

# What is IT in Use and Why Does it Matter for IS Design?

Riemer, Kai, The University of Sydney Business School, Discipline of Business Information Systems, Darlington, NSW 2006, Australia, kai.riemer@sydney.edu.au

Johnston, Robert B., School of Business, University College Dublin, Belfield, Dublin 4, Ireland, robert.johnston@ucd.ie

*Accepted to the International workshop on IT Artefact Design & Workpractice Intervention, 10 June, 2012, Barcelona*

## Abstract

*In Information Systems and Design Science two core concepts are the IT artefact, commonly seen as a core object of interest, and the user for whom the artefact is designed and by whom it is adopted. In this position paper we analyse the ontological character of this conception and suggest that it is (implicitly) informed by Cartesian dualistic ontology that separates a subject (user) and an object (artefact). We present an alternate holistic ontology derived from Heidegger's analysis in *Being and Time*. Using Heidegger's ways of being we argue that while the artefact/user dualism might be adequate to describe what IT is in the designer's or IS researcher's world, in the user's world IT is equipment which is co-constituted with a nexus of other equipment, user practices and social identities. We articulate why this distinction matters for practices of design under three headings: Studying the user, the design object, and studying IT acceptance. We conclude by advocating IT as equipment as the appropriate object of design in IS.*

*Keywords: The IT Artefact, Design, Heidegger, Cartesian Dualism, Holism*

# 1 Introduction

In Information Systems and Design Science, two core concepts are the *IT artefact*, commonly seen as a core object of interest (Benbasat and Zmud 2003) and the *user* for whom the artefact is designed and who adopts and uses the artefact to fulfil tasks in various social contexts. There is a widely held and largely taken-for-granted view in these disciplines of how users interact with the IT artefact. The IT artefact is a bundle of features (Orlikowski and Iacono 2001) that resides outside the user – it is a thing with properties. Users have access to these properties via internal representations of the artefact that reside in their minds (Dourish 2001). Users’ interactions with the IT artefact are mediated by mental representations of the artefact and its properties. Through these mental representations, users are able to formulate intentions about IT use, make plans and decisions about IT use, and select actions to implement them. Many of our IS theories (such as the Technology Acceptance Model (Davis and Bagozzi 1989), the Unified Theory of Adoption and Use of Technology (Venkatesh et al. 2003), the Task Technology Fit model (Goodhue and Thompson 1995) and media choice theories (Daft et al. 1987; Dennis et al. 2008) are formalisations of this story and its underlying ontology (Weber 1997; Weber 2012).

This story is plausible because of a deeply engrained and taken-for-granted understanding of the relation between humans and the world originating in the work of Descartes (1644, 2010), later refined by many other thinkers (e.g. Hume 1740, 2009), and giving rise to a set of beliefs that have entered everyday and scientific ontological understanding which can be referred to as the Cartesian worldview (for a review see Scada 2004). The Cartesian worldview rests on a dualism that places human subjects vis-à-vis an ‘external’ world that is populated by objects. On this view, humans take in this external world via their bodily senses and hold in their mind internal representations of the (objects in the) world. Hence, the Cartesian view posits a mind “in here” reflecting on, and directing the body to act upon, a world “out there”. To implement the independence of minds as subjects and worlds as objects the Cartesian view makes use of self-sufficient and independently existent entities as the contents of both the world and of minds. The mind is the substance that turns the external world of initially meaningless substances into the meaningful world that we experience.

In this position paper we will argue that this Cartesian dualism of user as subject and IT artefact as object gives rise to a number of difficulties for the practice of designing IT as an enabler of change. We will do this by presenting in the next section an alternative ontology to the traditional dualist one. We find this alternative holistic ontology in Heidegger’s analysis of equipment in *Being and Time* (1927; 1962). Then, through a close examination using our Heidegger lens of the nature of IT in the user’s world, we will claim that 1) for the user IT is equipment, implicated in practice, not an artefact, 2) that the object of IS design should be equipment not artefacts, and 3) that acceptance of IT innovation should be conceived as appropriation not adoption. With our paper we contribute directly to multiple themes of the workshop, in particular the theorising of the IT artefact and the theorising of practices and work-systems at the same time, both with a view to further our understanding of design in IS.

## 2 Heidegger’s Ways of Being: Equipment

The traditional topic of ontology has been to elaborate and categorize the *kinds of entities* there are in the world. Heidegger’s innovation in *Being and Time* is to ask an entirely new question: what are the *kinds of ways* that entities can be in the world? This question is important for us, because one of these ways of being is that of ‘equipment’.

