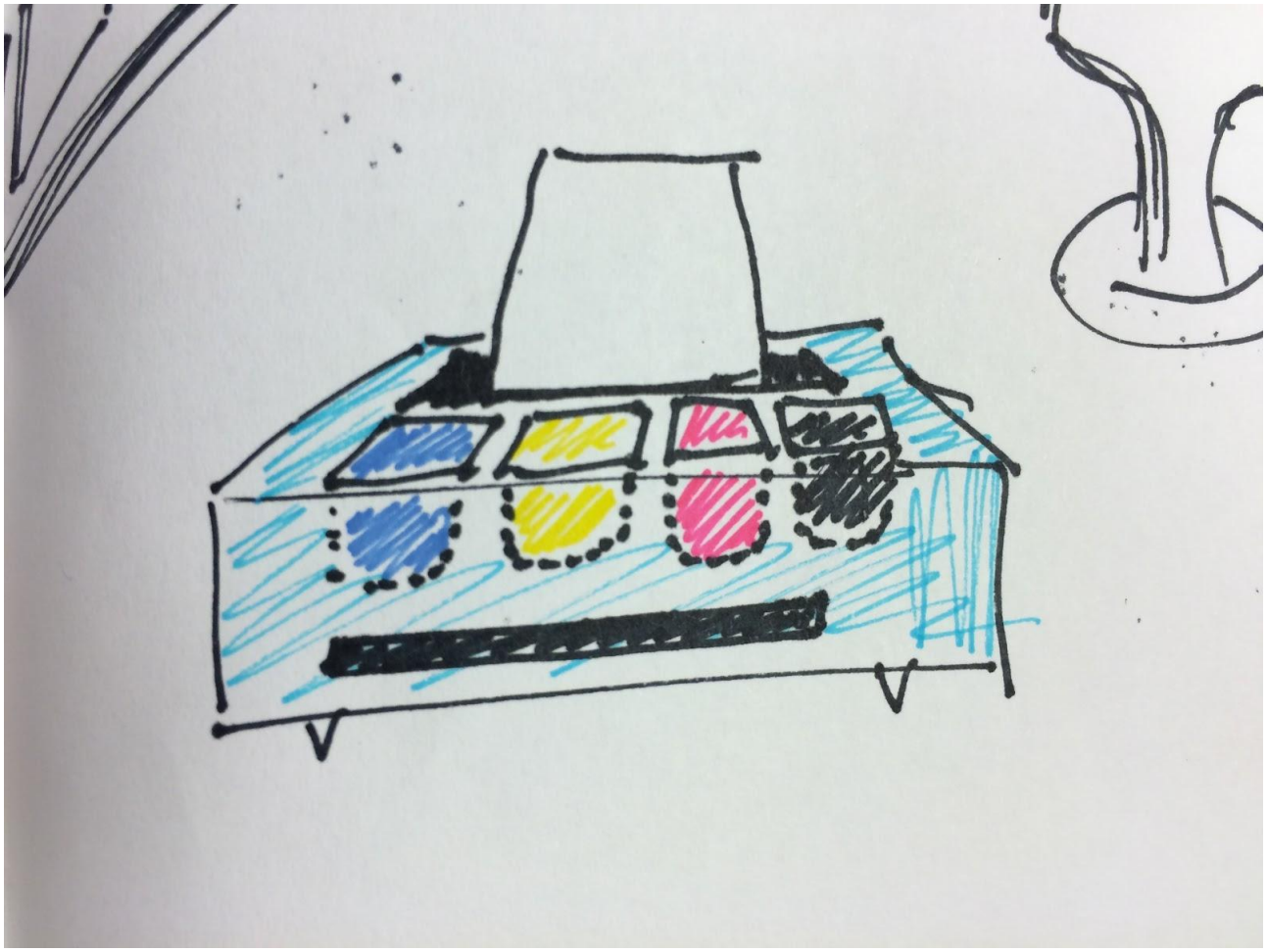
The case for recoding printers –

the embodiment of materialism through unethical design



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Introduction

Fig. 1. Office Space. *Printer scene*

For many years, printers have been a standard supplementary tool for the modern business and home office. The ability to physically print a document has become a staple activity for most people. Before cheap inkjet printers, printing was done either at the office or in a printing-store. Sometime during the 90's printer became household items often bundled with new desktop computers, changing the workflow and enabling the home office. Skip forward 10-15 years and today I and many like me abscond printers and detest the global printer cartell economy.

Project scope

In this project we wish to look at household inkjet printers and how to redesign and recode them. The reason we wish to look at inkjet printers will be discussed in the technology and problem definition. After that we will introduce our projects ethical and theoretical framework and how it applies to household printers. Thereafter we will introduce and explain the proposed alternative. Lastly we will discuss the projects intended transformation and their limitations and how this could be expanded upon.

