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Materialising Materiality

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Matérialiser la matérialité

Research-in-Progress

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Abstract

This paper examines the recent claim that "technologies remain largely understudied in organizational research". The core contention is that the materiality of the IT artefact has been ignored, thus contributing to an impoverished understanding of the relationship between technology, people and organisation. While accepting much of the criticism directed towards the "isolation of technology", this paper sets out to develop a basis from which the concept of materiality may be fruitfully developed by outlining a structure of mediation based on the work of Don Ihde and Peter-Paul Verbeek. In discussing the role of mediation, the paper claims that much of the literature on Clinical Information Systems has failed to address the 'substitution of bodies' and the 'de-centred patient', thus providing a fertile environment for a promising research agenda in Information Systems Materiality.

Keywords: Materiality, mediation, perception, ANT, telemedicine

Résumé

Ce papier développe le concept de matérialité dans la recherche en Systèmes d'Information. Ce faisant, le papier reprend les débats récents sur l'intentionnalité en se concentrant sur la médiation et la perception dans le contexte d'un système informatique en neurologie. Les recherches contemporaines portant sur la télé-médecine échouent à prendre en compte la « substitution des corps » et le « patient dé-centré ». Par une approche reposant sur la matérialité, cette recherche essaye de remédier à cette omission.

Achomaireacht

Cothaíonn an páipéar seo coincheap na hábharthachta laistigh den taighde Córais Faisnéise. Nasc leanúnann an páipéar tríd diaspóireachtaí agus diaríonn sé isteach ar eadráin agus aireachtáil laistigh den gcomhthéacs de chóras faisnéise i néareolaíocht. Theipeann ar staidéar teilileigheas comhaimseartha chun míniú a dhéanamh don 'ionadaí de chorpaithe', agus an tothar míláraithe. Déanann an staidéar seo iarracht an easnamh sin a léiriú.

Introduction

The fascination with materiality is becoming more manifest as researchers grapple with the malleability of materiality (Dale et al. 2008; Kelly 2005; Leonardi et al. 2008; Orlikowski et al. 2008; Orlikowski 2007). Indeed, recent contributions within the Information Systems (IS) community suggests that IS researchers have implicitly ignored the IS artefact, in and of itself, when studying technology in organisations (Orlikowski et al. 2008). If true, this claim has wide reaching consequences for the IS discipline. The central contention of recent criticisms focuses on the issue of materiality and how we have alienated ourselves from the systems themselves by ignoring materiality and its influence in shaping the flow of practice (cf. Verbeek 2005).

Materiality is a fascinating topic of concern for IS and related disciples (see Miller 2006), however, the relevance and direction of this concern is nascent, in turn, demonstrating the need to seriously reflect on materiality and its possible contribution to the gamut of IS research.

In contributing to this debate this paper reviews a number of attempts to theorise the materiality of the digital artefact. The paper initially focuses on a central claim of Actor Network Theory (ANT), symmetry, and the rising tide of criticism directed towards this aspect (Dale et al. 2008; Orlikowski et al. 2008; Whittle et al. 2008). In addressing the criticisms, the paper draws on the recent contributions of Harman and Verbeek (2005; 2005; 2008) to illuminate a perspective, which posits materiality within the context of mediation, intentionality and perception.

It is this paper's contention that a fruitful research agenda surrounding materiality can materialise if we conceptualise materiality by focusing on mediation and perception in communication. The paper further contends that materiality research in the area of Clinical Information Systems (CIS) is, with some rare exceptions, absent (Zuiderent et al. 2003). Within the area of CIS, telemedicine is one of the most popular approaches in clinical innovation. While much of the debate has focused on the substitution of various 'archaic' artefacts, such as the paper record, the literature is silent about the substitution of bodies, and crucially, how the materiality of a telemedicine system is implicated in the reconfiguration of the practice of diagnosis and treatment.

The paper concludes by outlining why the theoretical furtherance of materiality could benefit from a more generous interpretation of symmetry and intentionality. Moreover, the paper suggests that current arguments to dispense with ANT's network focus, may be premature. In supporting a synoptic approach to materiality, the paper outlines the early stages of a telemedicine study which intends to contribute to our understanding of how the materiality of the digital artefact is implicated in the process of diagnosis and treatment and the dynamics of such practice (re)configurations.

