practice-based studies and theories dominate scholarship in fields such as organization studies (Barnes, 2001; Jarzabkowski, 2005; Chia & Holt, 2006), management science (Orlikowski, 2000; Gherardi, 2009), and increasingly information systems research (Schultze & Orlikowski, 2004; Levina & Vaast, 2005). At the core of these debates is the intertwining between human and material agencies to determine possibilities for action. Specifically, of particular interest is how human agency is enacted in response to the ‘performativity’ of non-human actors and the material agency of technologies (Pickering, 1995; Pickering 2001; Volkoff et al. 2007; Leonardi, 2011). To capture the essence of the dialogue between agencies, scholars have recruited concepts such as affordances (Gibson, 1986; Norman, 1990; 1999; Zamutto et., al., 2007), technological embeddedness (Volkoff et al. 2007) and imbrication (Leonardi, 2011). Although there has been progress in the direction of understanding the complexity involved in theorizing technology and organizational change/life, there is also a noticeable gap in pointing deficiencies and shortcomings in the construction of the material agency embodied in technologies and the ways in which such material agency invokes human action.

Arguably, the performativity of any technology is linked to the design qualities embedded in that technology. Recent efforts recognize the need for making such links explicit and approach the challenge from different standpoints. For instance, Kallinikos et al. (2010) advance a theory of digital artefacts (Kallinikos et al., 2010) qualifying them as special constructions that are editable, open and reprogrammable, interactive, distributed and modularly composed. Leonardi (2011) relies on the concept of imbrication and describes how the intertwining of human and material agencies leads to changes in human routines but also technology. Lanzara (2010) examines remediation of practice and how assemblages of human and material agencies migrate from one medium to another.

Although these frames of reference suffice to disentangle elements of the new digital setting, they do not offer a consolidated base for understanding the linguistic conventions (or vocabularies) anchoring sociomaterial entanglements. As linguistic vocabularies we understand artificial inscriptions or conventions such as coding schemes (i.e., Morse code) whose recurrent appropriation leads to enactment of communication acts that arise from the history of co-engagement between the involved partners. Social technologies offer a variety of such linguistic vocabularies, including tagging mechanisms (as in the case of social bookmarking), the hashtag (as in the case of micro-blogging), as well as re-configurable digital artefacts such as word clouds, scented interaction objects, social widgets, etc., which trigger different communicative acts between human collaborators. Moreover, the history of such co-engagements becomes increasingly tacit since the material agency of these technologies makes provisions for digital trace data management (e.g., in the form of public APIs) which can be used to gain insight into different configurations of people, artefacts and social relations.

In light of the above, the present work seeks to motivate and advance a conceptual framework for understanding the increasingly linguistic nature of organizational routines and the way in which organizational practices are re-aligned and re-configured using novel linguistic vocabularies inscribed into different social technologies. To this effect, certain research questions are of particular interest. For instance:

- What is it that constitutes the technology-inscribed features of practice;
- How are they allocated to agents (human and non-human);
- How do these practices become remediated using computer-reliant media to depict novel configurations of people, artefacts and social relations?

To shed light to the above, the present work recruits concepts from different theoretical streams to advance a proposition and a scaffold for remediating practice and then it reflects upon the proposed constructs using the lens of an on-going case study. The paper is structured as follows. The next section sets the baseline for understanding practices and their remediation by reviewing relevant scholarships from organizational science management and information systems research. Then, an attempt is made to synthesize an analytical scaffold for remediating practice by design. To 'test' the scaffold, we briefly reflect upon an empirical case seeking to re-organize the operation of a virtual alliance. The paper is concluded with a summary of findings and directions for future work.

2. Theoretical background

The present research rests on recent scholarships that seek to untangle the notion of practice, its constituents and their relationship to technology. Thus, we will review organization and management science perspectives but also current thinking in the information systems research community. In an effort to maintain focus while motivating our argument, we will concentrate on some categories that unfold how practices relate to media, regimes of remediation and what are the pre-requisites for remediation in digital settings.

2.1. Practices and media

The idea that practices are instituted through mediated activities is not new. It can be traced in the work of Vygotsky but also in treatments of human and material agencies as in Pickering's 'mangle' of practice (Pickering, 1995), Schuman's concept of 'creative sociomaterial assemblage' (Schuman, 2007) and Orlikowski's 'constituting entanglement' (Orlikowski, 2007). Nonetheless, there is a lack of understanding the relationship between a medium and a practice, the medium's implications on practice and the extent to which practices become medium-specific (Lanzara, 2010). In his analysis, Lanzara (2010) motivates the problem and observes that "the more deeply embedded is the practice in a specific medium, the greater the amount of restructuring involved in the migration to a different medium". At core what is called for is an assessment of the embeddedness of practice into a certain medium by account of intrinsic constructs such as representation of meaning and means of transmission.

In terms of meaning and representation, there are practices, such as painting and music composition that tend to avoid detail and value abstraction. They also tend to embrace ambiguity as enabling richness of meaning and bring into play our intuition and imagination (Akoumianakis, 2009). These practices – frequently referred to as creative practices – explore visual, spatial, textural and audio representations that afford abstraction, rich meanings and interpretation. In contrast, there are technical practices that aim to eliminate ambiguity, seek for certainty and pursue correctness, completeness and detail. They rely on formalism, symbolic representations and logical reasoning.

With respect to embeddedness, there are practices which are framed almost entirely in processes, with their transmission being primarily verbal and relying on some sort of language. Such practices are common and popular in most of the engineering and natural science disciplines (Akoumianakis, 2009). Their social character stems not so much from the situational engagement in the practice or cultural bindings as from the fact that they are so well established that they are distinctively codified, widely accepted and used by many practitioners. Such practices tend to possess precise meaning, typically decoupled from cultural interpretations, and instituted as blueprints for others to follow. On the other hand social practices are much more different as they are spontaneous, culturally interpreted, locally reconstructed and sometimes unpredictable. They are framed primarily in the interpersonal interactions between members and are transmitted both verbally and non-verbally.

In all cases and irrespective of their categorical form, practices become intertwined with the media through which they are enacted. The question which is now prominently posed is what happens with certain practices when media change? And by change in medium, we do not imply only the digital medium, but also genres of

digital media. In this vein, two anchors may be identified. On the one hand, there are practices whose digital configuration may be conceived as direct or merely improved reconstructions of established practices as instituted in another medium (online or offline). On the other hand, there are cases where totally new practices emerge through innovations driven either by creative designers or even end users who can translate their creativity into novel products and services or radical technical change.

