Papier-mach(in)e: thinking with 'sticky' paper in the cloud

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Abstract
There is nothing less about paper and its use when it comes to academic study as we experience increasingly converging media spaces and functionalities of online applications within the screens of our laptops, mobile phones and tablet devices. The paper persists, and the paperless office, classroom and pedagogy become nothing but pure rhetoric. Hence, it is most pertinent to focus on paper and its "stickiness" in maintaining educational structures and practices. Usually hidden from view or neglected in educational technology studies is a consideration on how we think and interact not only with our mind but also with our heads and limbs. This paper will argue that paper has a composite place or bearing, a kind of stickiness to our technologised bodies, digital mobilities and hybrid practices in what I have coined here as *papier-mach(in)e*. This claim will be supported by evidence that demonstrates how we simply think both practically and pathically and that our mobilities in media and physical spaces are in one form or another meshed with paper. In fact, a drive towards a paperless classroom or pedagogy is without much foundation when it comes to mobilising a sustainable agenda for technology-enhanced learning.

Key Words: Paper, printed media, mobility, mobile devices, body, embodiment, paperless office, paperless classroom, paperless pedagogy.

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1. Introduction

In every media and technological development, the notion of the paperless arrangement of everyday has been promoted and promised for the sake of our work and our planet. Yet, the paperless office or classroom or places and practices have remained invisible. There is something about documents realised in paper form that preserves the human condition and the order of things. Most of daily activities are subtly or blatantly mediated by writing and reading documents, some of which are realised in paper forms. Yet, few of us stop to reflect on "boring things" like paper, and this is probably just as it should be. However, to present an urgency to address the question of the future of education and indeed the environment in relation to technologies, we must turn to paper *closely*.

This paper is about paper and its "stickiness" both figuratively and quite literally in everyday practice of perhaps mundane things. Particular attention is given to the practice of studying, clarification and repair of things in material and

corporeal terms in research I have done and in places I have visited and found myself in. Figure 1 is an academic office in the 21st century, no different from Signer's picture of his office featured in his book (2008, p. 2). Paper is everywhere, on desks, shelves and pinned on walls, juxtaposed and organised around the computer desktop, under a mobile phone and as a reminder on the office telephone. There is a *papier-mache* here of a different kind—a cross-media integration of physical and digital resources.

Figure 1: Author's office

Paper easily disappears in the act of reading and writing as the hammer disappears in the act of hammering and yet it is the very "glue" that holds everyday practice in place. To understand the "stickiness" of paper, it will attend to the following considerations in relation to paper *from* and *for* machines:

- Sellen and Harper (2002) studied paperless offices in two organisations in the USA; this paper revisits their work and focuses its framing of paper as a way of looking at organisational life in the university and everyday things;
- To re-establish that the myth of the paperless still persists and to present the view that in fact digital and paper are meshed;
- Furthermore, to problematise the drive towards a paperless classroom or pedagogy as without much foundation when it comes to mobilising a sustainable agenda for technology-enhanced learning.

This paper collates its evidence for a *papier-mach(in)e*: (1) by exploring the materiality and phenomenology of paperwork (van Manen, 2007) alongside other digital devices and how paper is used to facilitate study practices in body–space relations; and (2) by talking about the "(im)mobilities" of paper and other devices in terms of recycling and e-waste to further uncover the realities underneath the drive to go paperless. To provide evidence on how our cyber-cultures in the everyday act of studying is very much meshed and held together with paper, I have analysed places of study as photographed by participants and tagged in Flickr. It must be noted that Norrie, Signer and Weibel (2006) reported *Print-n-Link* as a system that allows the users to access digital information and/or searches for cited documents from a printed publication using a digital pen for cross-media infrastructure. Perhaps here we have a *real* paper-machine. However, my concern here is not a technical/representational mesh but a practical/material one. In considering paper and how much it still matters, its material and corporeal configurations are enacted through a relational materialist approach and ontology. This suggests that the reality we live in or would like to promote in terms of the paperless, in this case, has multiple and coordinated contrasting actual effects (Latour, 2005; Mol, 1999). For this reason, the focus on this paper is not the "state-of-the-art," but the "state-of-the-actual," ie, what actually happens in practice (Selwyn, 2011). A relational approach also implies that there are options between the versions of the actual and some ones I could choose which ones I would perform (Mol, 1999).