Heidegger argues that his question can only be answered by first examining the peculiar way of being of that entity that asks the question. This being Heidegger calls *Dasein*. For Heidegger the way of being of humans (*Dasein*) is *engagement in practices* (Existenz). The unique mode of human existence

is to be such-and-such by doing such-and-such. For instance, a doctor not only practices medicine but is a doctor *because* s/he practices medicine. Dasein is not an individual person who gives a mental account of his/her own experiences; Dasein denotes the being of humans, whose mode of existence is distinct from that of other entities, namely to be engaged in practices that at the same time constitute what they do and who they are.

Heidegger then defines two other ways that entities can be in the world on the basis of how they are encountered by Dasein in the course of such self-constituting practices. The first way of being he calls *ready-to-hand*, which means that the entity is encountered in fluent use as a means for a practice. A carpenter who is engaging in hammering encounters a hammer not as an object with properties, but as ready-to-hand *equipment* both for doing what carpenters do (hammering nails) and for being what a carpenter is (a craftsman). Equipment as such is constituted through its relationship to other equipment, to typical activities and purposes for which it is used. The carpenter has an embodied skill for using the hammer in order to drive nails, and as equipment the hammer lends itself inconspicuously and naturally to this task without reflection.

On the other hand, an entity may be for Dasein *present-at-hand*. In this case it is encountered in terms of properties rather than through its use in practices. Entities are present-at-hand for Dasein as objects when they are encountered in a distanced analytical way (for instance, as objects of curiosity, in a first encounter, when giving an account of them, and when attending to their construction). In the same way, in a certain sense, humans have a substantial existence as physical bodies and humans can encounter their own practices and experiences as present-at-hand. In this distanced and reflective stance, practices show up as behaviours, tasks, and goals; experiences as mental states and emotions; social interactions as norms and rules of behaviour. Thus through the present-at-hand way of being Heidegger recovers the subject/object dualism of Cartesianism. The difference is that now the material objects and human subjects encountered as present-at-hand are endowed with properties through relating to them as a reflective enquirer, rather than through being ontologically prior to human activity, as Cartesianism would have it. Table 1 summarises Heidegger's ways of being.

| Being     |                                                                               | Way of being                    |                                                                                                                                                                                                                                                                                                 |
|-----------|-------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dasein    | <i>Dasein</i> is the being of humans                                          | Engagement (Existenz)           | The human way of being is concerned <i>engagement</i> in practices. Familiarity with everyday practices is the background against which all beings are rendered intelligible.                                                                                                                   |
| Equipment | <i>Equipment</i> is the being of entities encountered by Dasein in fluent use | Ready-to-hand (Zuhandenheit)    | The way of being of equipment is to be <i>ready-to-hand</i> , withdrawn from experience as a means ( <i>in-order-to</i> ) in a holism of other equipment, practical involvements and identities; it is most genuinely ready-at-hand when it withdraws during use and is not experienced at all. |
| Object    | <i>Objects</i> are entities that are encountered by Dasein through attention  | Present-at-hand (Vorhandenheit) | The way of being of objects is to be <i>present-at-hand</i> as an object of detached analysis.                                                                                                                                                                                                  |

Table 1: Overview of Heidegger's ways of being (see also Riemer and Johnston 2011)

Thus Heidegger's ontology provides us with two theoretical categories (ways of being) into which to place the IT entity. The first (objects) corresponds to our familiar notion of an artefact with properties, the second is the much less familiar, but no less important, notion of an equipment holism. Heidegger's project in the equipment analysis was to refute the Cartesian tradition by precisely

articulating the structure of this holism and showing that the world does not simply consist of collections of things with properties (cf. Weber 2012). We will briefly spell out this structure.

In our everyday dealings, we do not encounter equipment as (a collection of) objects with properties but as a holistic means, or what Heidegger calls an *in-order-to* (“das Um-zu”) (Heidegger 1962, 98). In that sense, a hammer is not encountered as a wooden shank with a metal blob but as a ‘to-put-nails-in’, a word processor is not seen as a software artefact with a set of features but encountered practically as a ‘to-write-letters’, ‘to-capture-ideas’, ‘to-edit-a-memo’, depending on its place in different practices. Hence, equipment “is not grasped thematically” (Heidegger 1962, 98) or ‘consciously’, because our understanding for dealing with equipment in an everyday manner is not one that resides in the mind as representations, but is a primordial one played out in activity (know-how rather than know-that (Dreyfus and Dreyfus 2005)).

