Reconfiguring Early Childhood Education and Care

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Reconfiguring Early Childhood Education and Care:
A Sociomaterial Analysis of IT Appropriation

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Abstract. Existing studies of IT within early childhood education and care settings are scant, and those that do exist traditionally utilise a Cartesian worldview where humans and IT are separate self-sufficient entities with properties. In this worldview, change is attributed to either the technological or the human entity, leading to limited, either techno-centric or human-centred accounts of IT implementation and use. We reframe the activities in an early childhood organisation as a process of appropriation, and utilise a sociomaterial theory of technology appropriation alternative to the Cartesian worldview. We contribute a rich account of the changes that occur to the practices, the educators, and the technology itself during the appropriation process and demonstrate the theory's usefulness as an analytical tool for providing a deeper understanding of how early childhood educators appropriate a new technology into their practices in a sociomaterial, non-dualistic way.

Keywords: technology appropriation · early childhood · educators · sociomateriality

1 Introduction

The number of early childhood education and care organisations who are innovating with information technology (IT) is increasing, with interest and support for IT to be integrated into policy, curriculum and practice [1]. To date there have been few empirical studies on IT in early childhood education and care organisations. Plumb et al. [2] found that the majority of existing research involves descriptive studies of use by the educators with the children and pedagogical benefits of the use of the IT as a teaching and learning tool with young children, interspersed with a few studies examining the acceptance of the IT by children and/or educators. These studies are useful for practitioners, but present a difficulty in that they can be classified as either: human-centred, which minimises the role of the technology and focuses primarily on the human or social side of the relationship; or techno-centric, which assumes the technology performs as intended and exists without historical or cultural contexts, leading to technology determinism [3]. Within the discipline of Information Systems (IS), studies of IT implementation and use traditionally utilise two core concepts: the IT artefact and the user. These studies are grounded in a dualistic worldview where humans and IT exist

independently, and IT 'implementation' is a process of discrete stages where various decisions are made. The studies employ theories in a quantitative manner and provide useful information on factors and their contribution to the outcome of technology adoption, but neglect the "often messy process through which teachers struggle to negotiate a foreign and potentially disruptive innovation into their familiar environment" [4, p. 483].

Using a sociomaterial theory of technology appropriation that overcomes the traditional dualistic view, this research aims to understand the appropriation, "the way that users evaluate and adopt, adapt and integrate a technology into their everyday practices" [5, p. 6] of an innovative technology into the practices of an early childhood education and care organisation with particular focus on the changes that occur to the practices, the educators, and the technology itself during the appropriation process.

2 Theoretical Background: Sociomateriality and a Phenomenological Theory of Appropriation

Sociomateriality is an emerging worldview within the IS literature first introduced by Orlikowski [3, 6] together with Scott [7, 8] which reconceptualises the relationship between the social and the material. It rejects the concepts of discrete self-contained entities such as 'people', 'organisations' and 'technology' and instead accepts them as being inherently inseparable. As Orlikowski and Scott explain, it is "a move away from focusing on how technologies influence humans, to examining how materiality is intrinsic to everyday activities and relations" [7, p. 455].

Orlikowski's work has been influential in inspiring other sociomaterial conceptual contributions, such as those by Leonardi [9, 10] and with Barley [11, 12]. In turn, these influential conceptual contributions to sociomateriality have inspired scholars to adopt a sociomaterial perspective in IS/IT-related studies such as mobile IT usage [13], digital and physical visualisation boards in a hospital surgical emergency ward [14] software usability [15], and digital entrepreneurship [16]. The September 2014 special issue of Management Information Systems (MIS) Quarterly Sociomateriality of Information Systems and Organizing highlights the current mounting interest in "the relationship between the social and the material, in the context of our increasingly digital society" [17, p. 809], while also noting that debate exists around what constitutes the relational basis for the term sociomateriality [18, 19] although this is viewed as "quite healthy" for an emerging stream of research [17, p. 809].

Orlikowski [6] argues that sociomaterial approaches to studies of IS/IT can overcome the common dualist approach to studying technology and people (what she calls 'ontologies of separateness') and the Cartesian worldview, which is dominant in IS/IT literature and makes the distinction between subjects and objects and between individuals and the external world.