Encountering Materiality

Orlikowski and Iacono in their paper, *The Truth is Not Out There: an Enacted View of the Digital Economy* maintained, "to be useful, technology must be used, and when we fail to pay attention to what people actually *do* with a technology, we often end up focusing on the wrong thing, such as the artifact itself, its features, or the discourse around it (p. 360 2000)."

Orlikowski and Iacono attempted to reel in the techno-utopian conception of a digital economy that emphasised the isolation of technology and humans and attributed an innate trajectory to technology. While technological deterministic arguments form the basis of a substantial number of IS critiques, the authors made a significant contribution in reemphasising and differentiating between 'espouses views' and the 'technology-in-use', thus contributing to a more reflective approach to field research.

Their request to focus on what "people actually do with a technology" was a significant step forward in overcoming the modernists inspired separation of people and technology. Their contention, however, that people focus on the wrong thing "such as the artifact itself, its features, or the discourse around it" was, with the benefit of hindsight, an unwitting ally to theories of isolation (ibid). Avoiding the 'artefact itself' reinforces the 'division' between subject and object in our analysis of 'action'. Consequently, we further alienate those entities of co-existence which, for want of a better term, we call non-human (Latour 1988). Digital artefacts thus become the symbolic site of social forces *ex post factum*, rather than participants. We appear to judge in haste when faced with radical approaches that initially appear to attribute anthropomorphic qualities to so-called inanimate objects. In this haste, technologies become the vehicle to which we append a whole host of sociological concepts, in particular, issues surrounding

power and 'modes of control' (Cartwright 2000; Dale 2005; Mort et al. 2008; Whittle et al. 2008): The materiality of the artefact becomes an object of pre-existing power relations.

Timmerman and Berg sum up this latter point (in a medical informatics context) when they state, "All the topics traditionally of interest to sociologists are projected on to medical technology but what is typical of the technology is left unexplored (p. 101 2003)." Orlikowski and Scott make a similar, yet devastating claim: "Despite the considerable empirical evidence of technology's central role in organizational affairs, technologies remain largely understudied in organizational research (p. 39 2008)."

The disciplines, which one would expect to be best positioned to examine and understand how technologies are implicated in practice, appear slow to attribute a participative role to the technologies themselves. In his typical brashness, Latour alludes to this point when he asserts, "Much like sex during the Victorian period, objects are nowhere to be said and everywhere to be felt (p. 73 2005)."

If Latour is attempting to rectify the practice of not thoroughly exploring who and what participates in the course of an action and Berg and Timmerman are demonstrating how the technology has been blurred by the social, then Orlikowski and Scott are sounding the church bell, warning how IS researchers have understudied technology. In many other disciplines a similar claim would result in an 'examination of conscience' of inquisitional proportions.

Indeed, Orlikowski appears to have begun this *mea culpa* by acknowledging how previous contributions have "…generated some conceptual difficulties for dealing more generally with materiality in organizational research" and proposing an "…approach that posits materiality as constitutive of everyday life" within the concept of Sociomateriality (p. 1435-1436 Orlikowski 2007).

The Controversial Agent

Current attempts to position materiality within IS are directly and indirectly influenced by a mix of philosophers, social anthropologists and physicists, of note, Latour, Ihde, Pickering, Miller, Harman and Verbeek (Harman 2005; Ihde 1990; Latour et al. 1986; Miller 2006; Pickering 1995; Verbeek 2005). While in general agreement that materiality is a promising direction for IS studies, there are a range of unresolved difficulties. One such difficulty is the perceived relegation of humans when conceptualising actors using an ANT lens.

Orlikowski and Scott contend that Latour's principle of symmetry attributes intentionality to artefacts which is "a move too far", and further, assert that ANT's approach does not account for the "role and influence of institutions". The authors in turn propose a move away from the "…metaphor of networks as a way of ordering relational interactions…", to a focus on performativity and (re)configuration in situated practice (p. 24-25 2008). Situated practice for Orlikowski and Scott refers to the work of Reckwitz and the Practice Turn (see Kelly et al. 2006). Latour too is ill at ease with the word networks, preferring instead the more performative 'worknets', but in the end surrendering to a "sensible usage" of the word network (p. 132 Latour 2005).