Moreover, equipment is only equipment in a use context. It is defined and draws its being from its *place in a referential holism*. Equipment always bears for what it is on other entities, on other equipment and various aspects of the practice in which it is implicated. Heidegger uses the example of a hammer that can only be understood when one is already familiar with nails and wood and the ways in which they are used in building houses from wood. Equipment is always implicated in a practice and draws its particular *in-order-to* from a chain of practical assignments, an involvement in the *towards-which* of the task at hand (“Wozu”) and the *for-which* of the practice (“Wofür”) (Heidegger 1962, 115). We will refer to this structure as the *for-structure* of the practice. For example, the particular being of a word processor as equipment arises from its place in the chain of assignments in a particular practice (*in-order-to* write a letter, *for* making a customer offer, *towards* securing a contract). Consequently, equipment is not used in a certain way because it is a certain kind of entity, rather the other way around: equipment *is* what it is *for* within a practice. The ultimate *for-which* of this chain Heidegger terms the *for-the-sake-of-which* (“Worum-Willen”) (Heidegger 1962, 116), the bearing that the equipment has on enacting a particular identity of Dasein. In the above examples the *for-the-sake-of-which* might be ‘to be a carpenter’ or to ‘be an office clerk’. The *for-the-sake-of-which* is not simply a goal or purpose but a way of being that is ultimately possible only against certain established and inherently social practices.

In contrast to the Cartesian subject/object dualism, Heidegger sees the relationship between Dasein and equipment as fundamentally *co-constitutive* (Turner 2005) in the way now fashionable in so-called Sociomateriality (Barad 2003; Orlikowski and Scott 2008) studies. For Heidegger, equipment, practices and the human self are inseparably entangled as the one holism. Constitutive of Dasein is to have practices. Practices depend on equipment for their performance. Therefore, Dasein as the human way of being depends on equipment. But the being of equipment depends on practices and therefore on Dasein, closing the holism loop. This co-constitution of practices, equipment and Dasein is clearly seen in the *for-structure* explicated above which referentially connects the *in-order-to* of equipment (to hammer nails) to the *towards-which* of the practice (towards building a house) to the *for-the-sake-of-which* (for the sake of being a carpenter), which pertains to Dasein’s identity.

### 3 In the User’s World IT is Equipment

While the artefact/user dualism might be adequate to describe what IT is in the designer’s or IS researcher’s world where endowing an IT object with features is the main aim of the profession, our discussion of Heidegger’s ways of being above suggests that in the user’s world IT is equipment that is co-constituted with a nexus of other equipment, user practices and social identities. To make this case we will show that 1) IT during use goes unthematized as it withdraws, 2) for users, IT is not a given thing but an *in-order-to* and 3) IT holistically co-constitutes social identities and is thus not ontologically separate from a “user subject”.

### 3.1 IT withdraws during use and is not experienced as an object

It is a well-known phenomenon that during absorbed use we do not experience the objects we are using (e.g. Winograd and Flores 1987). When driving a car we can engage in conversation or thought while our body does the driving to the extent that we find ourselves at our destination without quite remembering how we got there. Even if our attention is with the street ahead, the car itself remains withdrawn, as we move effortlessly in traffic. The same happens to the word processing software and the computer keyboard when our attention is with the text we are writing. This phenomenon is further evidenced in the problems users have when asked to give accounts of their use of IT (e.g. Coughlan et al. 2003). In a recent usability study we undertook for a telephony software provider (Riemer and Vehring 2010), users frequently failed to recount the existence of certain features in the software interface they were using on an everyday basis.

While consistent with the way of being of readiness-to-hand, this phenomenon is at odds with Cartesian dualism, which conceives of IT use as an interaction between a user subject manipulating an IT object mediated by explicit mental representations. But if use of IT were mediated by mental representation in this way, use would involve a constant series of translations between representations of the task in the mind and the tool in the world through continual plan building and execution (Suchman 2007). Such an approach to action however is highly burdensome cognitively and conducive only to a faltering beginner's performance (Dreyfus 2010; Dreyfus and Dreyfus 1996).

By contrast Heidegger's equipment analysis makes clear that when IT as equipment is most authentically in use it is not present as an external object standing apart from a user subject, which needs to be manipulated via mental representation. Instead it withdraws as it assumes its natural way of being of readiness-to-hand, and becomes an unreflected means for absorbed dealing with the task at hand (e.g. writing a text). This is not to say that certain aspects of equipment cannot be brought into focus during use. For example, while writing a text, one might occasionally pay attention to the size of the very large screen one is using in trying to organize different documents within the workspace based on the capabilities and limitations of that screen, until the screen withdraws back into the background and attention shifts to the task at hand.