According to Poole and DeSanctis [20, p. 150], the concept of appropriation goes back to the 19th century philosophers Hegel and Marx who were concerned with "how humanity progressively learned to control and shape the natural world and how this, in turn, influenced and changed human society" and where to appropriate an object was

"to use it constructively, to incorporate it into one's life, for better or worse" [20, p. 150]. Utilising this perspective in their study of group decision support systems (GDSSs), Poole and DeSanctis note "…GDSSs have no meaning apart from their use. Indeed, it is use [author's original emphasis] that makes GDSSs what they are in a given context and gives them reality" [20, p. 150]. Continuing with their work, DeSanctis and Poole [21] introduce the notion of technology appropriation as a time-extended process where mutual adaptation occurs; both the technology and the practices of an individual are changed through the attitudes, behaviours and intended and unintended uses of the technology.

IS/IT studies utilising a view of technology appropriation are often found in the computer supported collaborative work (CSCW) field of IS to understand the ways users give technology meaning and fit it into patterns of their every-day lives [see e.g., Silverstone and Haddon 1996, Dourish 2003, Pipel 2005, Balka and Wagner 2006, Stevens 2009; all cited in 22, p. 408]. In agreement with Poole and DeSanctis, Draxler and Stevens also note that during the appropriation process, "what a thing is depends therefore on how it is used, and how it appears into human activity" [22, p. 409].

However Riemer and Johnston [23, p. 4] contend that existing approaches in the technology appropriation literature draw on a dualist worldview, where technology and humans exist independently as things with properties. They state that a dualist understanding of technology appropriation is limiting in that:

> …any changes occurring have to be attributed to changes in either the technology object (via changes to its properties or features) or in the user subject (via changes to internal representations, such as cognitive scripts)…such dualist accounts fail to capture: 1) changes to the technology as experienced by users (what technology becomes in practice, its meaning in the user world); 2) technological agency, as appropriation is typically attributed to the users as the causal agents of change; and 3) how appropriation of new technologies makes the world intelligible to users in new ways. [23, p. 4]

Riemer and Johnson's [23, 26] use of German philosopher Heidegger's ontological perspective in regards to overcoming these limitations in IT/IS appropriation studies is of particular interest for our research. Heidegger's [24, 25] sociomaterial alternative to the Cartesian worldview postulates that our basic mode of engagement with the world takes place through practices, which involve both social and material arrangements. A Heideggerian ontology posits the question: 'what are the kinds of ways that entities can be in the world?'; starting with humans, Heidegger calls the being of human Dasein, human existence is being-in-the-world and the way of being human is through 'engagement in practices' [26]. Dasein does not denote an individual; but rather the social being of humans, "whose mode of existence is distinct from that of other entities…engaged in social practices that at the same constitute what they do and who they are" [26, p. 5]. Heidegger also defines two other ways that entities can be in the world, in terms of how

they are encountered by Dasein in the course of engagement in practices: equipment1; and objects.

When Dasein encounter an entity in the world for the first time, whether they are constructing the entity, or reflecting on it, it is encountered as an object of attention that is *present-at-hand*, but may still be *unready-to-hand*. The entity is encountered by Dasein in terms of its individual properties, rather than its use in practices [26]. When an entity is encountered as a means to perform a practice, it is encountered as equipment. Equipment as such is constituted through its relationship to other equipment, typical activities and purposes for which it is used, and lends itself to use without reflection; a craftsman has an embodied skill for using equipment in order to perform a task and equipment lends itself inconspicuously and naturally to this task [26]. When equipment fails or its fluent use is interrupted, or when an individual is acquiring the skill necessary to be involved with the equipment, the equipment becomes conspicuous and becomes an object unready-to-hand. In the Heideggerian ontology, equipment, practices and human identity are inseparably entangled and form one sociomaterial holism. Riemer and Johnston state:

> 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. Hence, as much as equipment depends on Dasein for what it is, so Dasein is constituted through its engagement with equipment. [26, p. 9]

Riemer and Johnston [23] developed a phenomenological theory of IT appropriation based on concepts from Heidegger's relational ontology and it is their theory of IT appropriation which we chose to utilise for this research. They conceptualise the appropriation of technology as human engagement through a series of activities, during which the way of being of the technology moves from the foreground of being present-at-hand when first encountered, in the activity of inspecting the object to determine its suitability; to the background of ready-to-hand where it has assumed its place within the identity-practice-equipment holism and is in fluent, transparent use in the activity of performing, where the individual is performing their practices using the equipment in-order-to a achieve a purpose. A key element of Riemer and Johnston's theory is, in addition to Heidegger's concepts, a 'middle-ground' activity which they term 'place-making', involving "embodied activity that disrupts the existing equipment holism, changing socio-material practices as well as the being of the new and of existing technology" [23, p. 8]. In this activity the technology is considered as a tool which is unready-to-hand. Each activity can be analysed across three dimensions: the material, the practical and the social. An overview of the theory is presented in Table 1.

