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# What is IT in use and why does it matter for IS design?

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## Abstract

In both 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 dualist ontology that separates a subject (user) and an object (artefact). We present an alternate holistic ontology derived from Heidegger's analysis of equipment in *Being and Time*. Using Heidegger's *ways of being* we show that while IT may naturally present as an object in the world of the designer, designers must understand and take account that in the world of the fluent user, 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 a necessary perspective for design in IS.

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

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## 1 Introduction

In both 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 commonly seen as a bundle of features, essentially a thing with properties (Weber 2012). Users have access to these properties via internal representations of the artefact that reside in their minds and that are the basis of their interactions with the artefact (Dourish 2001). In this conceptual paper we question the usefulness of such a view

for understanding the use of IT and its subsequent implications for our understanding of IS design. We argue that this view of IT is deeply grounded in what is commonly referred to as the Cartesian worldview that stresses an ontological dualism between subject and object, between individual and the external world.

We will argue that the dualism of user subject and IT artefact gives rise to a number of difficulties for the practice of IS design as an enabler of change. We will do this by presenting an alternative non-dualist worldview. We find this alternative holistic worldview in Heidegger's analysis of equipment in *Being and Time* (1927; 1962). We will demonstrate that under this worldview IT in the users' world is ontologically different to what it is in the designers' world. Whereas designers encounter IT naturally as an object, in the users' world IT is what Heidegger terms 'equipment'. Equipment takes on a specific technical meaning and covers the being of IT when it is holistically implicated in a use practice, co-constituted by a nexus of other equipment, sayings and doings of that practice, and social identities. We will show the applicability of this notion of IT by making new sense of widely known IS phenomena such as 1) that IT withdraws during use and is not experienced when users are absorbed with their task at hand, 2) that the same artefact takes on different roles in different use practices (where it is different equipment ontologically), and 3) that IT becomes co-constitutive of human identity.

Our main contribution is to demonstrate that this alternative understanding of IT in use has significant implications for IS design. Firstly, we will show that for the proficient user IT is equipment, implicated in practice and withdrawn during use, not an object of attention. This has implications, for example, for how information about IT use can be elicited from users. Secondly, we will argue that if the aim of IS design is indeed to affect change in the world, it needs to make equipment its focal point, as any artefact is always designed to ultimately become equipment. Finally, we will show that this means rethinking the adoption of IT, from an individual decision about an artefact to a social process whereby a new artefact is appropriated into a social practice as equipment. In sum, with our paper we contribute to theorising the nature and status of IT in IS design. We hope to invigorate a discussion about the nature of design and the interplay between IS design and IS use practices, both with a view to further our understanding of design and the so-called design science approach in IS.

## **2 The traditional dualist conception of IT use**

The dualism between IT as an artefact on the one hand and the user as an individual subject on the other hand seems self-evident to a discipline that is concerned with the design and use of IT. Under this view, the IT artefact is designed as an object with features to be adopted, taken up and used by a user or group of users. 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 conception and its underlying ontology (Weber 1997; Weber 2012).

This conception of IT and its use is plausible because of a deeply engrained and taken-for-granted understanding of the relation between humans and the world, commonly referred to as the Cartesian worldview (Spinosa et al. 1997). This worldview, originating in the work of Descartes (1644, 2010) and refined by many other thinkers (e.g. Hume 1740, 2009), has given rise to a set of beliefs that have entered everyday and scientific ontological understanding (for a review see Scada 2004). The Cartesian worldview is useful to us in many ways because it is the basis of the rational scientific attitude that has dominated Western thought since the enlightenment (Spinosa et al. 1997). Because we grow up with this view, it appears self-evident.

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.

With the aim of unsettling this orthodox view of IT, in the next section we present an alternative ontological position, which we will subsequently use to make our main argument.