ANT attempts to account for action and describe who and what participates in the course of an action. In so doing, it accounts for the 'role and influence of institutions' by pulling down the proverbial curtain to reveal how the responsibility for action is spread over an "ensemble of parts" or what Latour calls a 'composition' (p. 156 Verbeek 2005). Moreover, from a practice perspective, Reckwitz makes clear, "When we talk of 'social fields' or 'institutions', in the end we find nothing more than nexuses and sequences of social practices (p. 211 2002a)." By following the actors in this nexus and sequence ANT makes a valuable contribution to our understanding of institutions. In *Tracing the Trajectories of Issues, and their Democratic Deficits*, Noortje Marres utilises an ANT lens to examine a controversy surrounding a project know as the Development Gateway to account for the struggle between NGO's and the World Bank, thus bringing to the fore the politics pursued by political institutions and "unsettling the asymmetry between the politics of extra-institutional and institutional actors that is often assumed" (p. 145 Marres 2004).

The concept of agency, which Latour pursues, rejects action as only that "which intentional meaningful human beings do", overcoming the purification of subject and object by refocusing on the participants in the course of action. Latour is not claiming that non-human participants determine the course of action (p. 71 2005): "A-NT is not the empty claim that objects do things 'instead' of human actors; it simply says that no science of the social can ever begin if the question of who and what participates in the action is not thoroughly explored, even though it might mean letting elements in which, for lack of a better term, we would call non-humans (p. 72 2005).

Human intentionality and 'object intentionality' are radically different. An object in not a moral agent, it cannot be perceived as having an intention as a human has an intention. Alluding to how a two-month old baby can differentiate between intentional and non-intentional movements, Latour again proclaims how humans and objects are obviously distinct—"but a difference is not a divide" (p. 76 2005).

Moving away from a network perspective to a performative view in order to grapple with the issue of materiality may be unnecessary. The common ground between socio-materiality, the praxiological perspective and ANT suggests that more may be gained through an approach that attempts to work within existing perspectives. Critics of ANT appear to be applying a strict 'geometrical' interpretation of symmetry and in so doing naturally tense when intentionality is ceded to objects.

Don Ihde's *Technology and the Lifeworld: From Garden to Earth* (1990) is an early attempt to theorise an object intentionality. In demonstrating how 'technologies-in-use' do not determine the course of action he suggested that they do however provide a framework for action; certain intentionalities and inclinations (p. 141 Ihde 1990). Verbeek describes this as 'technological intentionality' while stressing that this ability should not be conceived as an intrinsic property of the artefact itself, "[a]s artifacts can only be understood in terms of the relation that human beings have to them" (p. 117 2005). Artefacts are mediators which mediate our perception of the world. This mediation is co-shaped by the artefacts materiality—a kind of hermeneutic materiality, hence understanding materiality leads to a more sophisticated understanding of mediation and the dynamics involved in interpretation.

The prominence of ANT is, in part, due to Latour's determination to demonstrate that things act. This determination has emerged from a mood, which up to recently paid little attention to technological artefacts, in and of themselves. Recent arguments by Reckwitz (2002a), Dale and Gibson (2008), Orlikowski (2007) and Scott (2008) and, in particular, Whittle and Spicer (2008) revolve around the claim that Latour's symmetry implies or 'makes clear' that the human body is merely material, the same as any other material.

The difficulty with these interpretations of ANT arises when one confuses 'difference with divide'. Latour is attempting to overcome the divide between subject and object in accounts pertaining to action. ANT's *raison d'être* is to account fully for action, the human/non-human invocation does not, "specify any ontological domain, but simply replaces another conceptual difference (p. 72 Latour 2005)." Reckwitz appears to concur, he writes "when particular 'things' are necessary elements of certain practices, then, contrary to a classical sociological argument, subject–subject relations cannot claim any priority over subject–object relations, as far as the production and reproductions of social order(liness) is concerned (p. 253 2002a)." Adopting a more flexible approach to symmetry and intentionality is a practical route to developing materiality.