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[1] We make note here that the term *equipment* is given a precise technical meaning by Heidegger and is not to be confused with its everyday connotation as merely physical implements or tools.

Table 1. A phenomenological theory of appropriation (based on Riemer and Johnston [23])

Dimension	**Activities that unfold over time in appropriation**		
Human engagement	Inspecting	Place-making	Performing
Way of being of technology	Present-at-hand	Unready-to-hand	Ready-to-hand In-order-to
Being of technology	Object	Tool	Equipment
Place in practice	Fore-ground	Middle-ground	Back-ground
Material dimension	Object properties are inspected using existing skills and expected affordances	Acquiring the skill to use the tool. Discovering what the tool affords	Equipment withdraws from attention and becomes a means
Practical dimension	Object is inspected against equipment and understandings of the existing practice	Placing the tool among other tools and within the logics of the practice	Equipment has a place among other equipment and practices
Social dimension	Object is inspected against existing projects and social norms	Making the tool proper in the practice. Placing the tool in social identity production	Equipment is normal and part of social identity

The use of Heidegger's relational ontology within this theory of technology appropriation holds to the fundamental tenant of a sociomaterial analysis that "the social and the material are inherently inseparable" [7, p. 456]. In particular the concept that the technology changes ontologically through the notion of 'ways of being' can provide new and valuable insights into the technology appropriation process. We thus utilise this theory to frame the sociomaterial analysis of the appropriation of an innovative IT within an early childhood education and care organisation.

3 Case Setting

This research involves an exploratory, interpretive case study within Big Fat Smile (BFS), an early childhood education and care organisation in metropolitan New South Wales, Australia. BFS is responsible for 23 early childhood centres within the region, providing education and care services for children aged zero to five. The IT under study is a software 'app' called Kinderloop that runs on tablets and mobile devices, in particular on Apple iPad tablets, but is also accessible on PCs via a web portal. It is promoted as a safe, secure and private way for early childhood educators to communicate with parents and families of children attending an early childhood centre, in addition to documenting information on child activity and development. This combination of technologies will be herein referred to as *iPadKinderloop*. Kinderloop began development in 2012 in response to the founder's concern about not having appropriate times and opportunities to communicate with the educators at his children's early childhood centre in regards to being informed about his child's activity through the day. iPadKinderloop

aims to enhance early childhood centre-parent/family communications through the following process:

1. An early childhood centre installs the app onto their tablet or mobile devices, which are then made available to the educators during the day;
2. At appropriate times, the educator opens the app, takes a photo and writes a short description about what is occurring; the educator can link to learning outcomes, practices and principles, centre philosophy, national quality standards, policies and procedures, educational visions etc.;
3. The child/ren are 'tagged' in the photo;
4. The photo and annotation are then uploaded to the centre's secure Kinderloop;
5. Kinderloop automatically and securely posts update notifications to the tagged child's parents;
6. Parents can then login to the centre's Kinderloop using their own device with the app installed, or navigate to the online web portal using any Internet-accessible computer and see all of their child's updates and can 'like' or comment on the posts that are visible to them.

The motivation behind Kinderloop is an inherently social one: as a parent with children, the founder felt that communication between parents and families at the centre his child attended needed improving; parents are always rushed when picking up their children that they do not have time to stop and talk to the educators about how their child was through the day; and they also might feel guilty for leaving the child at a centre while going to work, wondering if they are okay.

4 Research Methodology

This research aims at obtaining a deeper understanding of the process of appropriating an innovative technology into the practices of an early childhood education and care organisation with particular focus on the changes that occur to the practices, the educators, and the technology itself during the appropriation process. We also aim to assess the applicability of the presented theory of technology appropriation as a sociomaterial lens into the appropriation process, and as such we have used the theoretical framework as background for our data collection, the coding of the data and the data analysis. Data collection occurred at four BFS centres that were appropriating iPadKinderloop between November 2013 and January 2014. Not all centres were at the same 'stage' or level of appropriation due to differences in the timing of the roll-out; although the BFS Head Office mandated the use of Kinderloop, it was left to centre directors to decide when they would start using it. The empirical data was collected via semi-structured interviews with two or three educators at each centre, each centre director, and the Chief Executive Officer (CEO) of the BFS organisation, resulting in a total of 13 interviews. The data was complimented by a collection of 12 short videos provided by the Kinderloop software founder which were comprised of short testimonials from current Kinderloop users, including educators, centre directors and parents/family members. These videos are available on the Vimeo website (http://vimeo.com/kinderloop). Data was

also obtained via observations of current practices and the examination of secondary documents used by early childhood centres in Australia including the Early Years Learning Framework and National Quality Framework.