The current status of printers

Technological aspects

Printers are one of the few modern digital tools which has a physical input and output. Unlike computers, phones, mobile phones, screens, peripherals that all use electricity, printer also use paper and ink.
Hating printers is so normal it's almost universal. It has traversed the cultural landscape from common irritation, comedic symbol of the embodiment of irritation (ref the movie Office Space) to its current state of pastiche; here by theOatmeal.

The sheer multitude of problems with modern printers makes critiquing them an exercise in futility. However we can view the problems as resulting from business logic and marginalization of profit in capitalist enterprises. Some of the main problems are related to:

- Planned obsolescence
- Proprietary ink formats
- Closed drivers / Software
- Features over function
- Lack of symbolic and real value

Capitalist theory would prescribe a segment with universally hated products and manufacturers as ripe for takeover. This is however a false dichotomy disregarding the entry cost, saturation of products, low cost of production, fierce pricing strategies, high sales-value of ink and technical complexity. The printer market has been a baffling spectacle not only because of ludicrous practices but due to globalized competition leading to marginal profit margins.

The printer business model

Let's consider the cost of ink versus a new printer, here from a post to reddit.com:

Fig. 2: residentskitz. *Everytime I run out of ink*.

The “poster” here shows that it is indeed sometimes cheaper to buy a new printer than to buy ink. Most times the low-end printer are priced under cost to lock customers into buying proprietary ink. This is often referred to as “freebie marketing”, used in markets where there is a secondary source of revenue. From this closed loop there arises several problems for consumers and also for the environment. There are several intentional components acting and creating effects we believe are problematic.

Cartridges and ink

In short, there are three types of cartridges:

- **Genuine or OEM cartridges** (original equipment manufacturer) are cartridges sold by the printer manufacturers.
- **Compatible cartridges** also known as "generic" or "alternative brand" are produced by a third party and have different brand names.
- **Remanufactured cartridges** are cartridges that have been refilled, either OEM or compatible ones.

If a printer only uses the manufacturer's cartridges and they have patented the cartridge design, they control and profit from the public buying as many cartridges as possible. Different methods have been used to increase the replacement of cartridges and disable other suppliers cartridges, for instance rfid chips. Lexmark, Hp and Epson have all been sued for various infractions. Any

attempt to interrupt the value chain is constrained by the litigious nature of the business. The printer manufacturers main goal is to control the value chain and they will therefore fight and lose money to discourage legal competition.

According to the IDC, the forecast for cartridge sales for the EMEA region in 2010 was 314 million units. This is the equivalent of almost 30 units sold per *second*. Calculations done by the UK Consumer Associations' *Which?* magazine shows that coloured ink is more than six times more expensive than Dom Pérignon champagne (Waller 2013). Further, *Which?* considers the habit of printers to go through cleaning procedures often unnecessary, and is greatly wasting ink (ibid.). Whether this is a deliberate function of the software, or just bad engineering, none of the manufacturers contacted was willing to comment on this seemingly exuberant generosity of printers' cleaning regime (Poulter 2012). But if we consider this in light of the planned obsolescence as described in the film "The light bulb conspiracy", then it is quite possible that this might well also be part of the business strategy (Dannoritzer 2010).

Further the enormous amounts of cartridges used is unsustainable and an environmental hazard considering that:

- *Each year over 350 million cartridges are thrown out to landfills.*
- *By 2012 500 million laser cartridges and 1.8 billion ink cartridges will be dumped in landfills.*
- *Cartridges can take up to 450 to 1000 years to decompose.*

("Ink cartridges", Wikipedia)

Lastly non-refillable cartridge types may go out of production meaning that the printer is essentially useless.

Hardware quality

When selling without any profit margin there is always an incentive to save costs. Therefore cheap printers are almost entirely plastic (also true for more expensive printers). If parts break it is cheaper to buy a new printer. Cheap printers are rarely designed with aesthetics in mind, they are often large, oddly shaped and disruptive with rattling components and flimsy hinges. As designed objects we assert that they are a visual and environmental offense to users, and bear none of the hallmarks for good design as exemplified by Dieter Rams' "Principles of good design" (Dieter Rams, Wikipedia).

Further the lack of diversity implies that there is little to no incentive for manufacturers to create more sturdy products or spend more time designing.

Drivers/Software

Some printers have, demonstrably, in-built software mechanisms that are at best illogical (such as refusing to print black if the machine is low on yellow ink), and at worst; stop working after a certain number of sheets printed. This latter scenario was made clear in the film “The light bulb conspiracy” (Dannoritzer 2010).

Conclusion

Nobody buys used printers, simply because there isn’t any economic incentive. Similarly they are often stowed away or hidden in the home. They are built without quality and retain no perceived inherent value. Society has accepted that printers are cheap things and inks are expensive. This means that almost nobody is interested in buying quality printers.