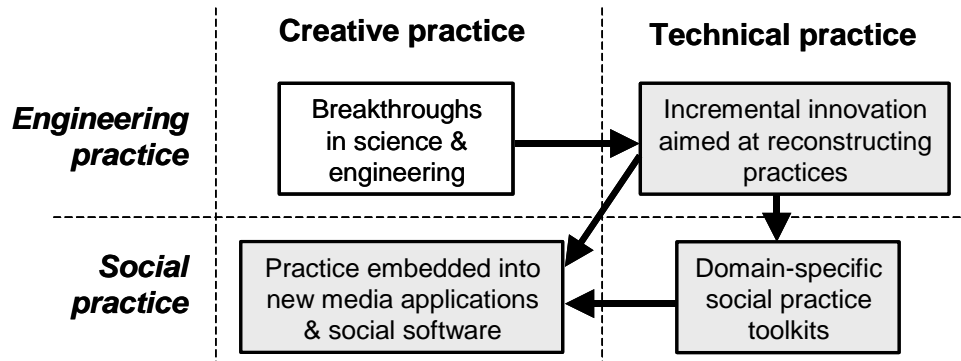


Figure 1. The practice grid and pathways of innovation

In broad terms, the possible pathways through which practices can be altered, and accordingly change status in the scale creative/technical and engineering/social, are depicted in Figure 1. The diagram can also suggest a scheme for qualifying the variety of systems available today under the category of social computing on the grounds of the basic practice being served and how it was modified, improved or altered as a result of the digital medium. Specifically, early systems such as MUDs, MOOs, IRC channels and bulletin boards can be conceived of as attempts to reinvent ‘presence’ and ‘communication’ practices in virtual ‘places’, thereby fostering some sort of togetherness and/or sense of community. Systems adhering to this design objective emphasize the notion of a common virtual place resembling the meeting spaces encountered in civil society models and rely on media that afford reconstruction of interpersonal communication practices that serve as a constitutive practice of community. Subsequent efforts progressively shift away from (without abandoning) the metaphor of a meeting ‘place’ to ‘space-oriented’ practices such as networking with adaptations in the way connections are made resulting from the intrinsic properties of the digital medium (i.e., symmetric versus asymmetric networks, etc.). These systems are transitions either along the technical practice dimension or in the diagonal dimension as indicated in Figure 1. Typical examples of the former are currently popular social networking services such as mySpace, which may be conceived of as systems for articulating a digital practice of presence.

2.2. Remediation of organizational practices

Our current interest is in organizational practices, which according to Kostova & Roth (2002) may be defined as “an organization's routine use of knowledge for conducting a particular function that has evolved over time under the influence of the organization's history, people, interests, and actions.” (p. 216). Organizational routines are tightly interrelated to the technology which mediates their execution, and as technologies change so do the respective practices (Zammuto et al., 2007; Leonardi, 2011). Nonetheless, new practices do not follow inexorably from the material features of established technologies; instead, they are improvised on the basis of old practices that work differently in new technological circumstances (Harrison & Barthel, 2009; Jensen & Helles, 2011). Phrased differently, new technological

trajectories catalyze old practices which become enriched and frequently totally redefined in the new socio-technical context. As a result, new organizational routines emerge to signify either reconstruction of existing or the establishment of new practices. Although such reconfigurations of practices are widely acknowledged, it is not yet entirely clear how they are brought about.

In this vein the concept of remediation may offer useful insight. In the New Media literature remediation occurs when one medium becomes the 'content' of another medium. Marshall McLuhan's (1964) remark is indicative "The content of writing is speech, just as the written word is the content of print, and print is the content of the telegraph" (p. 23–24). Thus, remediation entails the representation of one medium in another. More recent thinking by Lanzara (2010) defines remediation as a "migration of an assemblage of embedded agencies established in a certain medium to a new assemblage in a new or multiple media". It is also worth noticing that in Lanzara's analysis 'content' is important, but equally important are the affordances of media which enable or constrain use. For our purposes, remediation entails a process of realigning our understanding and experience of the world using signs and semiotic conventions. In virtual settings, such realignment typically rests on digital representations and the way in which they are designed to serve new virtualities.

The critical role of representations in re-arranging or creating new realities has recently been emphasized by organization scientists e.g., Leonardi (2010) in his analysis of digital materiality; Bailey, Leonardi & Barley (2013) in their account of the 'lure' of the virtual, as well as information system researchers advancing views such as 'software as material' (Bertelsen, Breinbjerg & Pold, 2009) or 'medium as material' (Dourish & Mazmanian, 2012). In all cases, the common bond that spans disciplinary boundaries is that any purposeful attempt to understand remediation of social practices should inevitably address challenges related to representation(s), their physical referents and affordances. For Bailey, Leonardi & Barley (2013) representations anchor "what it is that a technology makes virtual and whether work is done with or on, through or within representations". Such a qualification is important for two reasons. Firstly, it draws attention to two concepts which can help frame remediation of practice, namely digitization and virtuality. According to the authors "digitization involves the creation of computer-based representations of physical phenomena...[while] virtuality occurs when digital representations stand for, and in some cases completely substitutes for, the physical objects, processes, or people they represent". Phrased differently, digitization gives rise to the divide between physical and virtual through the creation of digital representations, while virtuality specifies what the interaction between physical and virtual will be. Based on the above, it is claimed that remediation entails both considerations of what is (to be) digitized but also assessment of the sort of virtuality forged.

The second reason why Bailey, Leonardi & Barley's work is important in the context of the present work is that it re-surfaces the notion of affordances as anchors of what representations are capable of representing and the possibilities for action they offer. Once again we are confronted with a concept (i.e., affordances) that remains problematic and loosely defined. Research studies typically focus on affordances as perceptible proprieties of artefacts. Early works by Star & Griesemer (1989), but also Erickson & Kellog (2000), advance various proposals for a minimum set of affordances such as expressiveness (capability of objects to represent common ground

and knowledge that is embedded in practice); usability (capability of objects to be usable by everybody); boundary and locality (capability of objects to be concurrently recognizable across social worlds and meaningful to the different institutional settings of each social world through translation); and social translucence (capability of objects to convey interdependencies between the involved social worlds so that there is the incentive for adjusting experiences and competences). More recent studies attempt to qualify social media in terms of social affordances such as persistence, replication, scalability and searchability (boyd, 2010) or intrinsic design qualities such as abstraction, openness, interoperability and plasticity (Akoumianakis, 2010) as embedded in platforms, environments and infrastructures. The latter is claimed to be pre-requisite for understanding emergent structures (i.e., cyber-formations), joint actions and social accomplishment across boundaries rather than capabilities for action in a single stage in which people act.