Developing Materiality

Drawing almost exclusively on the work of Andreas Reckwitz (2002b), Kelly and Jones (2006) set out to develop a distinctive 'praxiological' approach. For Reckwitz, a practice is " [a] routinized type of behaviour which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in forms of understanding, know how, states of emotion and motivational knowledge (p. 249 2002b)."

While Reckwitz opens up the importance of 'things', it is Kelly and Jones who develop this theme and identify materiality " as a promising avenue for the development of new ways of understanding the role of technology in general, and ICT especially (Kelly et al. 2006)".

The praxiological perspective acknowledges the centrality of 'things and their use'. Kelly and Jones state, "enacting a practice often means 'using particular things in a certain way', and Reckwitz argues that the history of communicative media points out that "writing, printing and electronic media *mould* social (here, above all, discursive) practices, or, better, they enable and limit certain bodily and mental activities, certain knowledge and understanding as elements of practices (p. 253 2002b)."

Reckwitz's claims the single individual is the carrier of a practice: "The signal individual – as a bodily and mental agent – then, acts as the 'carrier' (Träger) of a practice – and, in fact, of many different practices which need to be coordinated with one another (p. 250 2002b)." If this is not a simple matter of confusion surrounding the definition of practice, then, the point arises as to how objects too can be carriers of practice. In *Of Forms, Containers, and the Electronic Medical Record: Some Tools for a Sociology of the Formal*, Berg (1997) contends that the carrying out of a practice is distributed between a diverse set of heterogeneous actants.

Berg uses the example of recording the fluid balance of a patient and how this process is distributed among formal tools and individual nurses. Among the formal tools are the structured form, the record system, the tubes and the fluid container. To paraphrase Berg, nurses do not use these artefacts to calculate fluid balances. The calculating of the fluid balance is an activity, which only takes place at the level of the whole hybrid. Berg attempts to avoid conceptualising the calculating activity as something done in the heads of individuals, as this glosses over the fact that the container and the form have already done some of the work of calculating, or as Latour would put it, performed the practical task of abstraction (ibid).

For Berg there is no central command post or individual fully co-ordinating the day-to-day tasks of patient care—they are 'constitutively intertwined' (Pickering 1995). As researchers we need to examine the role technology plays in the accomplishment of everyday tasks. A not too dissimilar point has been made by Prout: "Work is constructed as done on and through machines, but not by them (2003)."

Examples of studies which focus on the materiality of the artefact—the way in which it moulds, limits and enables certain bodily and mental activities—are rare (Zuiderent et al. 2003). Leonardi and Barley sum up the situation: "What remains unresolved, however, is the epistemological and ontological nature of the relationship between the material and the social and, hence, how information technologies and organizing are tied (p. 160 Leonardi et al. 2008)."

Despite this rarity we encounter in Berg's work a competent approach to the role of objects. Berg investigates a medical activity and demonstrates how the various actors participate in the course of action. In another health setting, Luff et al (1992) revealed how practices had developed for using paper documents to support both synchronous and asynchronous collaboration. They concluded that three factors influenced their popularity: The documents' tailorability; their ecological flexibility; and the restrictions on the movement of personnel. Similarly, Kelly's theory of Digiscription (2005) discussed the material features of the 'digiscript' to include portability, persistence, accessibility and structure.

What these studies have in common is an attempt to define the materiality of a particular artefact. In each study the characteristics influenced the flow of practice in ways not originally contemplated. This suggests that the ability by which artefacts can be carriers of practice is related to the artefacts materiality. Moreover, it also suggests that Ihde's notion of technological intentionality (or trajectory) is a consequence of the artefacts materiality. In all of the above accounts the 'material features' played a critical role in the technology-in-use. These features appear to shape, not determine, the flow of practice. The obvious danger at this point is to rest a theory of materiality on the shoulders of the artefact's physical characteristics thus channelling the discussion in the direction of how designer's design and also ensnaring oneself in the deterministic trap.