Here I have opted for the heterogeneous assemblage of paper. As the case of *papier-mach(in)e* unfolds, I bring into the discussions the e-waste as part of the "state-of-the-actual." I would like it to acquire the same stickiness of paper in our digital lives. Hence, it is with urgency that I call attention to e-waste in the technologies we use and examine for the sake of enhanced learning. An online library search on Wiley's website (http://onlinelibrary.wiley.com) within *British Journal of Educational Technology* (*BJET*) publication, content for the keyword "e-waste" yielded one result, mentioned once by Njenga and Fourie (2010). Latchem (2014) suggests that *BJET* should direct research in educational technology from micro- to macro levels and from short- to long-term studies to facilitate the desired impact and outcome indicators and foster development and effective policy change. What is amiss here that I would like *BJET* readers to recognise is technologies are mutable and mobile at a speed which, as pointed out by Njenga and Fourie (2010), research studies are simply unable to cope with. The disposal of obsolete computer hardware is part of the social facts of educational technology and we must pay attention to it. In fact, it has to be mentioned more than once.

2. Meshing with paper

Technology developments are renewing predictions of a paperless world. With tablets and other mobile devices, eg, the notion of paperless pedagogy is introduced and promoted. Admittedly, tablets or e-readers are beginning to look and feel more "paper-like" sufficiently lightweight and portable with better battery life power. However, the most new technologies could do is shift or delegate the paper-related practices to other people and things. Printing documents is shifted and delegated to the recipient from the sender. This does not invite a problem in any way in organisational life (Sellen & Harper, 2002), instead it provides a lens on how we might study the *vehicle* of study as an *object* of study (Levy, 2001).

In its phenomenological focus, my approach is framed by the premise that every human–

technology relation is a body–technology relation. In an earlier article by Enriquez (2012), I have invoked the works of Ihde (2002) and Feenberg (2003) in presenting a body–technology framework for exploring the somatic/corporeal intimacy of wearable and handheld media and the collective or sedimented mobile user habits of a cyber-culture, in this paper, as this mobility culture is meshed with paper.

Here, I would like to revisit Seller and Harper's book alongside two research studies and consider the affordances of paper within body–space relations in the act of studying. In the first study, the study practices and places of learning were explored and revealed through images generated by users without the prompting of a researcher using photos tagged in Flickr (Enriquez, 2010a). The total photographs in Flickr reached 6 billion in 2011. A simple Flickr keyword search for both the words *studying* and *self* yielded 181 items in this study and 253 items as of March 7, 2013.

The photographs depicted a range of still compositions including highlighters, open and closed books, notes, papers, highlighted text, lamps, coffee mugs, eyeglasses, computers or laptops, stacks of books, shelves, beds, and sofas. The photo data centred around reading textbooks, writing notes and highlighting text, and seated at desks or tables where things could be spread out and not necessarily with a computer or a laptop or any other portable device in the photo-framed, self-portrait of studying in Flickr (Enriquez, 2010a). On Flickr, studying and tagging come together in ways that reveal how individuals depict themselves as students or in the act of studying and also the material configurations or resources that relates to studying itself as provided in the tags themselves and as visually evident in photographs. In most of them, paper is captured within the frame of a photograph.

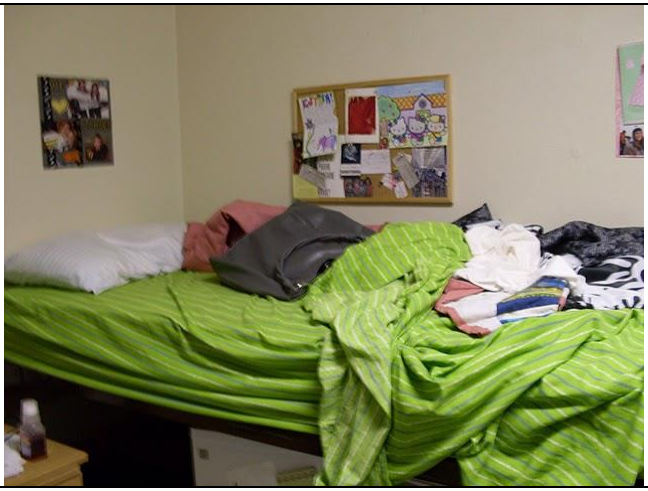
The second study used self-directed photographic method (Enriquez, 2010b).A total of 76 photos were taken by 16 participants, 20 years old on average. They came from different disciplinary majors including psychology, education, business, communication design, biology and rehabilitation.