2.3. The role of representations

Another useful lens for understanding how practices become remediated through new (computer-reliant) media rests on the call for a dual analysis of practice at the macro- and micro-levels as proposed by Schutze and Orlikowski (2004). According to the authors, social practices acquire their meaning from the macro-context (that defines broad commonalities, shared perspectives and paradigm-level commitments) and a micro-context (that anchors user activities on artefacts and the mechanics of mediation). For virtually constituted practices, the macro-context designates common design commitments inscribed into a range of technologies that collectively anchor a technological paradigm such as Web 2.0. These commitments can be assumed to affect a broad range of practices while they signal specific arrangements for the set of actors engaged, the conduct of practices and their wider intended or unintended effects. On the other hand, the micro-context binds routine human activities to specific digital spaces (i.e., blogging platforms, social networking services, etc.) thus ascribing meaning to otherwise banal actions such as mouse clicks, 'likes' and tags.

According to this view, it may be argued that provisions for building profiles, expressing opinion and communicating, sharing content, establishing and sustaining connections constitute broad commonalities easily traced in a range of technology genres and online services including blogging and micro-blogging platforms, social networking services and social media sites (Kim, Jeong & Lee, 2010). At the micro-level however these services are differentiated. For instance, connectivity in each service emerges through recurrent activities on designated artefacts (mostly) within a bounded system while in most cases it materializes into bounded system-specific digital traces (Howison, Wiggins & Crowston, 2011). The precise meaning of the users' activity is obtained relative to these artefacts and the technological configurations through which they are inscribed. Thus, it is possible to differentiate contact-based ad hoc connections in Facebook, Twitter and Flickr from more professional and business connections in LinkedIn by screening out commonalities at macro-level (i.e., all systems support user profiles, communication, establishment of social relations, mechanisms for sharing contents, etc.) while paying attention to the different patterns of interactions at micro-level.

Consequently, computer-mediated (and remediated) practices may be conceived of as clusters of recurrent human activities (with a linguistic intention) that emerge from the constitutive entanglement of broad macros-level commonalities and the specificities

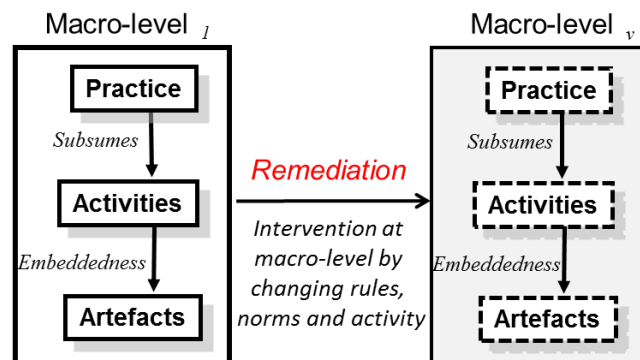
of micro-level interactions. Such constitutive entanglement ascribes precise meaning to otherwise banal or routine actions.

3. Remediating practices – A design perspective

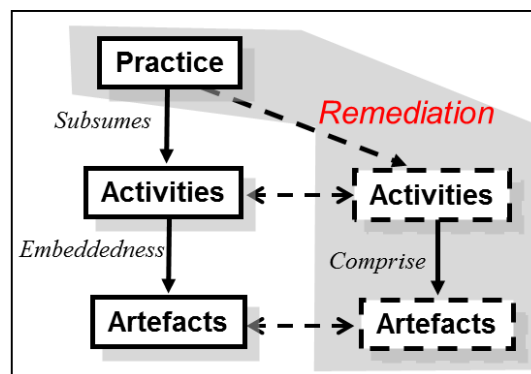
Having reviewed prevalent conceptions and perspectives, this section makes a step into the direction of synthesizing some of the concepts presented earlier to gain insight into what it is that needs to be designed to remediate practices manifested through computer-reliant media. Our intention is to provide an integrative scaffold capable of explaining / analysing existing systems and institutions of practice, but more importantly, informative of new potentialities, future developments and the space of opportunities.

3.1. Scaffolding for remediation

Our normative perspective acknowledges that remediating a practice may follow two pathways. The first assumes global changes that alter the macro-level to an extent that a change in paradigm occurs. The alternative is to conceive remediation as incremental refinements or extensions at micro-level. In the former case changes are so radical that the practice as known is no longer valid or relevant. It is replaced by a new practice that implicates different set of artefacts, new skills, new distributions of agency, etc. The latter case entails revisions in certain properties of the practice, but mainly the practice as known, does not become obsolete. It is augmented and extended by redefining certain sub-activities, installing new artefacts, re-distributing agency but in a way that the old practice as known and the remediated practice remain interrelated. Schematically, the two regimes of remediation can be depicted as in Figure 2.



(a) Remediated practices as new realities



(b) Remediated practices as improvements

Figure 2: Regimes of remediation

As shown the common denominator in these regimes of remediation is the triple <practice, activities, artefacts> pointing to a minimal context or unit for analysing remediation. Such a minimal context is broad enough to establish order and meaning to a range of virtual practices even when they implicate similar or identical artefacts. For instance, it can be used to anchor differences between electronic journalism, communication and networking even though they all subsume banal activities such as text editing confined to common or similar artefacts (i.e., digital documents).

Using this as lens, it is possible to conceive the dynamics of remediation as an evolving state of affairs where new practices are improvised on the basis of old practices that work differently in new technological settings. This is illustrated in Figure 3 which highlights a cyclical re-alignment of a practice through its virtual embodiment in new media. As shown, discontinuities between the practice as established in the old medium and the remediated practice progressively stabilize through the users' conscious efforts to cope with strangeness. Once the remediated practice is stabilized, it sets a new standard and incrementally becomes part of the community's culture.