### 3.2 IT is not a given thing, but an in-order-to in a use practice

It is well known in the IS field that the same artefact is often appropriated in entirely different ways in different contexts. For example, an earlier study we undertook (Riemer et al. 2007) exposed the radically different ways in which the same simple software product (Skype) was appropriated across five cases: as a background awareness channel, as a team coordination dashboard, a task coordination channel, a virtual office or as a travel companion. For example, in one case Skype as a task coordination channel bears on the distributed nature of software development, the way in which this work is divided into tasks, and the signalling of task hand-over carried out within the Skype text channel. Skype in this case is an *in-order-to-signal-one's-task-completion*, for coordinating task handover, for contributing to finishing a software module, for contributing to the effective creation of a software product. At the same time, in each of the Skype use-cases the very practices observed and studied are co-constituted by Skype as equipment; they are what they are only with and through Skype-in-use. Just as the Skype technology enables these various differing practices, so the practices define what Skype is in these practices (its various in-orders-to). Thus what Skype is in a practice cannot be separated from what Skype does.

On a Cartesian account this phenomenon cannot be grasped. On this account the being of Skype is independent of its use as it is a thing defined by its properties. So the only explanation is that as the same artefact is used in different contexts it enables different uses because users draw on different features for different tasks. However, our Skype use-cases indicate that this is not an adequate explanation. Skype (and other social technologies such as Twitter) are so generic that it is difficult to

explain differing uses through features of the technology as a thing. At the same time, and for the same reason, it is difficult to say what these technologies are without referring to what they are used for in a practice. As part of a practice they are determined by their function in relation to the whole of the practice (cf. Goldkuhl 2011). We contend that these technologies are not unique in this respect but just revelatory of a more general challenge to the idea that function resides in properties of technologies conceived of as self-sufficient entities.

Consequently, on a Heideggerian account IT in the user's world is not an artefact, it is not used in a certain way because it is a certain kind of entity, but rather the opposite: equipment *is* what it is *for* within the local practice; IT *is* its in-order-to. Hence, what is commonly seen as the same (or similar) IT artefact (defined as a bundle of features) used by human subjects in different contexts differently, in fact literally *is* different equipment ontologically in these various cases. Thus, each case presents a novel instance of IT as equipment for study or design.

### 3.3 IT is co-constitutive of human identity

Finally, equipment is intimately entangled not only with existing work practices, but with the user's identity. For example in our usability study mentioned earlier (Riemer and Vehring 2010), the telephony software as equipment in different cases could only be fully grasped by understanding how it bears on and co-constitutes the users' identities in various ways. For example, in one case of a busy, travelling company executive the manager, described how the telephony software enabled him to be "in charge" of his complex communications and travel arrangements, and to remain connected while mobile.

We argue that these identity-related aspects of tool use have been largely overlooked so far, as they have no meaningful place in the Cartesian story where user and IT object stand apart from each other as self-sufficient entities. At the same time these aspects are crucial for understanding innovation, design and change through IT.

Consequently, what IT is in the user world can only be fully understood by uncovering not only its place within the social practice, but how it connects with the for-the-sake-of-which of social identities of its 'users'. For our modern executive above, the telephony system was equipment for-the-sake-of-being the organised, mobile, always-connected, professional that he is. This further highlights the relational nature of equipment, since what equipment is, it not only derives from its place in a practice but also from the identities it co-constitutes. At the same time it shows that in the user's world the Cartesian separation of user and artefact is untenable.

We want to point out that this phenomenon is not limited to specialised technology and the local professional practices described in the examples so far. Practices, as the primary ontological entity in Heidegger's analysis, permeate every aspect of our (social) life from the most widely shared, taken-for-granted life practices constitutive of being a modern member of society, to the specialised local practices in various professions. Accordingly, Dasein assumes multiple identities depending on its places in these practices with various equipment taking part in co-constituting these practices and identities. For example, whereas the iPhone a professional ballet dancer relies on for making phone calls and organising appointments might not directly co-constitute her identity as a world-famous ballerina in the way that her ballet shoes do, she could hardly have become a ballet dancer in today's world without the equipment for being a modern 20<sup>th</sup> century human (such as an iPhone). Similarly, a wide range of taken-for-granted equipment co-constitutes who we are as modern beings in a Western society, such as houses, trains, cars, clothing, television, etc.

We argue that with its ubiquitous nature IT increasingly assumes its place as equipment in general life practices. For example, what it means to be a teenager today is intimately entangled with their presence on Facebook and other social platforms. We argue that traditional IS theories, which conceive of this phenomenon as 'teenager subjects using social technology objects', simply miss the point and are fundamentally inadequate for grasping these unfolding phenomena.

## 4 Implication of Equipment for IS design

We have argued above that when IT is most authentically in use it is encountered by users in their world as equipment, not as a self-sufficient artefact. In this section we will show why treating IT in use as equipment is important for Design in IS. We will address three topics: 1) Studying IT and the user (e.g. for requirements gathering), 2) Affecting change in the world through IS design, and 3) Acceptance of new IT into practice.