The transcriptions of the 13 interviews were thematically coded and analysed utilising the concepts from the theory of appropriation. First, the interviews were coded according to the dimension of human engagement (i.e. inspecting, place-making or performing). Second, we coded the data in relation to the material, practical or social dimension of the framework. The 12 short videos were first viewed by the first author who made notes on the vision, and these notes were subsequently coded and analysed in a similar manner to the interview transcripts. In the following we use pseudonyms for our interview participants when quoting original data.

5 Findings

5.1 Practices Prior to iPadKinderloop

To understand the reconfiguring of practices that occur with the appropriation of iPadKinderloop, it is useful to understand the practices of communicating with families and involving iPads within the BFS centres prior to iPadKinderloop.

Prior Methods of Communicating. Centre director Rochelle outlines how centres communicated with families of children attending their centre prior to the introduction of iPadKinderloop:

> In the old days, we used to put stuff in parent pockets, and parents would never check pockets. We put notes up on the door, parents wouldn't read them, and we were really frustrated that the communication wasn't getting through.

Prior Usage of iPads. Centres had begun to appropriate iPads before the arrival of Kinderloop and the establishment of iPadKinderloop. Educators initially encountered the iPads as objects with properties, featuring a practice-motivated perspective of the possibilities of use, they evaluated the suitability and applicability of the technology within an early childhood environment: the portability of the devices, allowing their use within all physical areas of the centre; the touch screen technology interface providing enhanced accessibility for young children; the ability to install a range of apps that provide both learning experiences and entertainment for young children. Educators compared the potential iPad use to other IT devices in the centre such as PCs, which was noted by Rochelle as not being ideal for use with the children due to: the fixed location, where "previously we would bring a group of children into the office to access the computer, to look stuff up, as part of research"; the limited fine motor skills of children impacting their ability to manipulate the mouse and making it "quite difficult"

to use. Additionally the desire to provide a child-led responsive and emergent curriculum was a consideration, for example, as recounted in an incident by Cindy where the iPads allowed such an experience:

> There was a conversation about a giraffe going, and I explained what colour was a giraffe's tongue, and they didn't believe me, so we used the iPad to YouTube a little video of a giraffe eating and they were amazed by the blue tongue, and we researched to find out why the giraffe's tongue is blue, all just happened so spontaneously and quickly within a space of five minutes.

The nature of the generation of children they are dealing with as early childhood educators, who routinely experience the technology in their day-to-day lives, and find the use of technology simply 'second-nature' was also a consideration, as Rochelle reflected: "[The iPad is] so much easier for the children to use…we noticed that a lot of the kids had iPads [at home] or were using their parent's phones…I think it is the way of the world and we have to embrace it". They recounted experiences with the iPads that indicated actively-performed place-making was occurring, a process whereby the educators were finding places to accommodate the technology within the existing practice-equipment-identity holism, as Anita explained:

> We started off with just the iPads, and we used them mainly just for the kids to have a play with, we use them a lot for, like separation, in the morning. And then we moved on to using them more as an interest based thing, so we'll get some apps that focus on their interests, but it's more just free play that they use them for.

Prior Methods of Documenting Children's Learning and Development. Documentation of children's development is a critical aspect of the role of an early childhood educator, and the use of paper-based documentation occurs extensively within the early childhood sector [27]. Within the 'curriculum' for Australian early childhood education and care providers the process of documentation is noted as part of the assessment for learning and intentional teaching aspects of the role of an early childhood educator [28].

There were two key documents produced within the centres: the day book, known as a diary or reflection book, and child portfolios. The day book was observed at a centre and was a physical book which was placed at the entry to the centre and provided parents with the opportunity to see an overview of what their child and their peers have experienced during the day. It was comprised of printed photos and annotations either hand-written or typed which illustrated and described activities the children have participated in during the day.

Child portfolios were comprehensive hard-copy documents provided to parents at the end of the year which included photos, annotations and examples of their children's art or other artefacts which demonstrate the developmental and learning progress of the child. Portfolios were historically costly, hand-written documents with commercially-developed photos glued on the paper where required, but with more centres providing PCs for the educators to program learning plans and update children's portfolios, the

presentation of the portfolios changed to word-processed printed documents which included printouts of photos taken with digital cameras.