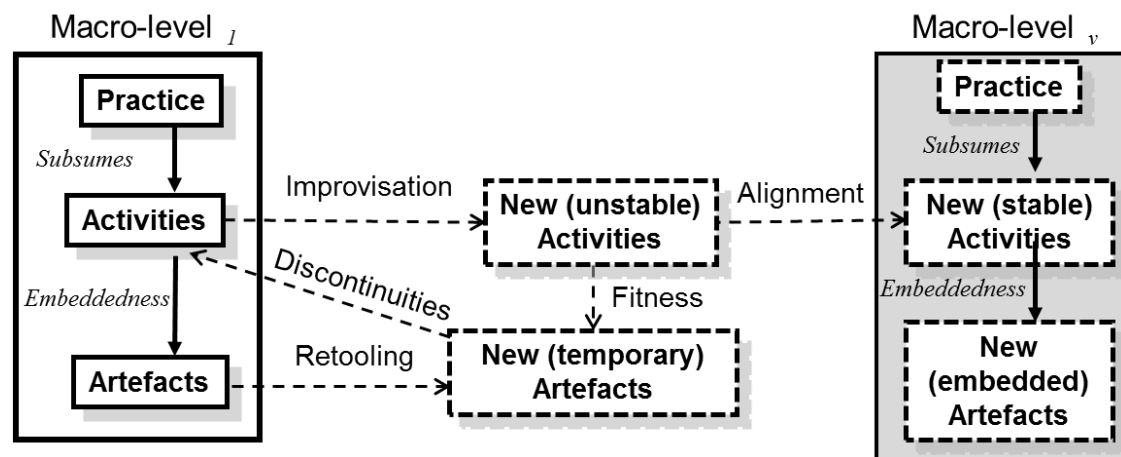


Figure 3: Dynamics of remediation

3.2. Illustrative example

As an illustration of the analytical purpose of the scaffold in Figure 3, we can use a seemingly trivial example, namely the implications of social buttons such as the 'like' button commonly encountered in social media and social web sites. Needless to mention that social buttons provide for novel practices such as for example revealing the demographic characteristics of a brand's online supporters (Naylor, Lamberton & West, 2012), while they have diffused across blogs, news websites, social media platforms and other types of websites. These buttons allow users to share, recommend or bookmark a post or page across different social media platforms such as Facebook, Twitter, Digg, and Delicious. Nonetheless, they remain buttons just as the two-state GUI buttons, and as such they offer a good case to assessing how new practices are improvised on the basis of old practices that work differently in new setting.

A useful starting point is to recall established conceptions of metaphor (Carroll & Mack, 1985) rooted in communication theory and the philosophy of language to conceive of buttons as a communicative pattern for conveying command. Conventional GUI-type buttons (i.e., artefact) serve as mediators through which

cognitive processing in the mind of a human agent (i.e., intention is transmitted to an application by means of button pressing and event handling (i.e., activity) so as to control the execution of functions. Such mediation is established by designing mappings between symbols in a user-oriented language to functions in a machine-oriented language. In the social web, social buttons such as 'like' buttons implicate the same user activity (i.e., button pressing) to convey state of mind such as agreement/disagreement, like/dislike (i.e., new intentions) in addition to command (as in the case of conventional buttons). This is achieved by embedding inscriptions such as social scent (Willett, Heer, & Agrawala, 2007) to allow 'like' buttons to indicate the number of affiliates who have been in the same state of mind or share the same opinion. Interestingly, social scent has its own agency that can be inscribed into various widgets in different ways (Willett, Heer, & Agrawala, 2007). By this account 'like' buttons convey additional human intentions and increase the bandwidth of communication by allowing users to exercise their agency not so much to affect the order of executing functions as to notify ambient affiliates of their state of mind.

One question is whether or not such an augmentation could be seen as remediation in the sense of migration of an assemblage of embedded agencies established in a certain medium to a new assemblage in a new or multiple media? Considering strictly the artefact in question, the answer could be negative as all material agencies are inscribed into a single medium. However, should social scent be conveyed non-visually (e.g., using tonal signals), then a form of remediation can be established in the sense that agencies are distributed across multiple media to convey the intended functionality (as opposed to being inscribed or co-present into one). In a similar fashion the involved agencies could be further discriminated and distributed across multiple media such as tactile (for conveying state), auditory (for conveying collectivity) and speech (for conveying command or choice). Focusing on practises however, it is clear that new material agency inscribed into buttons (as known in the conventional GUI settings) allow for new practices as in the case of marketing (Naylor, Lamberton & West, 2012). As depicted in Figure 3, these practices may entail activities which are unstable at start, and progressively once (and if) they mature, they establish a new practice that diffuses and becomes widely adopted. It can also be argued that such an explanation is consistent with the theory of digital artefacts (Kallinikos et al., 2010) which would anchor 'like' buttons as representing an assemblage of sub-objects (with own agency), that collectively convey (a) command or choice and (b) state of mind or opinion and (c) collectivity through social scent. It is also worth noticing that it is precisely such an assemblage of embedded agencies that ascribes to 'like' buttons linguistic codes and anchors them as cultural artefacts in the prevalent digital culture.

Consequently, migration of an assemblage of embedded agencies to a new medium or media need not have a specific cardinality or follow a pre-determined mapping scheme. It is more about establishing a new reality through which a phenomenon is conceived and understood than tailoring information processing properties of constituent parts. Then, it is this new reality crafted by the nexus of media and the re-distribution of agencies that anchors established activities subsumed by a practice and redefines them through remediation.

In light of the above, we may now attempt to anchor Web 2.0 along the lines presented so far. Specifically, it is argued that Web 2.0 represents a technological

trajectory where professional and social practices are remediated (both at macro- and micro-levels). At macro-level all practices are instituted by activities that entail profile management, communication, expression of opinion, maintaining connections, creating user-generated content. At micro-level, these practices are embodied into different tools and services for networking, video sharing, gaming, etc. Thus, Web 2.0 is a digital assemblage of separate practices with each being remediated in a manner that suits a purpose.

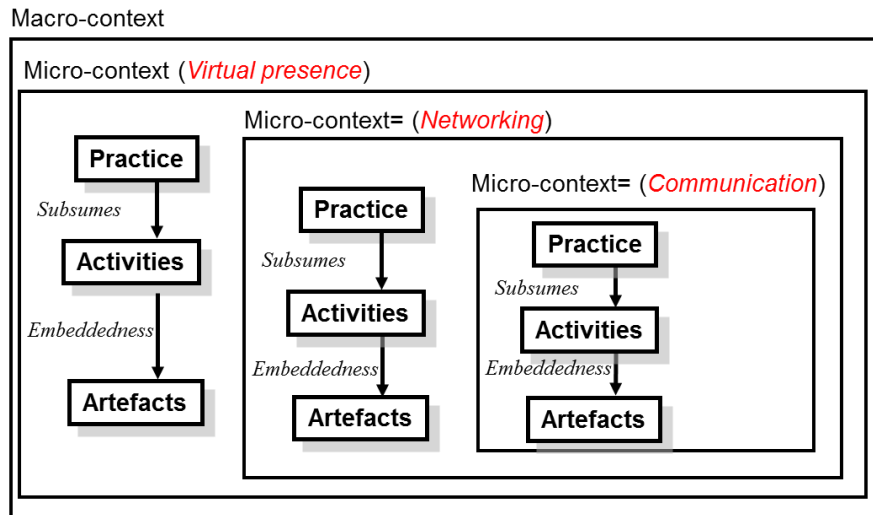


Figure 4: Social media as digital assemblages

Schematically this is depicted in Figure 4 where for a certain macro-context such as for example Web 2.0 a variety of micro-contexts maybe intertwined to provide support for designated practices (i.e., virtual presence, networking, communication, etc.). It is precisely such intertwining between the artefacts, the activities and the practices that creates different configurations of online ensembles. This view suggests that practices become entangled or blurred in new social media where they are remediated in different ways. As they become blurred and remediated, practices form a milieu that is distinct enough and in some cases specific to a purpose (i.e., photo sharing, video sharing, etc.).