Participants sent their photos via email with brief descriptions for each image (see

Figures 2–7). Images in both studies did not only identify a locale for studying, they also provided the spatial/social arrangements of captured places and spaces. In both studies, research participants, though not directly known in the former, made decisions about what to include or exclude from the photographic records of their study places, thus letting them control the images that are presented of their everyday world (Smith & Barker, 2004). In most frames, studying could not do without paper.

Figures 2–7 capture the spatial flexibility the body requires to "spread" materials for reading and writing without losing track of where things are or where they could potentially be moved without losing sight of other things. The ability to multitask not in terms of being able to open multiple windows simultaneously on the computer/device screen, instead the ease to use both limbs or fingers, one hand holding a page in place for reading and the other for jotting down notes.

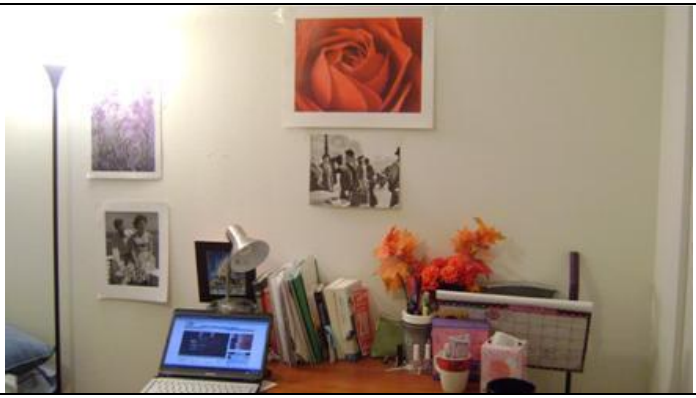
It could not be denied that e-readers or e-books are becoming more "paper-like." However, reading for leisure and for work or study requires different placement and ordering of things. Note-taking or jotting down is not just information transfer from one artefact to another. "As textbooks and student notes, they are crucial instruments around which learning practices are organized" (Levy, 2001, p. 37). Learning is material and physical. Its material practices involve places, beds, desks, pens, chairs, water bottles, toilets and, as it turns out, a lot of paper. Thus, studying is meshed with paper because the body and its positionings could not be reduced to information processing (Waltz, 2004).



This is a picture of my bed in my dorm room. Yes, it is very messy at the time of

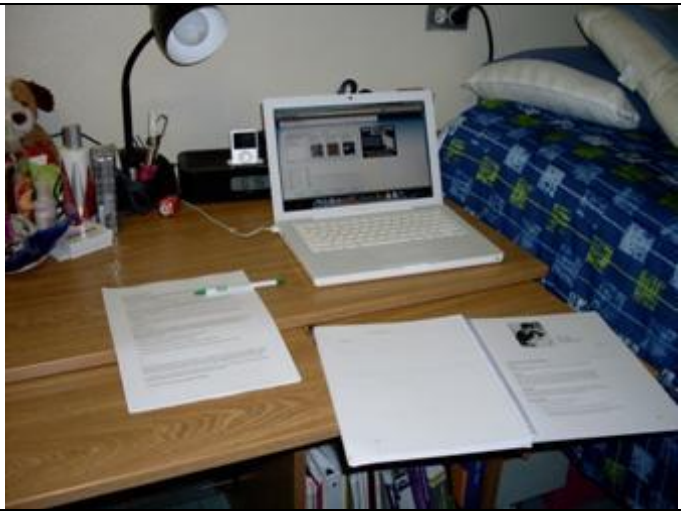
the picture being taken but as I do study here a lot I decided to include it. I read a lot of my textbooks either lying down or sitting on my bed. It is a convenient place to study as well because of the location. I do not like going to the library at night alone so I study a lot in my room.