5.2 First Encounters with iPadKinderloop: 'Inspecting'

The Present-At-Hand Way of Being. When iPadKinderloop is not in fluent use by a skilled individual, but is instead being inspected or reflected upon, its way of being is present-at-hand; that is, it is present as an object with features. iPadKinderloop therefore is an object not defined by its properties, but by its place within sociomaterial practices that make it intelligible in practical terms. However the properties of the iPadKinderloop object are not to be dismissed, as for technology to be appropriated, i.e. change its way of being from an object encountered as present-at-hand to equipment that is ready-to-hand, it will have certain material properties that enable it to do what it is supposed to do; what the developer designed it to do. Furthermore, the iPadKinderloop is evaluated as to its suitability and its appropriateness, as it has to "assume its place in the holism of equipment, shared practices, identities and social orthodoxies" [29, p. 10]. The following section first describes how the BFS CEO encountered iPadKinderloop, and then how centre directors and educators engaged in the activity of inspecting.

The Chief Executive Officer. The CEO of BFS was introduced to the Kinderloop founder at an industry conference in March 2012 and "made the decision that we would roll out Kinderloop to all of our centres, because we saw great value in it". This decision was shaped by the fact that BFS is in a crowded market of early childhood service providers and striving to differentiate them by providing high quality early childhood services with added values with Kinderloop being considered one such added value.

iPadKinderloop was present-at-hand as an object in the fore-ground of consideration by the CEO as he evaluated it against its expected affordances and against the existing practices and norms of the BFS early childhood education and care centres. In the social dimension, the CEO viewed the iPadKinderloop properties within the context of a number of social and cultural concepts, including parental guilt over leaving children at centres while they went to work and not knowing what they were doing through the day; time-poor parents; and the "need to provide as much information as possible to parents" and the "importance of strengthening family-centre communications".

It was also evident that that the properties of iPadKinderloop object were evaluated against existing considerations of the practical dimension that come with being the CEO of an organisation providing early childhood education and care services:

> When people are paying substantial money for the services we provide, you want to make sure that everything is available to them and you find ways in which the connections can be stronger. There's an onus on us, to ensure that the parents have as much information as possible, so they can feel good about their purchase decision! …[also] the ability for our educators in our centres to far more readily, and cost-effectively, deliver on their obligations, the documentation and

> reporting, and relationships with families is one major part of the seven assessment criteria against which we are all being rated, and everyone has a view about the 'My Schools' website, well there's now 'My Child'…

Against the context of an early childhood and care centre environment, particular iPadKinderloop properties were noted by the CEO within the material dimension: Kinderloop runs on mobile touch screen devices which allows educators to use iPadKinderloop while moving around; there is safe and secure access to the posts with photos and annotations on children in the centre; the provision of real-time notifications to parents; and the provision of a full digital history with search functionality which could be useful when educators are using the posts for documentation or reflection purposes.

Centre Directors and Educators. The activity of inspection of iPadKinderloop by centre directors and educators was distinctly influenced by the executive decision made by BFS Head Office in August 2013 that iPadKinderloop use would be mandatory for all BFS centres, although no strict time frame was enforced. Thus the iPadKinderloop object moved to the fore-ground of consideration first by centre directors and then educators, as they were now mandated to create iPadKinderloop by installing Kinderloop onto their iPad devices and begin appropriating it.

In the social dimension, centre director Judy recounts how at first she was reluctant to appropriate iPadKinderloop, but that changed once she inspected the Kinderloop component of iPadKinderloop:

> I was a bit reluctant at first, only because I was a new centre, and my focus is on settling these kids, and I don't want to complicate anything, and I need to make sure I'm establishing these relationships with children and families, and then when I actually had a look at it, I was like "oh my god what am I doing, this is going to help me with my families, and relationships!

By observing the educators, in the practical and material dimension of the 'inspecting' activities of the appropriation process particular iPad properties came into view when consideration was given to their suitability for use in conjunction with Kinderloop: the real-time updating of children's activities was supported by the iPad's portability and ability to connect into the centre wireless networks; and the uploading of photos and text annotations was supported by the built-in camera and on-screen keyboard functionality. Because the educators were already using the iPad in their educator roles they felt comfortable with using them as part of iPadKinderloop, although some who used Android tablet devices noted that the Apple iOS interface on the iPads was unfamiliar.

5.3 Making Room for iPadKinderloop: 'Place-Making'

Once iPadKinderloop was established (i.e. the existing iPads installed with the Kinderloop software app within the four BFS centres) it presented as unready-to-hand. This

meant that it was no longer an object in the fore-ground and centre of attention of the centre directors and educators, but similarly it had not become equipment and withdrawn from the focus of attention. Instead the centre educators and directors were now actively making sense of iPadKinderloop as a tool and looking for a place for it within the existing holism of their early childhood centre with its practices, equipment and human identity of the educators. This practice of negotiating, experimenting and conversing about iPadKinderloop is what Riemer and Johnston [23] call 'place-making' and is analysed within the three dimensions below.