3.3. Remediating by design: Towards Practice-oriented Toolkits (PoTs)

Having anchored regimes and the dynamics of remediation this section advances a proposal for what it is that needs to be designed to remediate social practices using computer-reliant media. To this end, and given our focus on digital media, it is important to distil that remediation relies on the mapping of functions in a source domain model to symbols in a target presentation model. The goodness of fit of this mapping determines not only the discontinuity / breakdowns between the established and the remediated practice (see Figure 3), but also the new space of possibilities enabled through remediation. Moreover, as remediation of practice is about new social accomplishments implicated through (computer-mediated) social interactions, it stands to argue that designing for remediation entails the construction of artificial vocabularies for humans to co-engage in a designated field of practise.

For purposes of simplicity we will refer to these artificial vocabularies by the label Practice-oriented Toolkits (PoTs) and claim that the primary function of PoTs is to facilitate the members' operation in 'linguistic domains'. The term is borrowed from Maturana and Varela (1992) where it is defined as "... systems of learned

communicative behaviour that arise between organisms as the result of their ‘particular history of co-existence’ (p. 207). In practical terms, this implies facilitation of recurrent interactions between human and non-human actors that lead to an act of communication meaningful in a designated practice. Thus, we envision PoTs as a broad category of social systems that create virtualities (in the sense of Bailey, Leonardi & Barley, 2013) in a variety of practice domains such as online design contests, virtual prototyping engines for consumer products (i.e., wrist watches, automobile equipment etc.), networked music performance and assembly lines for custom information-based services (i.e., vacation packages, etc.).

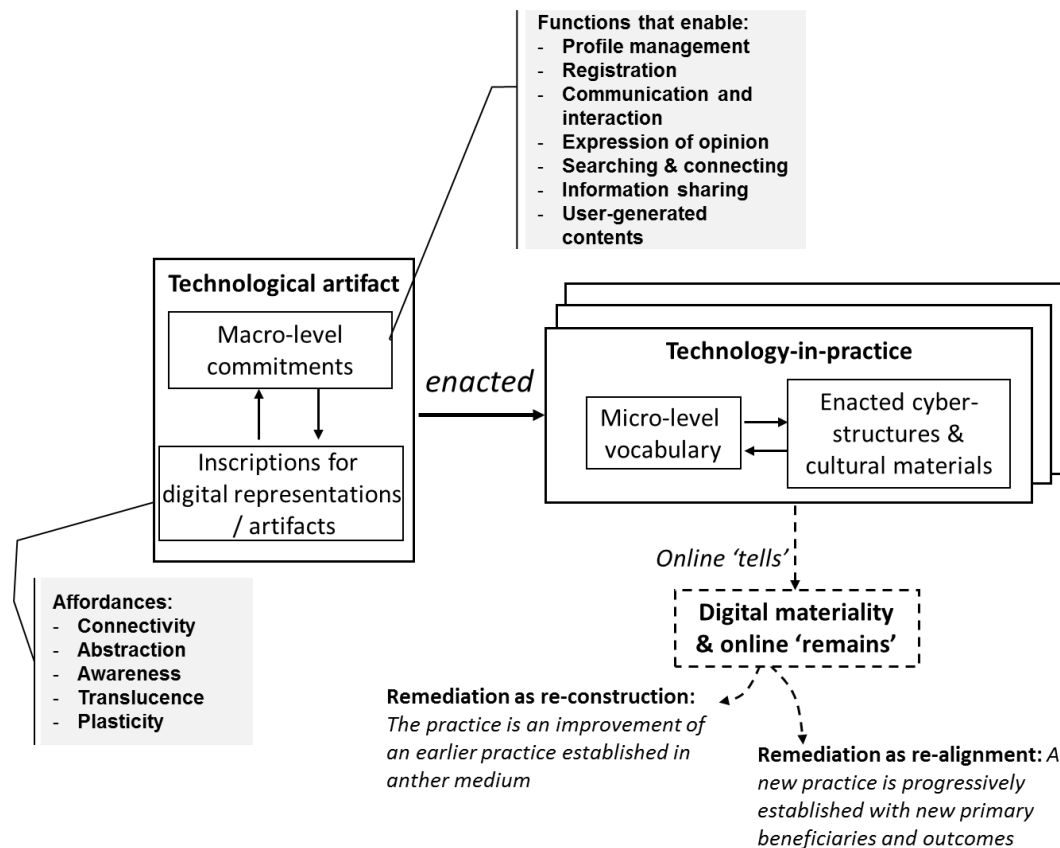


Figure 5: Remediation of practices with computer-reliant media

In terms of archetype, PoTs are made up from three basic constituents as depicted in Figure 5, namely the technological artefact (including its intrinsic construction), the technology-in-practice that emerges as a result of the users’ appropriation of the artifact and the resulting digital materials that provide evidence of what is being conducted online. The technological artefact (see Figure 5, left) comprises macro-level commitments as dictated by the running paradigm (i.e., profile management, communication, expression of opinion, etc.) and inscriptions of digital representations (of people, processes and artefacts) with certain affordances. As the technological artefact is being appropriated by users, not necessarily in identical manners, it gives rise to a variety of enacted technologies in practice in the sense of Orlikowski (2000). These are locally situated instances of the PoT representing an entangled socio-technical assemblage between human and non-human actors (i.e., the state of affairs between a specific user and specific inscriptions in technology). Due to their situated character, technologies in practice represent temporarily emergent and entangled configurations of a designated micro-level vocabulary (i.e., plugins, social widgets,

buttons, tags, links, URLs, etc.) as related to practice-specific cultural materials (i.e., web pages, custom widgets, electronic documents, etc.) and other enacted cyber-structures.