All of these properties shape the printer economy today and have detrimental effects upon the environment and consumers. The shoddy build quality and lack of emotional bond between printer and users means they are readily disposable objects. The proprietary ink in combination with illogical software leads to people being suspicious and disliking their printer. Thereby the printer falls in disuse or is thrown away, with the hope that a new one will work better. However for many there is a perceived need and feeling of autonomy related to having a printer in their home. This leads to people consuming both inks and printers at much higher rates than they intend, wish to or what is necessary. This is a huge problem since printers are not simply recycled but require expertise or otherwise become environmental hazards.

Recoding

Perhaps ideally, inventing something that would remove the need for printers entirely would be the most noble goal. Currently, this is not likely, so the aim is to use elimination design and recoding to present an alternative notion of printers. We have attempted to use redirective design drawing upon Fry’s strategies of *elimination design* and *recoding* (van der Velden, 2014, p.4). Fry proposes recoding as redirective design strategy, understood as “*de-signing, re-signing or the transformation of the sign value of things*” (ibid).

We draw upon a relational aspect of design, where “*the meaning and matter of design, designer, and the designed emerge in the encounter with each other”* (van der Velden, 2014, p.4). By creating objects, we create worlds (ibid); the choices we make as designers not only bring new artefacts, but by the very nature of objects, they also define what is *not* there, and hence define use, not-use and context.

We strongly assert the idea that printers have almost no value and almost nil sign-value. In the fairphone project van der Velden points to recoding as transforming the sign value of the smartphone as an object in a *“circular economy...and an investment in a sustainable future”* (2014, p.9). We have attempted to use the lessons from the fairphone project but ultimately we took a slightly different path.

Other projects

We have briefly researched several other design concepts to find out how others are tackling these problem. Most address alternatives to inks and some represent alternative use-cases, but there does not seem to be a holistic approach; an attempt to see all the parts of the object in a wider context (see Appendix 2).

Our idea: MI-Printer (Machina Impressorium)

We wish to create a beautiful printer, in the sense that its an object that serves its purpose in an excellent manner for the benefit of society and the individual. The notion of a beautiful printer seems to evade most people and definitely stumped google image search; which returned black plastic boxes with dismally small lcd screens (appendix 1). As mentioned earlier we assert that there has been almost no improvements in inkjet printers (with the exception of wireless printing). Therefore we believe a printer that prints and works excellently can retain its value for a long time.

We wish to look at several design perspectives and functionalities that will address specific problems we have already mentioned. Mainly:

- Disposability
- Value / Quality
- Proprietary
- Sustainability
- Usefulness

Principles

Indisposable design

Objects that retain their usefulness, value and can be repaired or repurposed. For printers we believe this means a complete paradigm shift. Therefore we have drawn inspirations upon objects that (for some people) have obtained this status. What they all have in common is an aesthetic and functional quality leading to a higher willingness to care for and repair them.

Fig. 3 Wikimedia. **Anglepoise lamp**

Fig 4. René Spitz, **Turntable by Dieter Rams**

Fig. 5. Piero - nl.wikimeida. **Harley Davidson 1961 FLH Duo-Glide**

Fig. 6 Stanley Kubrick. **Mitchell Transcriptor Hydraulic Reference Turntable**

Design for usefulness

To be a legitimate alternative this printer has to be able to print pages at similar speeds and with an acceptable quality. It doesn't have to be the fastest printer and it doesn't have to print with the highest quality. It also doesn't need to scan, fax or take copies. Neither should it support every connection type. Function should be only considered by their relation to printing pages and making this process simpler. Any other functions such as lcd screens, memory card support should only be included if necessary. Supplementary functions should be considered an evil that clutters and distracts from the real purpose of the product. However, due to the nature of the transparency and "hackabillity" we propose, it would be possible for enthusiasts to work with the software and hardware, and add functionality as they see fit.

Design for value

For this project we are not aiming to fix the industry but display an alternative notion. Therefore we believe this printer should be as expensive as necessary. If the environmentally sustainable

material are more expensive, then this cost should be considered legitimate. This means that we may be designing an expensive object, reaffirming the notion of value and sustainability.
If the consumer believes it is worth the investment then the connection between the object and the consumer becomes much stronger.