Social Dimension – Involvement and Identity. Centre directors and educators spoke of negotiating norms or rules for 'proper' use of iPadKinderloop as they actively sought to make a place for it within their practices as early childhood educators. Centre director Rochelle spoke of formalised guidelines that included "a three sentence maximum for those individual posts; it's supposed to be something that's really easy and quick to put out, so it's not taking up a lot of our time". She also noted that her centre has "processes in place so that we're checking each other's posts" to ensure a certain level of quality. Educator Chris described an informally negotiated norm between himself and the other educator who teaches in his room at his centre, where they mutually negotiated to make "about 30 posts a day, we try our best to cover each child at least once".

Language changes can be considered evidence of taking ownership of new technologies as part of place-making in technology appropriation [23], and we found evidence of the use of new terminology for those centres recognised as fully participating in the Kinderloop experience: the term 'superlooper' was used by the CEO to refer to these centres, and by the Kinderloop organisation on their website to refer to two centre directors who are "key ambassadors".

Rochelle noted that "everyone was keen and motivated" when it came to iPadKinderloop, highlighting the social dimension of the iPadKinderloop place-making; there is a sense of involvement as educators at the centre associate themselves with the place-making practice.

Practical Dimension – Incorporating Into Existing Tools and Logics of the Practice. We found evidence that the main purpose or intention of the iPadKinderloop appropriation differed in a number of centres. At two centres in particular it was evident that the way iPadKinderloop was being used was directly influenced by the particular understandings that the directors had of the iPadKinderloop affordances and their evaluation of it as a tool amongst the existing practices of the centres.

At one centre, the centre director had inspected and evaluated the iPadKinderloop affordances and determined its suitability as a communication tool, but with a distinct focus on documenting learning that's happening, which is then useful for educators to 'cut-and-paste' when programming[2] to save time:

[2] Programming here refers to the educators' activity of documenting an experience and activity sequence before and after observing the children within the early childhood centre.

> We use it mainly as a communication tool, but we also try to show, in a quite condensed form, the learning that's actually happening as well…when we're programming, take bits and pieces off Kinderloop as well that we've seen, like little observations and we use it as part of the children's individual plans. (Rochelle)

In contrast, another centre director had developed strong views on not using it as a developmental documentation tool but more as a simple event-recording tool:

> We're not using it as a massive developmental tool for analysis of the learning that's occurring, because I don't think I'd like it to be used that way. The potential is there, you can do it, but I would never use it that way, because I think it's far more beneficial as a communication tool for families. When my staff are planning and programming, they use a different format, and they have a piece of paper, with a set of questions that they need to answer when they're observing a child's learning. (Judy)

This quote from Judy additionally illustrates the nature of the place-making activity as active sense-making occurs as iPadKinderloop is placed next to the existing tools used by the centre's educators to document, and decisions being made to keep the existing tools and practices for documentation rather than utilise the iPadKinderloop in that way. Active sense-making was also evident as educator Anita recalls that the annotations' content of the Kinderloop posts changed over time based on parental feedback:

> It used to be a formal observation of what the child was doing and how it links to the Early Years Learning Framework; we still do link the outcomes to the photos, but we'll just put 'LO 4.1' so that it means nothing to the parents, they can still see that but it's just for our use. So what we used to do is we would write something like 'Bella is using her right hand to draw a picture and from this we can see we she's got good fine motor skills', using that technical language whereas now we'd write 'Bella is having a great time drawing a picture for mum', it's really casual and more informal.

Centre directors and educators spoke of how the iPadKinderloop had changed the practices of providing the traditional day book and portfolios, to the point where these artefacts were discontinued and replaced by iPadKinderloop:

> In terms of programming, we don't have to do daily reflections anymore, which is good because Kinderloop puts out all the pictures we do, it lets people know what we're doing throughout the day. (Chris)

There was also evidence that the practices of communicating information to parents had changed substantially, not only in how the information was transmitted but also in the response from parents, indicating increased engagement:

> We've put a lot of things [on Kinderloop], like last year we did like a pet interest, and normally even if I were to email, we might get one or two photos of kids' pets…last year we put photos on a pet board, we talked about the pets, people brought pets in, and we had so much more engagement from families. (Rochelle)

As the iPadKinderloop appropriation continued for one centre, the changes in the practices of the centre changed the nature of the iPads as existing equipment as centre director Sharon explains:

> We haven't gone back and bought all those games again on to our iPads [after apps were erased to make way for Kinderloop]. And I suppose, because now the iPads are more used for people to record what's going on. So the iPads are not really used for the kids anymore.