### 4.1 Studying IT and the user

On a Cartesian account studying IT use should be relatively unproblematic. User requirements gathering on this account can be undertaken in interviews with the user, typically outside the use context. The dualist notion assumes that user and designer (or researcher) inspect and converse about the same self-sufficient IT artefact entity 'out there'. Moreover, as use is mediated by mental representation users should have ready access to explicit knowledge (know-that) about their use through these representations. Studying the artefact and its use becomes a matter of communication between designer (or researcher) and the user about an independent object, where user representations of IT use need to simply be conveyed and captured in a detailed way.

However, manifold documented problems in conversing with users about their use of IT in requirements gathering (Coughlan et al. 2003; Gallivan and Keil 2003) speak to the contrary, and is often referred to as the user-developer gap (Wieggers 2003). It has been asserted that users and designers/developers do not speak the same language, do not share a common frame of reference (DeBellis and Haapala 1995) or that users lack proficiency in talking about technology and use (Macaulay 1996). In any case, problems are typically located in the user entity and in the realm of knowledge (e.g. Coughlan et al. 2003). However, our analysis above shows that this problem is better thought of as ontological than epistemological; it is due to the different ways of being of IT in the intersecting practices of IT design and IT use rather than in different representations of a pre-given IT artefact. On the equipment account, conversing about IT use amounts to engaging the user in an act of reflection and interpretation, which is not (and for reasons of fluency cannot be) their normal way of engaging with IT. In doing so, users would have to disentangle their own being and that of the IT from the equipment holism and render them present-at-hand.

Similarly, on a Cartesian account, testing of new IT designs (e.g. new software) can be done effectively and efficiently in laboratory settings were users inspect, interact with and then give their perceptions of the new artefact design, as in common usability testing practice (Dumas and Redish 1999; Rubin and Chisnell 2008). The idea is that shortcomings in the design can be uncovered before the artefact is introduced into context.

However, this approach is equally at odds with the equipmental nature of IT in use. In our usability study referred to earlier, the company had undertaken laboratory tests of its software artefact. Here a problem had been revealed with the color-coding of a central software feature, the phone line button for initiating a call. This icon was red when the line was disengaged and changed to green when clicked. The developers' reasoning was that red shows that the line is closed and green that it is open. However, an opposing view emerged from the usability laboratory tests that the users would expect to click a green symbol to make a call that turns red when in use (as on cellphones). Subsequently, in our field study we asked users about this. It turned out that this problem was not an issue at all for the users; in fact, some users had not actually noticed or could not recollect correctly the colours of the line button at all! The point is that surrogate "users" in the laboratory do not encounter their equipment, but rather interact with an unfamiliar object in a more or less present-at-hand way. "Problems" exposed in such settings might lead to costly re-development efforts despite minimal relevance in the users' world where the IT has become equipment and thus has assumed a different way of being.

Our argument lends credibility to situated design approaches (Hartswood et al. 2002; Kensing and Blomberg 1998), which advocates that designers study the users' world in context. The equipment lens might be useful to further sharpen the effectiveness of such approaches as it advocates attending to the uniqueness of equipment and its entanglement with professional/social identity.

## 4.2 Affecting Change in the World through IS Design

We argue that the object of IS design should be equipment not individuated artefacts. IS design is about affecting change in the world through creating new IT (e.g. hardware or software). On a Cartesian account this naturally amounts to the creation of new artefacts with appropriately chosen properties, hence the creation of new and better things. However, on an equipment account it is practices that change, regardless of whether one designs new IT for a specific professional practice or for a general life practice. In any case, what is changing ultimately is the IT equipment holism, implying changes to the being of all its parts: changes to professional identities, the practice and also the in-order-to of existing equipment at the same time.

For example, in a recent study we observed the emergence of Enterprise Microblogging (EMB) in the workplaces at companies such as Capgemini (Riemer et al. 2012). Such emergence results at the same time in changes to the local consulting practice, to what it means to be a consultant, but also to the place of other equipment. In order to understand what EMB is in the consulting practice at Capgemini, one has to examine holistically the place it assumed in that practice. EMB draws its various in-orders-to from the nature of consulting as a knowledge-intensive practice and the particular communicative nature of what it means to be a consultant whose business revolves around relationships. But what it means to be a consultant in Capgemini becomes redefined as EMB assumes its place; what relationships are, the nature of communication all bear on each other for what they are. Finally, other equipment such as email changes too, as the new equipment redefines the for-structure by partly appropriating the in-order-to of email. Hence, email after the introduction of EMB *is* different in Capgemini. This example of holistic change exposes a multitude of phenomena that are "lost" in the Cartesian view.