Figure 2: Studying on the bed



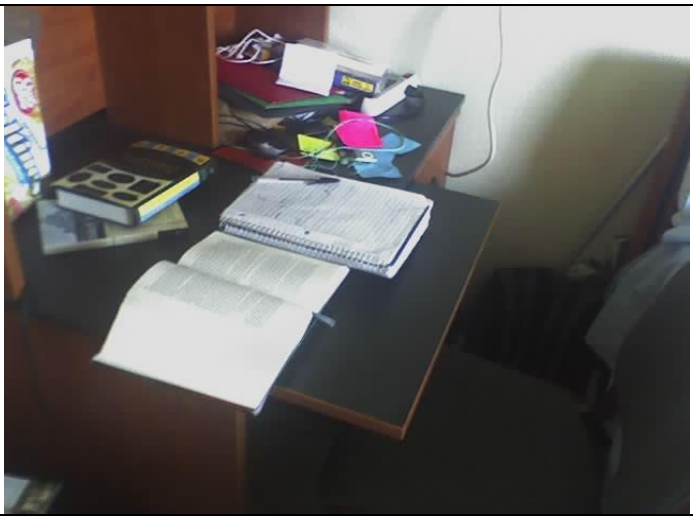
This is my room. I study in there a lot. When I am in my room, I am least likely to be disturbed. I can concentrate better and study longer. It is quite and everything I need to study is close to me. When I get tired, I can go get some refreshment or surf the Internet.

Figure 3: Studying in my room



This is the desk where I do the majority of my studying. It is in my dorm room, I have easy access to all of my other textbooks, references, pens, papers, etc. I prefer to study or complete homework in my room because I don't have to bother with lugging my books and computer over to the library.

Figure 4: Studying on my desk A

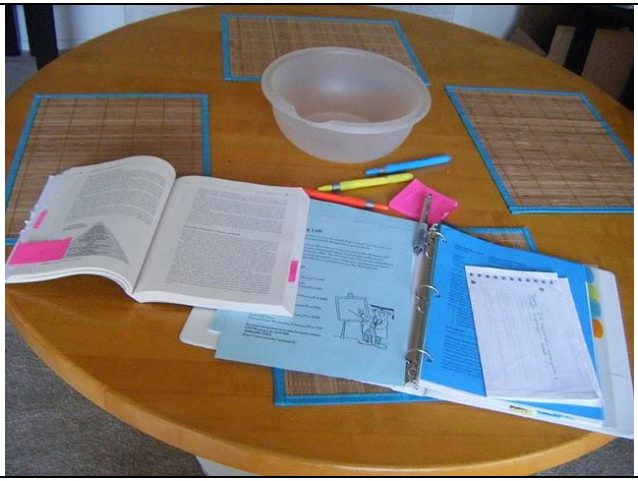


This photo is back at my dorm room but at my desk. I only study here when I have to really concentrate and buckle down. I forgot all electronics all distractions and just study, write, and do homework. I might not leave for hours; this place just reminds me of being at school and having to do my work in a certain amount of time.

Figure 5: Studying on my desk B

This room is just convenient for me because it has most of my study area here. When I study, I tend to spread my stuff out everywhere. So, I usually spread my work all over this couch. It's clean for now for the purpose of this clean photo. I study here mainly right after I arrive home from school, I immediately put my backpack here and then begin to take everything out to see what homework I have to do. In here, I am able to spread my homework everywhere when I need to so I can see things more easily.

Figure 6: Studying on my couch



This is my kitchen table. I like to study here when I have multiple things to

look at, read and highlight. The table allots enough space to have everything spread out, but still close enough together.