Material Dimension – Acquiring Skill. iPadKinderloop was introduced initially into two centres identified as 'pilot' sites. Once it was given approval, it was rolled out into each centre by the centre director, who attended training with the Kinderloop developers before informally sharing knowledge with the centre educators. iPadKinderloop was quickly and easily grasped by the majority of educators, as the previous participant experiences with technology such as the iPad shaped their acceptance:

> It came to my notice that every employee at [a particular centre] was using it, including some people who were known to be less than enthusiastic, a bit frightened of technology, having a go, getting on board, and realising it wasn't this big frightening thing, it's quite simple to use for handheld devices, iPads and smart phones… (BFS CEO)

Every-Day, Meaningful Use: 'Performing'. Once an IT tool becomes fully accepted and is being used in a practical and meaningful way it becomes *equipment* and its way of being becomes ready-to-hand; in this state the equipment is encountered by Dasein in an 'invisible' way, in that the individual does not notice it or pay attention to it. Centre directors and educators spoke of iPadKinderloop as a normal part of their daily life within the centres in a natural and fluent way:

> In terms of the iPads, primarily for Kinderloop, either I'll walk around the room with that throughout the day, and basically just snap moments that are appealing to me, or that I think parents might like to see. And then I just type up about four sentences on the go and I post it straight away. We try our best to cover each child at least once… that's just a good way for us to keep in touch with the families. (Chris)

The educators spoke of how they used iPadKinderloop "every day", in real-time situations where they are "capturing the photo straight away, we're instantly recording the learning that's occurred, we're not missing a thing, and the parents aren't missing a thing either" (Judy). These iPadKinderloop accounts reflect on how humans deal with

engagement in the world when everything is going well: “we just ‘do’ - we are absorbed with ‘what’ we are dealing with, without having to think or reflect on the ‘how’ of our doings” [30, p. 7].

As iPadKinderloop has found its place in the equipment-practice-identity holism, the educators and centre directors reflect on what impact iPadKinderloop has had on their role and identity as an educator and their associated practices: Rochelle reflected that “Kinderloop has made huge changes in the way we communicate with our families and has vastly improved the level of participation of families in the centre; we now have fun reporting while saving time!”. Other educators spoke of the time-saving afforded by iPadKinderloop, and centre director Judy mused that it had the power to be transformative for the early childhood education and care industry:

> Well it could totally change our industry in so many ways…you know, just like these documents that we get from the government, things like that, that are very influential. Kinderloop can be that as well, yeah. It just saves so much time, you know! And those conversations that you start with the parents...

When iPadKinderloop has withdrawn into the background of the existing practices, it is evident that there is an assumed level of familiarity with the equipment, against which educators are then able to evaluate and suggest new features based upon the practices that have been transformed by iPadKinderloop:

> Initially you could only put one photo in, and then, working with the guys, they were like ‘oh so you want to put more than one photo in?’ and ‘well yeah we’d like sometimes we want to show the progression of what a child’s doing’, so then they added the ability to include more photos. (Rochelle)

When something goes wrong with equipment, its way of being goes from *ready-to-hand* where its use is transparent, to being conspicuously visible and *unready-to-hand*, requiring action to resolve the problem [23]. Once the problem is resolved the equipment can move back into the background. We uncovered a problem with iPadKinderloop which resulted in a display of conspicuous visibility: two educators at one centre described issues with the Wi-Fi that the iPads were connecting to in order to use the Kinderloop software; when the Wi-Fi was down, educators were not able to post updates to the centre’s Kinderloop, or posts were lost because the upload didn’t complete. It caused one educator to become so frustrated she did not want to use iPadKinderloop anymore.

6 Discussion: Understanding the Entanglement within the Equipment-Practice-Identity Holism

6.1 iPadKinderloop and Centre Directors and Educators

According to Heidegger's ontological view of human existence, our mode of being is to be 'such-and-such' by doing 'such and such' [26]. Applied to our case study, we can see that our participants, the centre directors and educators, are concernfully engaged in the practices of early childhood education and care and in particular for the focus of this case study, the practices of communicating with families and documenting children's learning and development, and being engaged in these practices, constitutes their identity as early childhood centre directors and educators.

These practices that the centre directors and educators are engaged in now depend on iPadKinderloop as equipment, and we have shown how iPadKinderloop has ontologically changed through its 'ways of being' to become equipment within the world of the participants through the process of appropriation:

- It was encountered firstly as present-to-hand, as an object constituted through its properties rather than a use-in-practice, where the centre directors and educators inspected it against their existing practices and equipment;
- Then secondly as a tool unready-to-hand, where the centre directors and educators are actively making a place for it within their equipment-practice-identity holism,
- And finally as equipment, ready-to-hand, where it assumed its place in normality among the other equipment and practices of the centres.