### 3 Heidegger’s ontological position

The topic of ontology is *existence* and the question of *being*. Traditionally, this question has been taken to be the elaboration and categorization of 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. We would like to note that the term *equipment* is given a precise technical meaning by Heidegger and the reader should not confuse it with its everyday connotation as merely physical implements or tools.

#### 3.1 Overview: Heidegger’s ways of being

Heidegger argues that his question can only be answered by first examining the peculiar way of being of that entity that asks about the nature of being. This being Heidegger calls *Dasein*. For Heidegger the way of being of humans (*Dasein*) is *engagement in practices*. 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). Equally, an academic in writing a paper does not encounter the word processor or the computer as objects with properties to be manipulated, but as ready-to-hand equipment for writing and thus for confirming his or her identity as a writer and academic. 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; a similar account applies to the writer who can be absorbed with the text they are writing because of their embodied skill for dealing with the software/hardware as ready-to-hand equipment.

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 familiar subject/object dualism. Table 1 summarises Heidegger’s ways of being; in the following sub sections we elaborate in turn on the two ways of being of equipment and objects.

Table 1: Overview of Heidegger’s ways of being (Riemer and Johnston 2013)

Being		Way of being	
Dasein	Dasein’s nature is to have practices, to which the use of equipment is central. Practices (and the using of equipment) are constitutive of Dasein.	Engagement (Existenz)	Human existence is being-in-the-world, i.e. engagement in a practical, absorbed and concerned way. Familiarity with everyday practices is the background against which all beings are rendered intelligible.
Equipment	Equipment is part of a holism. It is inseparably entangled with practices and human skills. Equipment has no way of being independent of other equipment and human practice.	Ready-to-hand (Zuhandenheit)	Equipment presents itself as an in-order-to in a holism of other equipment and practical involvements; it is most genuinely ready-at-hand when it withdraws during use and is not experienced at all.
Objects	Objects are individuated bundles of properties.	Present-at-hand (Vorhandenheit)	When something is encountered reflectively it is present as an object of attention.

### 3.2 The holistic nature of equipment

In our everyday dealings, we do not encounter equipment as (a collection of) objects with properties but as a transparent means, or what Heidegger calls an *in-order-to* (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 fluent 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 for something, and draws its particular *in-order-to* from a chain of practical assignments, an involvement in the *towards-which* of the task at hand and the *for-which* of the practice (Heidegger 1962, 115). We will refer to this structure as the equipment *for-structure*. For example, the particular being of a word processor as equipment arises from its place in the chain of assignments in a particular writing practice (*in-order-to* write a manuscript, *for* publishing a journal paper, *towards* disseminating one’s research findings). 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* (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, respectively, ‘to be a carpenter’ or to ‘be an academic’. The *for-the-sake-of-which* is not simply a goal or purpose but an *identity* that is ultimately possible only against certain established and inherently social practices.

It follows that equipment, practice and social identity are fundamentally co-constituted because they are defined by reference to each other within the *for-structure*, which 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. Furthermore, these references are inherently circular: 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 circle. The co-constitutive and circular relation between parts indicates that the entity in question is a *holism* (Dreyfus 1991, 97-98). It follows that equipment, practice and social identity are merely three ways of looking at the same holistic entity, each stressing different aspects. Hence, 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.

### 3.3 Making sense of artefacts

While Heidegger's innovation was to recognise and elaborate the holist concept of equipment, he does not deny our familiar, everyday dualist encounter with the world. His ontology would not be credible if it was not able to make sense of and accommodate the notion that one can indeed experience oneself as a subject interacting with objects in the world. Heidegger recovers this way of engagement with the world in his present-at-hand way of being, whereby entities in the world show up as objects with properties. At the same time he shows that this present-at-hand encounter with objects is very different from the way it is conceptualised in the Cartesian worldview.