While digiscription and similar approaches highlight the material and physical 'characteristics' of the information artefact, a theory of materiality should extend to include those aspects we could describe as 'character' or even metaphysical[1]. Character is a useful term since it denotes something that grows and develops and not a pre-formed property of an object. Moreover, digital artefacts take a stand in an already existing environment which suggests that understanding the nature of the particular context may provide clues as to the character of digitally mediated engagements which, in the long run, may not only inform the way designers design but may also open up a new design ontology[2].

But before we reach such lofty heights we must first address the issue of materiality itself. Thus this research in progress agrees with Thrift when he calls for a more nuanced materiality that leaves room for "…contingency, complexity and a sense of wonder"(p. 249 in Miller 2006).

The Materiality of Mediation

There is no doubt that much investigation is required to redress the criticism of aloofness from the very things that identify the Information System discipline. Moreover, the recent debates on agency and materiality, including the emergence of a mood of criticism towards ANT, should stir a renewed interest for appropriate field studies. Establishing the importance of materiality posits the question: in which direction should such research develop?

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[1] See Harman *Guerrilla Metaphysics: Phenomenology and the Carpentry of Things* 2005 for a development of this argument.

[2] This is an argument pursued by Verbeek in *What Things Do, Philosophical Reflections on Technology, Agency, and Design* 2005.

In the following section I will draw upon the debates outlined above to justify a preference for the conceptual development of materiality through an exploration of the dynamics of a particular digital mediation in neurology. I will further demonstrate why healthcare is an important setting for empirical investigation.

In *What Things Do: Philosophical Reflections on Technology, Agency and Design* the Dutch philosopher of technology, Peter Paul Verbeek (2005) surveys the various approaches to the philosophy of things and attempts to develop a postphenomenological position drawing on, among others, Heidegger, Latour and Ihde [In spite of Latour's reluctance, there appears to be a flutter of activity aimed at reconciling Latour and Heidegger (see Harman 2007)].

Verbeek draws heavily on Don Ihde to develop his concept of mediation. Technologies, for Ihde, have a directionality, inclination or trajectory that shape the flow of practice, or as argued above, somehow act as a 'carrier of a practice'.

Ihde is careful to point out that they do not have a determining influence but an "implicit users manual" or script (p. 115 in Verbeek 2005). Verbeek also painstaking demonstrates how the ability of an artefact to co-shape the relations between human beings and the world must not be regarded as an intrinsic property of the artefact itself, for this would promote a kind of realism in which properties would be "…assigned to objects independently of the subjects for whom these objects exist" (p. 117 2005): the same reasoning must apply to the particular environment and situation.

The implication that technologies cannot be divorced from their use in practice demonstrates that they have no 'essence', "…they are what they are only in their use (ibid)".

Verbeek concludes that mediation is both embodied and hermeneutic. Crucially though, we have a new interpretation of hermeneutics. The traditional hermeneutic 'emphasis' on language and texts is broadened by an emphasis on things—a hermeneutic materiality where the world is not perceived through the artefact, but by means of it (p. 126 2005).

For Ihde and Verbeek, subject and object are mutually interwoven or as Orlikowski suggests, "constitutively entangled (2007)". For Reckwitz, practice is a routinised type of behaviour—comprising of forms of bodily and mental activity—things and their use. Relying on Maurice Merleau-Ponty, both Ihde and Verbeek take a similar view where things and their use represent embodiment relations. The crux of embodiment relations is that we extend perception and the spatiality of our bodies *by means of* information systems.

It would appear that the work of Ihde, Verbeek, Orlikowski, Kelly and Reckwitz share the view that things act, whether we couch this in the language of 'technological intentionality' or 'moulding'. Furthermore, Reckwitz comments on communicative media enabling and limiting certain activities, supported by Kelly and Jones (2006), reflects Ihde's underlying structure of the transformation of [mediated] perception which is "amplification and reduction": Mediation always involves some part been revealed while another is concealed (in Verbeek 2005).