When iPadKinderloop is encountered as equipment by the centre directors and educators, it is no longer encountered as a tablet device running a software application, but as an entanglement of and with those particular two pieces of IT, presenting itself as a set of particular *in-order-to* entwined in a use practice which is context-dependent, for example:

- In-order-to update parents on children's activity to inform them and/or alleviate concerns or guilt;
- In-order-to communicate centre news and activity information to parents;
- In-order-to document children's learning and development;
- In-order-to allow centres to save time and money on documentation obligations.

When the iPad as the platform for iPadKinderloop is extricated from iPadKinderloop, we can see that it also appears as a set of particular in-order-to entwined in a use practice rather than as a given object: educators used the iPad in conjunction with other software apps in-order-to facilitate children's learning, and in-order-to entertain children, or in fact in-order-to calm children experiencing separation anxiety. This concurs with Riemer and Johnston's musing that the design practices of the iPad intuitively follow an equipment perspective as 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" [29, p. 7], and

also the findings from Riemer et al.'s study on the software program Skype where they noted that the same technology object is often appropriated in entirely different ways [31].

In once again reflecting on the equipment-practice-identity holism, iPadKinderloop as equipment can only be understood in terms of the situated context of other equipment and human practices, and in turn shapes the identity of these centre directors and educators who are performing the practices that identify them. During the place-making activities of iPadKinderloop appropriation, the existing practices of communicating with families and documenting children's learning and development were transformed and thus transforming the identity of what it means to be an early childhood educator. As Chris reflects:

> It [iPadKinderloop] helped me save time which basically means less time off the floor mucking around with paper and typing it on computers, because I can do it all on the go and then because of that it means I get to spend more time with the children, and ideally that's what I want, and that's what the families want as well. And so if we do that then I'm getting the most out of the children and then I'm getting the most out of my role as a teacher.

6.2 iPadKinderloop and Parents and Families

Although we have focused on the changes to the practice-equipment-identity holism of the centre directors and educators and how their practices have been transformed, the data obtained from the video footage of short interviews with parents provided by the Kinderloop software founder allows us an insight into how iPadKinderloop has transformed the practice-equipment-identity holism of parents of children attending centres. In their familiarity with iPadKinderloop which has been shaped by their previous encounters with the tablet or mobile device that forms part of iPadKinderloop in other 'in-order-to' means, and in the context of their identity as parents and the practices that they engage in as being parents, they encounter iPadKinderloop as a series of means that are notably social in nature: in-order-to be reassured that their child is doing well ("Having two babies starting preschool at the same time, can be a bit nerve wracking at times so it's great to have that peace of mind that they're okay through the day, that they're enjoying their time at school" (Natalya)); in-order-to engage with their children ("[Kinderloop is] a really great conversation starter in the evening, because most young children can't remember what they did" (Megan)); and in-order-to include geographically distant family members in the lives of the children ("They [family in New York] miss out on those experiences so it's been a really great way to include them in our family life" (Megan)).

7 Conclusion

This study addresses recent calls to study the sociomateriality of IT [7] by providing a detailed, rich understanding of what happens during the appropriation of new IT within

an early childhood education and care organisation. Rather than utilise a traditional dualist approach where the world (humans, IT) consists of independently existent things with properties, our study utilises a phenomenological theory of technology appropriation by Riemer and Johnston [23] built upon the non-dualist ontology articulated by Heidegger [24, 25].

We contribute to the IS literature a detailed sociomaterial account of how IT appropriation reconfigures organisations, in our case early childhood education and care centres as well as of how human identity, practices and IT are inescapably entwined, framed by the different understanding of our way of being in the world as humans engaged in practices co-constituted by equipment. Our study demonstrates that such a sociomaterial view of IT appropriation allows us to overcome the limitations of dualist accounts of IT appropriation and change, as we have shown that IT change is more than just reconfiguration of designed properties or features, rather the IT ontologically changes during the appropriation of the IT; and that changes to practices are more than just changes to cognitive beliefs and attitudes.

As we have provided a rich case study of a technology appropriation, we contribute to IS practice by exposing the activities within technology appropriation which provide a basis for managers to plan and prepare for technology appropriation. However further research is required to derive more detailed information to guide managers in facilitating the appropriation of technology.

We also acknowledge that there are implications to the appropriation of such technology including workplace privacy, employee performance monitoring, and the inadvertent recording of child misbehaviour and/or injury which have not been addressed in this study. The first author intends to conduct further research and interviews with participants in order to discuss such issues and consequences.

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