Any object in the world will always be encountered against, and given meaning by, the background of our tacit practices (Taylor 2006), which influences which properties will show up. Heidegger argues that we can never step out of the world and encounter objects from nowhere. For example, the hammer when encountered as an object is still a hammer and not a meaningless wooden shank with a metal blob. In fact, it is only through our practical familiarity with equipment ready-to-hand that the properties of objects could be intelligible to us at all: if the being of objects were completely defined by context-independent properties, as in the dualist position, these properties could not have practical meaning for us. This is what archaeologists experience when they find artefacts that are clearly 'designed', but for which we have lost the practical context to discern what they are *for*, and hence what they *are* (e.g. Preston 1998). In such an encounter, all we are left with is examining particular physical properties of the physical object, but we are unable to successfully place it within any practices that we know and thus to understand what the artefact is.

It follows that any designed artefact is not actually defined by its *properties*, but by its *place* in a sociomaterial practice that makes the object intelligible in practical terms and thus gives it its in-order-to. In other words, even when entities are present-at-hand and present as objects with properties, these properties are neither definitive of what the object is, nor are they independent of the human practices within which the object is encountered. Thus Heideggerian objects do not have the self-sufficient existence of Cartesian substances; rather they depend on the practice for the very existence as that particular object we encounter. And it is because of its place in a sociomaterial practice that it is required to have the particular material properties to function as the particular object that we already understand it to be. The traditional ontological argument is thus turned on its head. The being of entities (what a thing is) is not grounded in *substantiality* (its material properties), but in *intelligibility* (how we understand it practically). This is not to say that material properties are unimportant for the object to *function* as what it is, but they do not define the object, as the archaeology example above clearly shows.

Any artefact needs certain material properties that enable it to do what it is supposed to do. In other words it needs to be *suitable* for a task (Dreyfus 2007). For example, a hammer has to have a certain mass, centre of gravity and balance for it to function properly in driving nails into wood. Similarly, a software tool needs to be able to display, manipulate and store text reliably to function as a word processor. However, for any tool to become equipment it further needs to be *appropriate*, which means it has to assume its place in the holism of equipment, shared practices, identities and social orthodoxies (what one normally and appropriately does). For example, while other heavy tools might be suitable to drive nails, a carpenter would not regard them appropriate. Similarly, while a word processor might be suitable to create lec-

ture slides for presenting, it would not be regarded appropriate by many academic professionals.

## 4 In the User's World IT is Equipment

Drawing on our exposition of Heidegger's ontology, in this section we will demonstrate that IT when adopted fully into a use practice is not an object, but equipment. As such it is co-constituted with a nexus of other equipment, sayings and doings of the practice and social identities. To make our case we will show that 1) IT during use goes unthematized as it withdraws, 2) for users, IT as equipment 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".

### 4.1 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 the dualist position, 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 1996; 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.

#### 4.2 IT is not a given thing, but a particular 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. 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-order-to). Thus what Skype is in a practice cannot be separated from what Skype does.

On a dualist 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 with 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). However, this phenomenon is exactly what we would expect on an equipment view of IT. We contend that social 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, that is, that they are self-sufficient entities.

Consequently, on a Heideggerian account IT in the user's world is not an artefact, but equipment. 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 differently in different contexts, in fact *is* literally different equipment ontologically in these various cases. Thus, each case presents a novel instance of IT as equipment for study or design.

#### 4.3 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 dualist 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 an organised, mobile, always-connected, consulting professional. This further highlights the relational nature of equipment, since what equipment is, 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 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 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, we assume multiple identities depending on our places in these practices, with various equipment taking part in co-constituting these identities. For example, whereas a smartphone a ballet dancer relies on for making phone calls and organising appointments might not directly co-constitute her identity as a world-famous ballerina, we assert that she would not become a ballet dancer in today's world without the equipment (which includes smartphones) for being a modern 21<sup>st</sup> century human. Similarly, a holism of taken-for-granted equipment, such as houses, trains, cars, clothing, television, co-constitutes who we are as modern beings in a Western society

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 'teenage subjects using social technology objects', simply miss the point and are fundamentally inadequate for grasping these unfolding phenomena.