Figure 7: Studying on my kitchen table

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4. 'Getting a grip with paper'

While there have been dramatic increases in the use of digital technologies for the storage, processing and delivery of information over the last two decades, the affordances of paper could not be replaced. It is simply more attuned to the human actions such as grasping, folding, marking on, etc. (Signer, 2008). Sellen and Harper (2002) have captured the key bodily relations that paper is able to establish in the act of reading or studying in the places and material arrangements depicted in Figures 2–7. Paper is tangible. It coordinates eyes and hands for quick browsing or skimming through flicking pages or folding page corners. It allows the body to have spatial flexibility, as noted in Figures 6 and 7. People need to use both their hands and eyes to fully grasp the meaning or "attend" to the document "at hand" (Levy, 2001) or to draw things together (Latour, 1990), ie, by physically getting a grip of it with other things (Sellen & Harper, 2002). To study is to be attentive and attention in reading has to be a whole bodily experience and not merely eyes glazing and gazing markings on screen or paper in a process of information retrieval (Levy, 2001). On the one hand, fixity in spatial ordering is crucial for concentration and attention, as described in Figures 3 and 5, and on the other hand, fluid hand–eye coordination handles the material arrangement of multiple documents both in digital and print media alongside other things. Finally, paper supports the seamless interweaving of hybrid activities, such as reading and writing. Paper-based spaces allow for the independent manipulation of those spaces for different tasks (Sellen & Harper, 2002). Consequently, *papier-mach(in)e*

becomes a system of juxtapositions of bodies, places and practices all meshed with paper. Hence, the paperless office, classroom or pedagogy is a persistent institutional approach that disregards the specifics of particular office or classroom events and material conditions of embodied interactions. When we study and read, paper is not just an information delivery vehicle and we are not mere "information processors" (Levy, 2001).

Paper as handy work

Paper still matters. The fragmented whirring of printers in print rooms and libraries despite the Internet, social media, scanners, smartphone apps and tablets attests to this. It delivers a manner of reading and writing not easily replicated through the screen (Derrida, 2004; Rose, 2011). It is fully integrated with our habits of thought and with the structures of academic and everyday life. E-books and PDF files have retained the traditional architecture of paper as a collection of pages despite the fact that the dynamic pattern of information retrieval has been altered by digital and touchscreen interfaces, screen sizes or software applications (Stoicheff & Taylor, 2004).

5. Paper *for* Machines

Paper makes visible the hidden breakdowns or failures of machines or technologies, such as printers and photocopiers, and clarifies the logic of automated toilets (see Figure 8).When technologies or machines find themselves "out of order," in need of repair, paper is the "fix-for-now," making visible the breakdown of a machine that could not speak for itself, its breakdown is silenced unless paper articulates its state of affairs. A paper document speaks on behalf of other inanimate objects, like toilets. Figure 8 is a photo taken behind the door of one of the cubicles in a female toilet at Stowe. The laminated paper speaks on behalf of the loo to explain how it could be that at times the flush water turns yellow in the bowl. It was posted there to be read by a user who might be alarmed thinking that the toilet water was dirty, when in fact it is not. The truth of the matter is it is rainwater from the roof and it does not only promote cleanliness but also environmental friendliness. All this was articulated and made visible not by what was visually available but by what was said through a "paper order."

Figure 8: Signage in the female toilet at Stowe

In many cases, the digital increasingly extended the use of paper and vice versa. The materiality and mobility of paper assists in the local distribution and production of electronic media. For instance, quick response (QR) codes printed in flyers, brochures, billboards, newspapers and magazines, and on packaging push people towards websites, emails and social media sites, such as Facebook. In short, factors that contribute to the "stickiness" of paper have to do with the unique characteristics of print media and the impact of electronic media itself in enhancing the production and distribution of paper-based materials transferred and stored in the "cloud" (ie, remote storage).

6. De-paperisation for sustainability

From the paperwork in the study practices of learners and paper-order in institutional management, we must also call into question the green educational initiative, which privileges the status of the paperless in the conservation argument. I briefly displace the locus of interest from production, distribution, use and maintenance in educational institutions to the terminal conditions of upgrades, disposals and replacements delivered to foreign places. Cartwright's article in 1994 described how a paperless classroom was set up with hardware and software at Duke University (see Figure 9). This classroom arrangement of enhanced learning and paperless order requires upgrades and are typically replaced after a few years. Every old part of a computer has to be disposed, and for this to happen, it actually have to be collected to travel somewhere else. With less care to the boundaries of micro and macro perspectives and from an image of my office space, including a loo in Stowe to burnyards in China (see Figures 10–12 adapted from Basel Action Network photo gallery in 2012 (www.ban.org). More recent images are now available at https://www.flickr.com/photos/basel-action-network/), I make the case

that the drive for the paperless has serious material and corporeal consequences. From my own office in Figure 1, I would like to destabilise the seemingly innocent or "green" reality of the paperless office. I extend the relational view of the co-constitutive role of people, objects and environment "outside my office" and in places far from the study spaces depicted in Figures 2–7. More recently, the campaign for paperless classrooms and offices extends to "saving trees" as a sustainability effort or agenda. Contrary to popular belief, going paperless does not result in "going green." Paper use is no more damaging to the environment than electronic media.