Such entanglements can be analytically explored through digital trace data management which convey the PoT's digital materiality. Digital materiality coins the layer where digital traces of online user activity become tangible and concrete digital material available for further processing. Through such traces, technologies obtain a capacity to convey a digital materiality of their enacted structures, thus allowing reflections on (typically hidden and) embedded features or ingredients, in addition to the experienced or perceived aspects of the technology. Such a provision makes it possible to assess how humans (re-)align their understanding and experience of practice through media (digital worlds) that comprises signs and semiotic conventions. To illustrate the concept, one can draw parallels with social networking services and other digital services offering public APIs. For instance, Facebook and YouTube started out to facilitate a practice of networking and sharing that was fully bundled and hidden in the design of these services. Progressively, and through public APIs, both networking and sharing became more open as these services offered a means for third party-application development. A by-product of these APIs is that it is now possible to trace data retained within these services and make sense of online activities and phenomena occurring there within or across service boundaries. However, other social networking services in spite of relying on similar artefacts to allow connectivity and sharing, do not offer such capabilities. This implies a classification of media not only in relation to artifactual properties and cultural artefacts but also in relation to inscriptions devoted to supporting different regimes of sharing levels of interoperability.

Consequently, designing for remediation requires attention to (at least) three critical elements:

- (a) Digital artefacts (in the sense of Kallinikos et al. (2010) that enable or constrain activities of the designated practice;
- (b) Design qualities that determine use of these artefacts; and
- (c) Provisions for digital materiality.

Digital artefacts may comprise generic components such tagging schemes, scented objects, social widgets, etc., or special purpose and practice-specific digital constructions that convey intrinsic properties of the practice. On the other hand, design qualities are seen as technology-inscribed features such as portability, abstraction and interoperability that determine how artefacts are used. Finally, digital materiality anchors the capacity to record and expose digital traces of human acting upon specific digital artefacts in such a way that the 'social' and the 'material' are disentangled (even temporarily) to depict an emergent configuration of people, artefacts and social relations.

4. Case reflections

This section aims to showcase the use of the scaffolds by reflecting upon on-going research and development in a collaborative project. The project investigates current impediments to computer-mediated collaboration and networking in the sector of organic agricultural production in the region of Crete, Greece.

4.1. The research setting

As currently organized regional organic farming is a strongly regulated sector that is characterized by the actors' commitment to quality, high concentration of effort, increased production cost and limited capacity to reach the wider consumer base effectively and efficiently. Due to these, but also other exogenous factors and unforeseen circumstances (e.g., weather conditions), organic farming is typically conceived of as an endeavour associated with high risk. To reduce such risk, producers seek to combine efforts and liaise with intermediaries such as specialists, certification experts and commerce-based outlets (retail or wholesale grocery stores) in search of support in all stages involved in organic farming, from planning to marketing. This makes organic farming a boundary spanning activity (i.e., an endeavour that crosses several social worlds), that is heavily reliant upon established ties and the actors' willingness to collaborate and network. Social web technologies, new media and social networking services can catalyse the way in which organic farming is conducted provided that they are aligned to serve specific purposes. Nevertheless, this is not always straight forward as these technologies rely on different foundational premises and employ different representations. Consequently, one design challenge amounts to re-aligning established field practices in organic farming in such a way so as to facilitate electronic collaboration and networking.

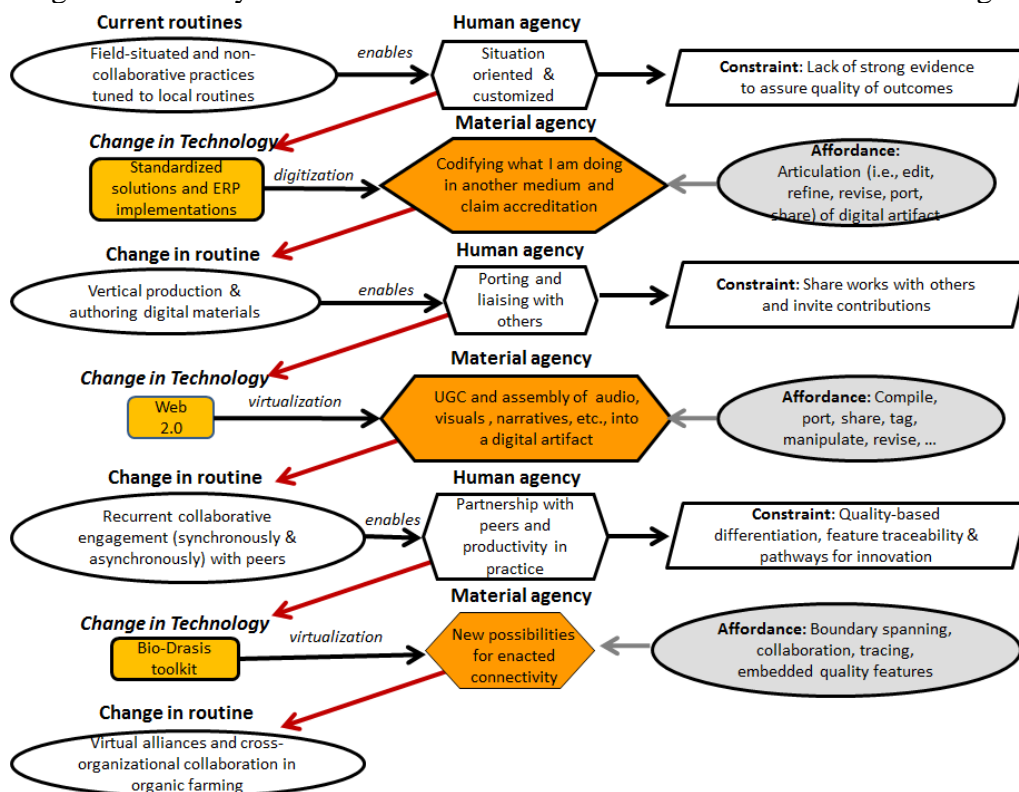


Figure 6: Design strategy

In an effort to assess possible re-alignments of practice using computer-reliant media we have undertaken a series of empirical inquiries aimed at formulating a design strategy which would progressively turn a farmer's situated and local activities into a shared and collective (computer-mediated) practice by engaging representations that span boundaries of time, place and knowledge / competences. Figure 6 depicts this strategy and anchors the imbrications of social and material agencies (in the sense of

Leonardi, 2011). Specifically, the figure illustrates a set of transitions grounded either on shortcomings in existing practices that create the need for change in technology or new technological affordances that set the scene for changes in human routines. Our current work focuses on the appropriation of Web 2.0 technologies for coordinating distributed activities, communication, task list management and sharing of different media types. For instance, a scenario where multiple parties (i.e., farmers, agricultural experts, certification experts, etc.) co-engage over a period of time to prepare and execute a shared agenda (i.e., crop production) may be realized by implicating different digital artefacts and technological venues. One possible arrangement entails:

- An online calendaring service to specify start and end dates for a certain activity (i.e., crop production, spraying, harvesting, etc.), scheduling and sharing the event, inviting guests and asking them to deliver progress reports of individual activities;
- Communication media such as telephone and e-mail or face to face dialog for negotiating details of executing activities, tasks and sub-tasks;
- Task management service or e-mail for producing shareable task lists and
- Online file sharing services to store event-related materials (e.g., shared documents, presentations, videos, photos, audios etc.)
- Information access and retrieval mechanisms to compile activity-specific records of distributed tasks and human routines.