For Ihde, the world is not perceived through the object, but by means of it; thus rendering a number of established communication theories problematic, including media richness (Daft et al. 1987) and most notably the conduit model of communication (p. 58 Kelly 2004). Moreover, media richness theory implies that there is a choice and that depending on the context, you choose your vehicle of communication over the other. Of course there are situations where we can choose, but in contemporary organizations, information systems are implicated in all manor of engagements where the system is simply not a tool to be deployed, but intrinsic to a particular mode of engagement; typing and submitting this paper is an immediate example.

There are of course many examples of contemporary approaches to information systems which are premised on a conduit model of information. But in terms of complexity, diversity and impact, healthcare has few rivals. In this context we have witnessed the development of an avalanche of clinical and administrational systems aimed at creating a more effective, efficient, patient-centred service. In the recent decade there has been a shift from the development of administrational systems to Clinical Information Systems (CIS) where terms like Electronic Patient Record (EPR), Evidence Based Medicine (EBM) and Telemedicine have become ubiquitous.

The Substitution of Bodies

Clinical Information Systems (CIS), specifically systems that mediate the relationship between doctor and patient in the process of diagnosis and treatment, are at the cutting edge of information system innovation in healthcare

settings (Ellingsen et al. 2006). The increasing desire to transform healthcare through IS innovation is persistent in the growing demands for transparency, efficiency, patient centred services and empowerment which, it is suggested, these *technologies* can achieve (Skov et al. 2005; Southard 2003). Despite this pervasiveness, few pause to contemplate the way IS mediates the transformation of clinical care (Mort et al. 2008; Ó Scolaí 2007; Southon et al. 1997).

More often, the digital artefact is interpreted, implicitly and/or explicitly with an aura of neutrality and/or inevitability (Timmermans et al. 2003). The more optimistic accounts define technology in terms of its conditions of possibility, its presuppositions, and its espoused functions (Anderson 1997; Grimson et al. 2000). When technology is defined as such, "aspects of the picture drop out which can only appear in more empirically orientated approaches (Verbeek 2005)."

The results from some of these more restricted empirical studies highlight the problem of developing systems detached from their context of use (Jones 2003; Littlejohns et al. 2003; Thompson et al. 2003), others demonstrate how clinical practice is complex and underestimated by those entrusted with the responsibility of designing and implementing systems (Jones 2004; Malvey 1981; Southon et al. 1999), others discuss the persistence of local social practices, the persistence of the paper record and the detrimental effect changes in communication patterns and workflows can have on clinical practice (Campbell et al. 2006).

In addressing the failures and unintended consequence the majority of CIS research focuses on training, end users and improved design (Ball 2003). Seldom do we heed the call to re-evaluate how we understand the dynamics of technology mediated healthcare and only recently have we realised that materiality has been ignored in studies of IS (Leonardi et al. 2008; Orlikowski et al. 2008; Zuiderent et al. 2003).

Teleneuro One

The system upon which this research is based focuses on the development and use of a particular telemedicine system in neurology and aims to contribute to our understanding of the nature of digitally mediated neurology practice and the attendant re-configuration of practice resulting from the introduction and use of Teleneuro One[3]. The research intends to contribute to our understanding of the dynamics of clinician led innovation and how the materiality of the digital artefact is implicated in the process of diagnosis and treatment in neurology.

Teleneuro One is typical of many current telemedicine innovations in that it attempts to overcome distance, improve productivity and reduce waiting times. The problem, however, is that the system's ability is taken at face value. The thought that the system introduces a new dynamic into the relationship between neurologist and patient, particularly in the process of diagnosis and treatment, remains absent. While much discussion has taken place regarding how digital systems will substitute more traditional and somewhat mundane artefacts such as paper, the 'other' substitution, *id est*, the substitution of bodies, is rarely examined (Ó Scolaí 2008) [4].

The difference between co-located and 'virtual' engagement is "qualitatively different" (Cartwright 2000; Mort et al. 2008). That the materiality of the digital artefact is implicated in this difference is obvious, but how it is implicated and what the consequences of this intertwining in neurology are, is the subject of ongoing investigation.