The Yammer case is interesting from an IS design point of view, since the platform provider Yammer Inc. develops the service not for a specific professional practice, but for one of the most general human practices: communication. At the same time however, Yammer itself becomes very different equipment when taken into and appropriated by different local corporate practices, which in turn generate very different feedback and local wish lists for further Yammer-enabled practice changes. We argue that only the equipment lens can provide adequate ontological grounding for grasping the vast differences in context-specific Yammer appropriation and its significance for local practices and identities. For example, when researching the impact of Yammer across different cases, it seems woefully inadequate to assume that what is being investigated is the same ontological entity which is merely used differently, as its role within the practice, its source of meaning, its impact on other equipment, and local identities will all go unaccounted for.

Another excellent example of designing for the most general life practices by (intuitively) following an equipment perspective is provide by the Apple corporation. Apple is well known for approaching its design from the use perspective in a radical way, in that the user is not actually a direct source of input for its design, with Steve Jobs famously arguing that "people don't know what they want until you show it to them."<sup>1</sup> Rather, it can be argued that a key success factor for Apple is that the company envisions bold changes to general use practices, life styles, ways of life, and ultimately entire industries; hence, Apple is able to see its emerging products as equipment in its customers' lives. In doing so, Apple deliberately takes into account and plays to the (social) identity aspects of equipment,

---

<sup>1</sup> BusinessWeek (25 May 1998)



where owning and using an Apple product is a way of self-expression. Moreover, to achieve this Apple creates radically simplified technology, designed to enable the product to take on its equipment role in very different local use practices. The iPad is a good example: it is a music instrument, note-taking device, personal organiser, inventory keeping unit, academic reviewing tool, light-weight personal computer, video player, etc., depending on its place in a particular local practice. At the same time, the device itself has been created to enable it to do what equipment does: to withdraw from use. Evidence for this can be found in Apple's television ad for the iPad 2: "Here is what we believe: Technology alone is not enough. Faster, thinner, lighter, these are all good things, but when technology gets out of the way, everything becomes more delightful, even magical."<sup>2</sup>

### 4.3 Studying IT Acceptance

This is not to say that the characteristics of the IT artefact are unimportant. Of course, it needs to be ensured that a new artefact is capable of doing what it is supposed to do in order to induce any envisioned change. But endowing an artefact with properties will only ensure its suitability for a task (e.g. ability to transfer a text message), a necessary but not sufficient requirement for change to occur in practice. For such change to occur, new IT needs to be accepted and made part of the practice context.

On a Cartesian account this is largely a matter of "fit". Simply put the fit logic posits that if the properties of the IT artefact fit the requirements of the task and the user, change will occur. This is a logic of the popular task-technology-fit (TTF) model (Goodhue and Thompson 1995) that underlies much of the thinking and theorising in IS. However, at the same time a large body of literature in IS pays testament to the manifold problems that arise in practice when IT innovations meet the "messiness" of user practice, with users adopting IT innovations in unfaithful ways (Beaudry and Pinsonneault 2005; DeSanctis and Poole 1994), engrained habits standing in the way of adoption (Limayem and Hirt 2003) or users resisting new IT outright (Jiang et al. 2000).

However, on a Heideggerian account such problems show up quite differently. In fact, that users might come to different interpretations of the artefact than designers, which might lead to negative evaluation or 'unfaithful use', is quite to be expected on the equipmental view of IT. The issue is that an IT innovation when first encountered is not yet equipment so it does not yet present as in-order-to. The new innovation might not make sense against the background of existing practices at all, in which case it is resisted, or users will have to engage in a social sense making process for the new thing to find its way into the practice holism and find its place as equipment; it must become entangled with other equipment, user practices and social orthodoxies, a process we might usefully call appropriation as it involves precisely the move from suitability to appropriateness (Riemer and Johnston 2011).

Finally, introducing new IT into a workplace and replacing existing equipment can in the worst case equate to tearing apart one's (professional) life-world, and thus one's identity, which was built on the basis of what one does and therefore how (in what way) one "is" an accountant (or a manager, a sales clerk, etc.) co-constituted by one's equipment. Hence, what is often characterized as a recalcitrant resistance to the inconvenience in changing one's routine or habit is now seen properly as identity preservation.