4.2. Design challenges and research questions

At first glance, it appears that various candidate technologies may be configured to administer the designated sub-practices of coordination, communication, resource sharing resources and retrieval of information. Nonetheless, due to technical barriers such as mismatches in code, different architectural styles and runtime libraries, lack of interoperability, etc., integrating these technologies into a digital assemblage may be problematic. For instance, online calendars allow scheduling of events but fail to provide data storage for event-related digital materials. Communication media foster information exchanges and negotiation between parties but do not anchor these exchanges to the events which may have invoked these exchanges. Similarly, shared repositories and search engines facilitate access to digital objects but in manners which disentangle these objects from the social context within which their meaning is obtained. On the other hand, overcoming these barriers entails establishing a layer of (information and social) connectivity that spans across bounded systems, unifying activities of collaborators under a shared context and bringing together emergent configurations of people, artefacts and social relations. From the perspective of remediating practices, this orientation gives rise to two prominent research questions:

- What linguistic conventions may be recruited to establish a shared context for collaborative co-engagements between different actors of a virtual alliance in organic farming?
- Can these linguistic conventions re-arrange individual and collective activities so as to enact practices that serve novel human intentions, not viable through traditional means?

4.3. Preliminary findings

To provide a context for reflection, this section presents the re-configuration of two prominent practices, namely calendaring and information search & retrieval, based on the notion of shared linguistic vocabularies. As starting point, let us recall that calendaring coins a coordination practice which is enacted by articulating representations of time-oriented (individual or group) schedules. In digital settings,

the practice implicates additional features such as task lists, reminders, notifications and awareness (in the case of group calendars). Nonetheless, online calendars lack genuine support for deeper information management (i.e., local and global data storage), event-based collaboration (i.e., task allocation, bookmarking, etc.) and activity awareness (i.e., progress status, artefact state monitors, etc.). On the other hand, information search & retrieval is typically configured around keywords and algorithms for retrieving data sets, while it is also common to bind their scope to specific repositories or type of digital objects. Thus, it is not always easy to dynamically specify the domain of search (i.e., range of places or repositories to be searched) or to set search conditions other than keywords.

These commitments impose various limitations to virtual teams such as our organic farming alliance. For example, it not possible for members to appropriate the calendar so as to mobilize a community of farmers around certain time-critical events or unexpected incidents by monitoring execution of remote activities assigned to different users; or assigning digital resources such as narratives, documents, photos or video to events; or qualifying events and their assigned resources by special-purpose markers to distinguish events by state (i.e., pre-scheduled, draft, scheduled and completed) or content (i.e., events carrying certain metadata such as a tag or quality indicator), etc. On the other hand, such human intentionalities trigger the need for technical developments (in the sense presented in Figure 6) so as to improve the material agency of online calendaring systems in the direction of connecting people based on user generated contents and facilitating an increased digital materiality for events and their associated resources. Both these point to the requirement for devising imbrications that allow events to exhibit a digital materiality that allows them to be linked to traces resident across different digital spaces. In light of the above, we have re-invented an online calendaring service so as to exhibit the following affordances:

- (a) improved data management function that allows events to maintain virtual referents to digital resources deposited by distributed users and physically stored across different digital services;
- (b) event states such as pre-scheduled, draft, scheduled and completed which allow tracing the history of an event in terms of distinct anchors;
- (c) social bookmarking at the level of events and assigned digital resources so that events or their digital traces may inherit resource tags (from the resource's host service i.e., Flickr and YouTube) or meta-tags created locally and stored in the calendar.

An instance of this calendar is depicted in Figure 7. As shown each event makes explicit the digital services where the event's resources reside. In the current implementation, these services include the Disqus commenting platform, Google Drive, Flickr, YouTube and the Asana task management for teams. Moreover, the event dialog compiles and presents the event's general details, preparatory work assigned, completion data and resource metadata such as tags inherited from other digital services but also meta-tags at the level of events. Introducing such provisions in the calendaring service raises an additional requirement, namely making such digital traceability accountable and assessing its implications. This intention is served by analysing a second practice, namely searching & retrieving resources from digital repositories, including the calendar. The key concept this time is the imbrication between search engines inscribed in separate digital services and our calendaring service. Phrased differently, the challenge amounts to making calendar events searchable using appropriate linguistic conventions that manifest their emergent

digital materiality. In Figure 8 this notion is demonstrated by indicating search results exploiting the calendar's meta-tagging mechanism.

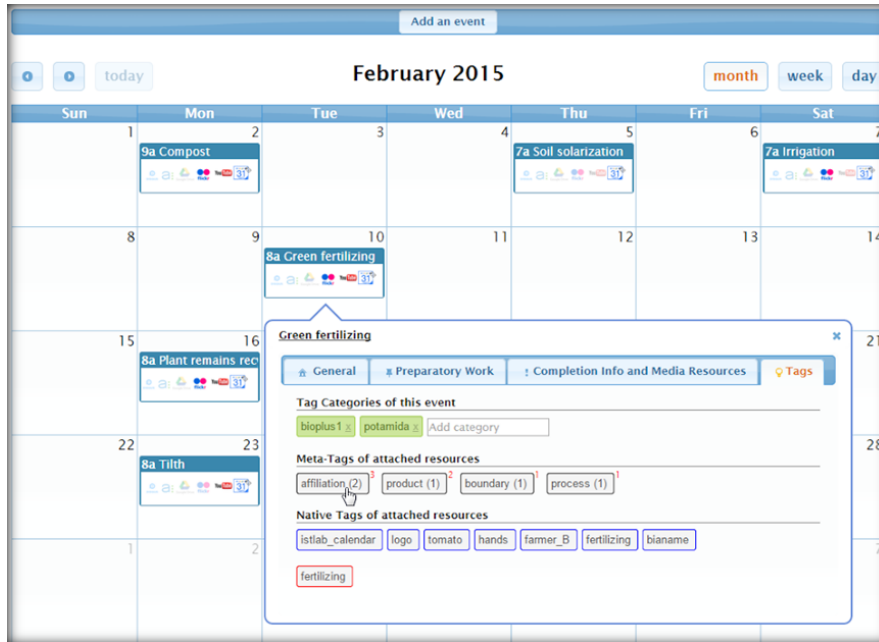


Figure 7: The new calendaring service with tagging capability



Figure 8: Meta-searching - Locating events tagged as 'bioplus1'