In a study by Lanzara on the differences in perception between different mediums in judicial cases, magistrates found their perception of the witness significantly differed when presented with testimony mediated by a video and monitor than testimony mediated by the established paper transcript. Lanzara concluded that the criteria for establishing 'evidence' and 'truth' in this context were medium sensitive (Lanzara 2008). Miscione's ethnography of a telemedicine system in the Amazon highlighted how clinicians would resort to voice communication even when sending a spreadsheet by email was more efficient (2007). Moreover, there was a reluctance to engage in certain types of remote diagnosis where a particular treatment might give the physician on the other end "moral co-responsibility for a mistake" (ibid).

One feature of Teleneuro One is the ability to remotely diagnose/treat/assess a patient through a web-base assessment 'tool'. The system comprises of a menu of drop down questions and free text. A patient presents to their General Practitioner (GP) with a neurological complaint, is assessed *by* Teleneuro One and the GP, and this

[3] A pseudonym.

[4] The notion of the substitution of bodies was partly explored at ECIS 2008.

information is then transmitted back to the consultant neurologist who decides on a particular course of action. One initial finding from observing Teleneuro One is that the greater the complexity of the neurological disorder the less likely the GP will use the system. While this resonates with Miscione's findings, it also suggests a correlation between medium and illness specificity.

To summarise, then, the empirical accounts of materiality while rare, suggest that the materiality of the artefact is centrally implicated in the mediation of perception. Of the literature cited, there is common ground regarding the structure of technical mediation—mediation always involves some part been revealed while another is concealed. As Lanzara has highlighted, media sensitivity in particular contexts has profound implications which forces us to be more attentive to the artefact and the way in which its materiality is implicated in the construction of various 'truths', be they legal, medical or otherwise.

Conclusion

The charge by Orlikowski and Scott that "[d]espite the considerable empirical evidence of technology's central role in organizational affairs, technologies remain largely understudied in organizational research (p. 39 2008)," is the primary motivation for this paper. This charge is not without support. Timmermans and Berg (2003) claim that, "all the topics traditionally of interest to sociologists are projected on to medical technology, but what is typical of the technology is left under-explored", and Verbeek sets out to redress "…the isolation of technology and human beings in whose existence it plays a role, into two separate spheres (Verbeek 2005)."

Paying particular attention to understanding how the materiality of the digital artefact is implicated in mediation, may play a modest role in supplementing our understanding of the world of clinical practice and its organisation. In this regard, this research is influenced by Zuiderent, Winthereik and Berg (2003) and their call to focus on the communication and cooperation mechanisms that come into play when digital artefacts are introduced. Such a focus reveals the level of embeddedness needed for communication to become "grounded in sufficient mutual knowledge" raising the question: under what circumstances does the e-mail [or web-based] communication provide sufficient context for a shared understanding? And when does it not (Zuiderent et al. 2003)?

One interesting phenomenon is the clinician designer. All too often the design process in clinical environments is conceptualised as emanating from the design labs of a particular vendor. The package arrives 'black-boxed' and the focus then surrounds issues of how designers inscribe particular patterns of use and how systems are redesigned to accommodate local usage. In the discipline of neurology all types of CIS introduce new dynamics in the practice of diagnosis and treatment; the consequence of such reconfigurations is poorly understood. The materiality of the artefact is implicated in this new dynamic and thus, in and of itself, demands closer scrutiny.

The conceptual development of materiality presents a number of significant obstacles and conflicts of opinion. Despite this, the paper contends that abandoning aspects of ANT may be untimely. There is sufficient ground to apply a generous interpretation of issues such as symmetry and intentionality so as to utilise existing perspectives and, moreover, the common ground between ANT and the Praxiological Perspective on the structure of perception presents the possibility of enriching our understanding of how digital artefacts are carriers of practice.

A focus on materiality to better understand media and illness sensitivity should not be perceived as an implicit desire to test which mode of engagement is 'best' or 'richer'. Rather, this paper is advocating an approach, which examines how these new modes of engagement alter and reconfigure clinical practice and the consequence of a de-centred model of patient care. Kelly has also argued that these "modes of engagement with the lifeworld [reifications in the form of a digital text] should not be seen as alternatives that are, in any sense, substitutable for one another." Within the theory of Digiscription these modes are viewed as complementary modes of learning/knowing, where the challenge is to develop/maintain an appropriate balance (2005).

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