The environmental impact of the consumption and production costs between paper-based and digital media has to go beyond the costs of reams of paper and toner cartridges. For instance, Arney, Jones andWolf (2012) reported a study on the implementation of a paperless classroom to promote a "going green" agenda, which was basically an oversimplification of the issue behind "going paperless" to a 48% cost savings on paper and toner. There are a number of factors that need to be taken into account, including the sourcing of (sometimes rare) raw materials and energy used in production and use. Surely, sustainability efforts in universities have to be more than just a matter of reams of paper, contrary to the suggestion of De Bonis and De Bonis (2011).

Figure 9: Paperless Classroom adapted from Cartwright, 1994, p.22

Figure 10: E-waste in China 1

Figure 11: E-waste in China 2

Figure 12: E-waste in China 3

It is rather a misconception that if all information is stored electronically, fewer resources will be used, leading to an eco-friendly environment. The paperless classroom in Figure 9, though very far from here and out of sight, leads to Figures 10–12. The cost and complexity of recycling computer hardware that has an increasingly shorter life span is a key consideration often overlooked. To maintain a digital document requires an infrastructure of hardware: servers, personal computers, power cables, electric sockets and software applications for word processing to name one. "Please don't print this email," "Save trees: Print only when necessary" or "Please consider the environment before printing this email" are all well-intentioned (and widely used) email taglines inspired by a sincere desire to "save trees."

We appreciate colleagues who want to go paperless as an eco-friendly practice of paper use. However, paper is a recyclable, biodegradable and reusable substance whose raw material— wood-- is renewable. On the other hand, making a computer typically requires the mining and refining of dozens of minerals, chemicals and metals. The lifespan of a computer is short, and electronics have become the fastest growing waste stream in the world (see http://www.ban.org).

Our day to day depends on both paper and digital documents. Both media have significant carbon footprints and put at-risk lives and livelihood of people far from where we are. Consumer electronic devices and IT infrastructure contribute significantly to toxic electronic waste. E-waste was reported to be 53 million tons worldwide in 2009 with an estimate of 14–20 million PCs thrown out every year in the USA alone (Carli, 2010).

Digital media doesn't grow on trees. Its creation, distribution and use requires massive quantities of energy, minerals, metals, petrochemicals and labor. . . . Proponents of digital media often tout the benefits of the digital media shift in terms of the number of trees that will be saved, but shifting to digital media has an environmental footprint and toxic impacts that bear greater scrutiny. (Carli, 2010, online)

So finally, when and where the paperless is in sight, we are actually confronted with e-waste—the unfortunate reality that the materiality and mobility of "paperless" machines leave other bodies (out of sight), such as those in Figures 10–12, potentially ill and eventually terminal (Enriquez, 2012).

6. Closing

To be paper is to be *papier-mach(in)e* – to be connected to computers, including tablets and mobile devices, printers, modems, servers, power cables and electric sockets, probably dependent of wifi connection, at the risk of losing battery life and lack of enough memory space on a drive, in a pen or in the cloud. I agree with Levy's (2001) words of more than a decade ago, that it is, '[b]etter to say that we are still working out how best to achieve fixity in the digital world, not that we are trying to abolish it – or, worse yet, that fixity is inherently absent from the new medium' (p. 37). It is better to acknowledge *papier-mach(in)e*, than pretend or claim we could go paperless. In fact, the digital documents in cloud storage obscure or 'cloud' the sticky realities of the ultimate paperless condition – e-waste.

In closing, the observations in this article presents the *papier-mach(in)e* as a manifestation of the material conditions, both (im)mutable and (im)mobile, of paper and digital documents stuck to our bodies and practices. There is hardly a dimension of life in which *papier-mach(in)e* does not figure.

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