The search mechanism is configured so as to interoperate with various digital services, including Flickr, YouTube, Google Drive and the Calendar so as to assemble collections of distributed resources resident in these services on the basis of designated search criteria. Figure 8 and Figure 9 depict a typical search scenario where the user declares intentions (by setting search conditions and anchoring the category of the search condition and the scope of the search) while the system compiles an initial set of search results (as in Figure 8) which can then drive subsequent search refinements (as in Figure 9). Thus, it is made possible to locate calendar events tagged as ‘bioplus1’ (Figure 8) and then compile the digital resources of these events meta-tagged as ‘affiliation’ in the referent event irrespective their native tags retrieved by their host services (Figure 9). As shown, the latter search & retrieval step provides further details about the technology’s performative capacity. Specifically, using word and tag clouds the system qualifies emergent relationships as well as the ‘logic’ of establishing these relationships. Thus for instance, in the case of Flickr, the tag cloud summarizes the tags assigned to the search results, while in the case of YouTube it reveals topics from the Freebase and their relative popularity. By this account, the user is exposed to intrinsic properties of the search & retrieval mechanism and obtains an insight into the sociomaterial context of designated objects.

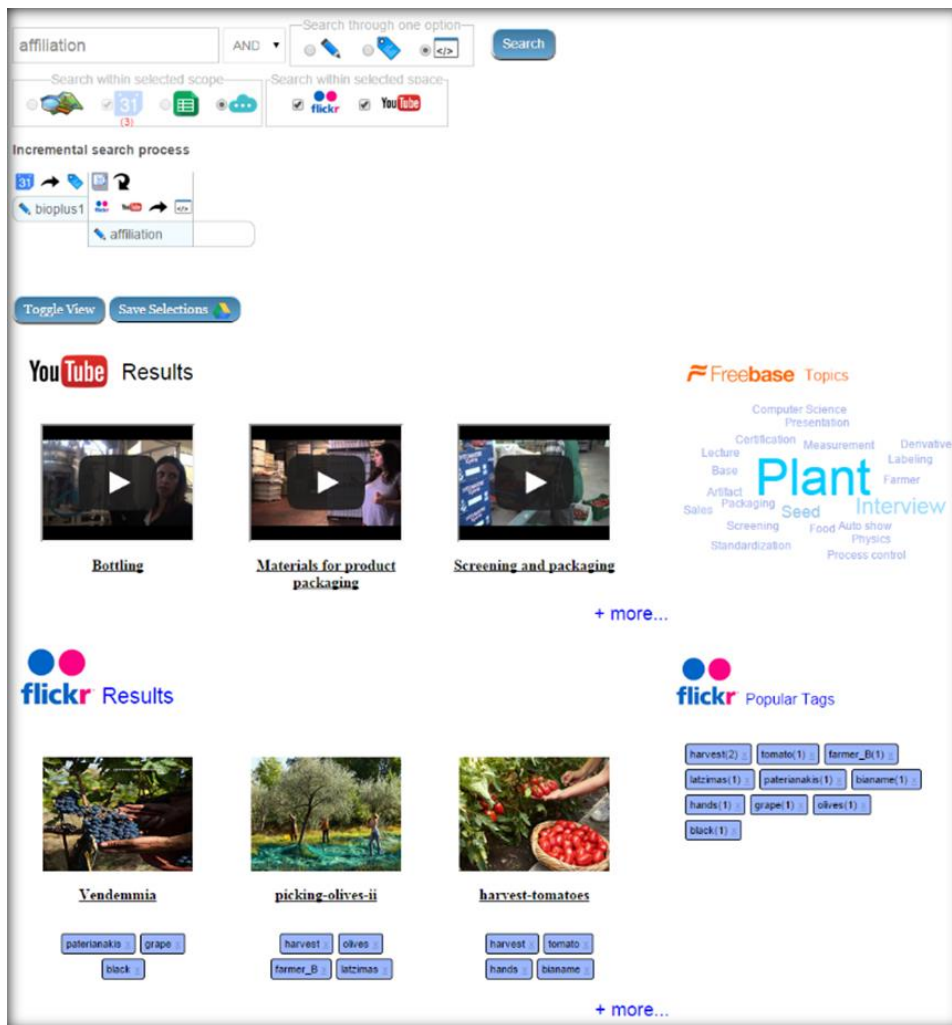


Figure 9: Refined search presenting Flickr and YouTube resources tagged as ‘affiliation’ within the bioplus1 initial collection

It is also important to note that the search results compiled through this arrangement could not have been assembled otherwise since the search conditions are not part of the resources' metadata in their host services. In other words, the specific digital collection presents an emergent configuration of distributed digital objects compiled by using linguistic markers such as tags that convey the collective wisdom of a virtual team.

5. Concluding remark

This paper has attempted to provide an analysis of how organizational practices maybe re-aligned and re-configured in digital settings. In support of the claims made, we elaborated on two prominent practices, namely calendaring and search & retrieval, as configured to serve members of a virtual alliance in organic farming. Preliminary results indicate that through such reconfigurations the calendar which is normally conceived as an artefact that embodies representations of time-oriented schedules was progressively retooled to become a searchable (domain-specific) electronic repository where wisdom of different people is codified and retained in the form of metadata. As a result, new opportunities for human action become viable, while a new digital materiality of human routines emerges to complement the traditional setting. Such a digital materiality stems from an increased capability to trace resources distributed across digital service boundaries. Although the research is still on-going and empirical data on user experience are lacking, it becomes evident that digital trace data ascribe technologies with a new material agency and a transformative capacity that invoke novel human intentionalities, not viable otherwise. This was prominently revealed in our brief case where retooling of the calendar led to new vocabularies (i.e., tags and meta-tags) which in turn rendered searchable the calendar events' digital resources retained in Flickr and Youtube.

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