In summary, while the artefact view usefully describes the underlying material properties of IT that renders it suitable to fulfil a task (e.g. organize and present data, perform calculations, facilitate information transfer) the Cartesian approach cannot capture how IT is encountered by the user, since IT has a different way of being when it is equipment than when it is present as an artefact. We argue that rather than a user encountering a new thing and making a one-time adoption decision (as portrayed in influential technology adoption models in IS), on an equipment account a new technology

---

<sup>2</sup> <http://www.youtube.com/watch?v=tybq56zDC-E>

confronts an existing practice holism as an 'outsider', and the holism must find a way over time to accommodate this outsider, a phenomenon previously captured in the notion of 'hospitality' (Ciborra 1999).

## 5 Conclusion

IT is commonly conceived of as an artefact object standing against a user who acts upon the artefact through mental representations. We have pointed out that this view of IT is implicitly informed by a dualistic ontology that underpins everyday and mainstream scientific thinking about technology in general. While such a dualist view in many ways is a good account of a designer's or a researcher's relation to technology as an object of production or enquiry, we have argued against the assumption that this is how IT is encountered by users within their own authentic practices.

In doing so, our line of argument is part of a recent push within the IS discipline for non-dualist accounts of IT in use, most prominently articulated under the label "sociomateriality" (e.g. Orlikowski and Scott 2008). However, while these works expose the same shortcomings of the dualist tradition, they have not yet delivered precise conceptual tools and language to capture fully the ontological nature of "IT-in-practice" and its implications for IS research and design practice.

We argue that by drawing on Heidegger's original works we not only go to the source of non-dualist thinking in continental philosophy, but that Heidegger's work also provides us with a precise and rich set of concepts and language for exposing in detail the holistic nature of IT as equipment. Analytical tools such as the practice for-structure allow us to explain and explicate for IS research and design practice the ways in which IT is equipment in the users' world, co-constituted with a nexus of other equipment, user practices and social identities.

We conclude that the dualist notion of a distinct user and artefact is an untenable basis for theorising the design of IT that will be truly appropriated into, and effectively transform work practices. Design in IS should therefore be the design of IT as equipment, in the sense elaborated above. Our findings advocate design in context (e.g. Muller and Kuhn 1993; Winograd and Flores 1987) and the study of IT in practice (e.g. Goldkuhl 2011).

## References

- Barad, K. 2003. "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter," *Signs* (28:3), pp. 801-832.
- Beaudry, A., and Pinsonneault, A. 2005. "Understanding User Responses to Information Technology: A Coping Model of User Adaptation," *MIS Quarterly* (29:3), pp. 493-524.
- Benbasat, I., and Zmud, R.W. 2003. "The Identity Crisis within the IS Discipline: Defining and Communicating the Discipline's Core Properties," *MIS Quarterly* (27:2), pp. 183-194.
- Ciborra, C. 1999. "Hospitality and It," in *Informatics in the Next Millennium*, F. Ljunberg (ed.). Lund: Studentlitteratur, pp. 161-176.
- Coughlan, J., Lycett, M., and Macredie, R.D. 2003. "Communication Issues in Requirements Elicitation: A Content Analysis of Stakeholder Experiences," *Information & Software Technology* (45:8), pp. 525-536.
- Daft, R.L., Lengel, R.H., and Trevino, L.K. 1987. "Message Equivocality, Media Selection, and Manager Performance: Implications for Information Systems," *MIS Quarterly* (11:3), pp. 355-366.
- Davis, F., and Bagozzi, R. 1989. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management science* (35:8), pp. 982-1003.
- DeBellis, M., and Haapala, C. 1995. "User-Centric Software Engineering," *IEEE Expert*, pp 34-41.