## 5 The challenge of IT as equipment for IS design

We have demonstrated that IT is encountered by users in their world as equipment, not as an object. Hence, we argue that phenomena of IT in use cannot be grasped appropriately with a worldview that takes the distinction between user subject and IT artefact to be a fundamental principle. At the same time however, unlike users, designers do indeed encounter the IT artefacts of their creation as objects, since these IT artefacts are at the focus of their concern. This is why design is commonly conceptualised as the act of endowing an IT object with specific features (properties).

At first glance it may appear to be a contradiction to argue that IT is normally equipment for users but that IT may be an object for designers. Our taken for granted understanding of the nature of reality is informed by the belief that what things are is determined prior to our engagement with them and therefore IT should be the same for users and designers. However, Heidegger's notion of ways or being resolves this contradiction. What we have demonstrated is that IT can take on different ways of being in practices of IT use (as ready-to-hand equipment) and of IT design (as pre-

sent-at-hand object). In fact, every practice makes present certain objects that are central to that practice and takes out of focus certain ready-to-hand equipment for that practice. Hence, whereas in design the IT artefact which is being designed is a focal object and other technologies such as development environments and methodologies recede from view as equipment, in a use practice IT is normally equipment taken out of view, while practitioners encounter various other objects of attention in a present-at-hand way (such as products, contracts, projects).

Our point is that in addition to making IT an object of design work, designers must take note of the different way of being of IT in use. We must resist extrapolating the designer's taken-for-granted understanding of IT as an object to the users' world. A view of design that only focuses on the artefact is too narrow. Design needs to take into account the way of being of IT in the users' world, because this is what any new artefact is ultimately being designed for: to become equipment. While we expect practicing designers to be tacitly familiar with this objective, we argue that design research in IS also has to take account of IT as equipment, both in producing designs as an outcome of research and in the quest for understanding and theorizing design practice. In essence, we argue that design is not simply the creation of abstract entities with features (IT artefacts) that are later placed into a use context, but ultimately the creation of equipment of which a use practice is already a part.

In the following we will demonstrate in detail why treating IT in use as equipment is important for the study of 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 as an accomplishment of good design. To make each of these points we begin by critically examining the 'received wisdom' on each topic that derives from the taken-for-granted dualist worldview of users and artefacts. We then point to some problems this view encounters. Finally, we will then reconsider each topic on the basis of Heidegger's holistic notion of equipment.

## 5.1 Studying IT and the user

On a dualist 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 actual use context. The dualist notion assumes that user and designer 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 and the user about an independent object, where user representations of IT use need simply to 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. This is often referred to as the user-developer gap (Wiegars 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 dif-

ferent 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 dualist account, testing of new IT designs, such as 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. In these test a problem was 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 the software as *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 will become equipment and thus has assume a different way of being.

Our argument lends credibility to situated design approaches (Hartswood et al. 2002; Kensing and Blomberg 1998), which advocate that designers should 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.

## 5.2 Affecting Change in the World through IS Design

We argue that IS design should be concerned with the creation of equipment not individuated artefacts. IS design is about affecting change in the world through creating new IT hardware or software. On a dualist account this would naturally amount to the creation of new artefacts with suitable properties, and thus the creation of new and better objects. 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; in particular we studied the emergence of Yammer use at Capgemini (Riemer et al. 2012). Such emergence simultaneously results in changes to the local consulting practice, to what it means to be a consultant,

and 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 also becomes redefined as Yammer assumes its place within the practice, much as the practice itself changes. 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 Yammer *is* different in Capgemini. This example of holistic change exposes a multitude of phenomena that are “lost” in the dualist worldview.

The Yammer case is also interesting in terms of how it is designed, 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 that 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.