- Dennis, A.R., Fuller, R.M., and Valacich, J.S. 2008. "Media, Tasks, and Communication Processes: A Theory of Media Synchronicity," *MIS Quarterly* (32:3), pp. 575-600.
- DeSanctis, G., and Poole, M.S. 1994. "Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory," *Organization Science* (5:2), pp. 121-147.
- Descartes, R. 1644, 2010. *The Principles of Philosophy*. Whitefish, MT: Kessinger Publishing.
- Dourish, P. 2001. *Where the Action Is : The Foundations of Embodied Interaction / Paul Dourish*. Cambridge, Mass.: MIT Press.
- Dreyfus, H.L. 2010. "The Current Relevance of Merleau-Ponty's Phenomenology of Embodiment," *The Electronic Journal of Analytic Philosophy* (4:Spring), pp. 1-15.
- Dreyfus, H.L., and Dreyfus, S.E. 1996. *Mind over Machine: The Power of Human Intuition and Experience in the Era of the Computer*. New York: The Free Press.
- Dreyfus, H.L., and Dreyfus, S.E. 2005. "Peripheral Vision: Expertise in Real World Contexts," *Organization studies* (26:5), pp. 779-792.
- Dumas, J.S., and Redish, J.C. 1999. *A Practical Guide to Usability Testing (Revised Edition)*. Exeter: Intellect.
- Gallivan, M.J., and Keil, M. 2003. "The User-Developer Communication Process: A Critical Case Study," *Information Systems Journal* (13), pp. 37-68.
- Goldkuhl, G. 2011. "The Research Practice of Practice Research: Theorizing and Situational Inquiry," *Systems, Signs & Actions - An International Journal on Communication, Information Technology and Work* (5:1), pp. 7-29.
- Goodhue, D.L., and Thompson, R.L. 1995. "Task-Technology Fit and Individual Performance," *MIS Quarterly* (19:2), pp. 213-236.
- Hartwood, M., Procter, R., Slack, R., Vob, A., Buscher, M., Rouncefield, M., and Rouchy, P. 2002. "Co-Realisation: Towards a Principled Synthesis of Ethnomethodology and Participatory Design," *Scandinavian Journal of Information System* (14:2), pp. 9-30.
- Heidegger, M. 1962. *Being and Time; Translated by John Macquarrie & Edward Robinson*. London: SCM Press.
- Hume, D. 1740, 2009. *A Treatise of Human Nature*. Merchant Books.
- Jiang, J.J., Muhanna, W.A., and Klein, G. 2000. "User Resistance and Strategies for Promoting Acceptance across System Types," *Information & Management* (37:1), pp. 25-36.
- Kensing, F., and Blomberg, J. 1998. "Participatory Design: Issues and Concerns," *Computer Supported Cooperative Work (CSCW)* (7), pp. 167-185.
- Limayem, M., and Hirt, S.G. 2003. "Force of Habit and Information Systems Usage: Theory and Initial Validation," *Journal of the Association for Information Systems* (4), pp. 65-97.
- Macaulay, L.A. 1996. *Requirements Engineering*. London: Springer.
- Muller, M., and Kuhn, S. 1993. "Participatory Design," *Communications of the ACM* (36:4), pp. 24-28.
- Orlikowski, W.J., and Iacono, C.S. 2001. "Research Commentary: Desperately Seeking the "It" in It Research - a Call to Theorizing the It Artifact," *Information Systems Research* (12:2), pp. 121-134.
- Orlikowski, W.J., and Scott, S.V. 2008. "Sociomateriality: Challenging the Separation of Technology, Work and Organization," *The Academy of Management Annals* (2:1), pp. 433-474.
- Riemer, K., Overfeld, P., Richter, A., and Scifleet, P. 2012. "Eliciting the anatomy of technology Appropriation Processes: A Case Study in enterprise social media," *20th European Conference on Information Systems ECIS 2012*, Barcelona, Spain, 13th June 2012.
- Riemer, K., and Johnston, R.B. 2011. "Artifact or Equipment? Rethinking the Core of IS using Heidegger's ways of being," *Proceedings of the 32nd International Conference on Information Systems ICIS 2011*, Shanghai, China, 7th December 2011.
- Riemer, K., and Vehring, N. 2010. "It's not a property! Exploring the Sociomateriality of Software Usability," *Proceedings of the International Conference on Information Systems ICIS 2010*, St. Louis, United States, 15th December 2010.

- Riemer, K., Froessler, F., and Klein, S. 2007. "Real Time Communication - Modes of Use in Distributed Teams," *15th European Conference on Information Systems (ECIS)*, St.Gallen, Switzerland, 9th June 2007.
- Rubin, J., and Chisnell, D. 2008. *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests (2nd Ed.)*. Indianapolis: Wiley & Sons.
- Scada, J. 2004. *Cartesian Metaphysics: The Scholastic Origins of Modern Philosophy*. Cambridge: Cambridge University Press.
- Suchman, L.A. 2007. *Human–Machine Reconfigurations: Plans and Situated Actions*. Cambridge: Cambridge University Press.
- Turner, P. 2005. "Affordance as Context," *Interacting with computers* (17), pp. 787-800.
- Venkatesh, V., Morris, M.G., Davis, G.B., and Davis, F.D. 2003. "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* (27:3), pp. 425-478.
- Weber, R. 1997. *Ontological Foundations of Information Systems*. Blackburn Australia: Buscombe Vicprint.
- Weber, R. 2012. "Evaluating and Developing Theories in the Information Systems Discipline," *Journal of the Association of Information Systems* (13:2), pp. 1-30.
- Wiegars, K.E. 2003. *Software Requirements (2nd Ed.)*. Redmond, WA: Microsoft Press.
- Winograd, T., and Flores, F. 1987. *Understanding Computers and Cognition: A New Foundation for Design*. Reading et al: Addison-Wesley.