Finally, we want to briefly discuss the design practices of Apple, which we believe provide an excellent example of designing for the most general life practices by (intuitively) following an equipment perspective (Riemer and Johnston 2013). 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 said 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’s ability 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, 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 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>

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

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

### 5.3 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 as we have argued above endowing an artefact with properties will only ensure its suitability for a task, 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 dualist 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 the 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 (Riemer and Johnston 2013). 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 (Riemer and Johnston 2012); 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 2013).

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 an IT artefact view might usefully describe 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 dualist worldview is unable to 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 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).

## 6 Conclusion

IT is commonly conceived of as an 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 a designer will naturally encounter an IT artefact under design as a present-at-hand object in their practice, since the IT artefact is the focal object of their practice, we argue that design has to equally take account of the way of being of IT in the users' world, where it is equipment. Ultimately, any design that intends to bring about change to the world is always *design for* a practice, or in other words, the creation of equipment.

Our line of argument is consistent with 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 struggled both conceptually and language-wise in grasping 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 Heidegger's work also provides us with a rich set of concepts and language for exposing in detail the holistic nature of IT as equipment. Concepts such as the equipment-for-structure allow us to explain and make accessible for design practice the ways in which IT becomes 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 extend and reinforce existing notions of 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*: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. 1991. *Being-in-the-World: A Commentary on Heidegger's Being and Time, Division I / Hubert L. Dreyfus*. Cambridge, Mass.: MIT Press.
- Dreyfus, H.L. 1996. "The Current Relevance of Merleau-Ponty's Phenomenology of Embodiment," *The Electronic Journal of Analytic Philosophy* (4:Spring), pp. 1-15.
- Dreyfus, H.L. 2007. "Being-in-the-World 2," in *Philosophy 185 Heidegger*, H.L. Dreyfus (ed.). Berkeley: University of California.
- 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* (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*. Seaside, OR: Watchmaker Publishing.
- 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* (4:3), pp. 65-97.
- Macaulay, L.A. 1996. *Requirements Engineering*. London: Springer.

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- Muller, M., and Kuhn, S. 1993. "Participatory Design," *Communications of the ACM* (36:4), pp. 24-28.
- 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.
- Preston, B. 1998. "Cognition and Tool Use," *Mind and Language* (13:4), pp. 513-547.
- Riemer, K., Frößler, F., and Klein, S. 2007. "Real Time Communication - Modes of Use in Distributed Teams," *15th European Conference on Information Systems*, St.Gallen (CH), 07-09 June 2007.
- Riemer, K., and Johnston, R.B. 2012. "Place-Making: A Phenomenological Theory of Technology Appropriation," *33rd International Conference on Information Systems (ICIS)*, Orlando, 9 Dec 2012.
- Riemer, K., and Johnston, R.B. 2013. "Rethinking the Place of the Artefact in Is Using Heidegger's Analysis of Equipment," *European Journal of Information Systems* (doi: 10.1057/ejis.2013.5).
- Riemer, K., Overfeld, P., Scifleet, P., and Richter, A. 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 Vehring, N. 2010. "It's Not a Property! Exploring the Sociomateriality of Software Usability," *International Conference on Information Systems ICIS 2010*, St. Louis, United States, 15th December 2011.
- 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.
- Spinosa, C., Flores, F., and Dreyfus, H.I. 1997. *Disclosing New Worlds: Entrepreneurship, Democratic Action, and the Cultivation of Solidarity*. Cambridge: The MIT Press.
- Suchman, L.A. 2007. *Human-Machine Reconfigurations: Plans and Situated Actions*. Cambridge: Cambridge University Press.
- Taylor, C. 2006. "Engaged Agency and Background in Heidegger," in *The Cambridge Companion to Heidegger (2nd Ed)*, C.B. Guignon (ed.). Cambridge: Cambridge University Press, pp. 202-221.
- Turner, P. 2005. "Affordance as Context," *Interacting with computers* (17:6), 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.
- Wieggers, 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: Addison-Wesley.



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