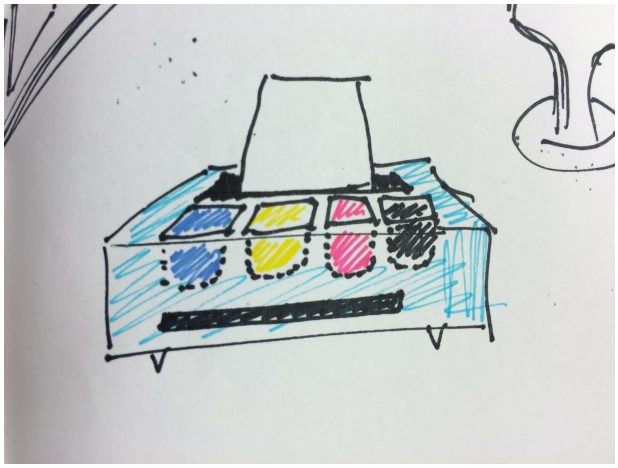
Design for quality

We believe its also necessary to embed symbolic properties in the object. To reinforce that this is not a disposable object we believe it must be and look sturdy and heavy. Some examples of this is using heavier materials such as iron and chrome alloys for different components. Similarly to luxury watches, where the weight is also a symbol of its quality.

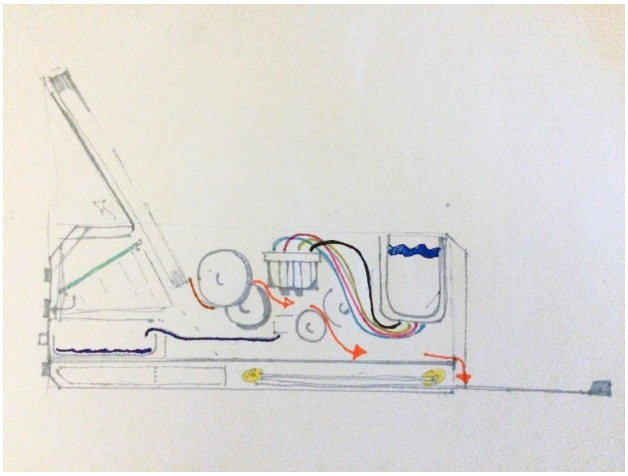
Design for openness

To firmly establish an opposition to the market logic of printers the entire products and its production should be open for the public. We believe that using principles and practices from participatory design this should be possible. By nourishing a community of enthusiasts and participation as a model for improvement, there is a good chance that the object will “live its own life”, and future technology can be incorporated.

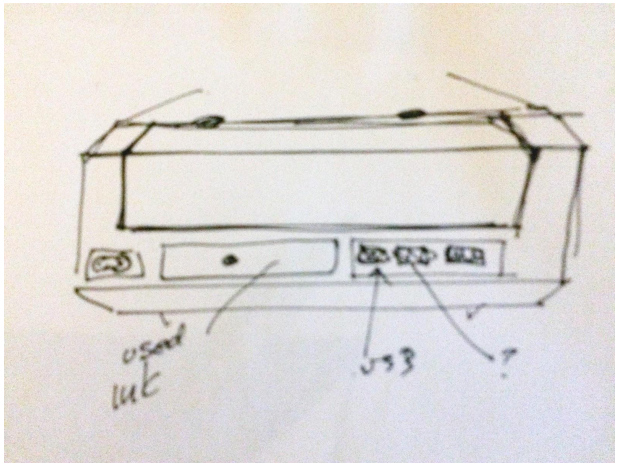
The artifact



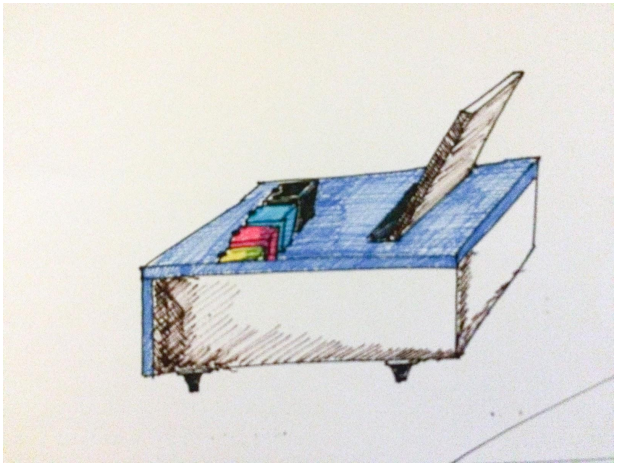
Sketch - blue = glass!



Sideways - Internal view



Back



Sideways view - blue = glass

These sketches show some of our ideas, it's quite clear we are not industrial designers but we have tried to show the most important properties. The sketches show a printer with a cmyk ink set up and vertical paper tray. The front and top panel is transparent glass. In the front there are four glass cylinders with hinges for the cmyk ink.
In the internal view we have included the excess ink tray and the circuit board in the back. There is also a power converter and automatic slide-tray for the paper at the bottom. At the back we have one usb slot and two perforated slots for further expansion. There is also a power inlet, excess ink tray and a hinged access to the circuit board.

Open-source

The drivers and software on the printer should be open-source. This allows the public to be sure that the software serves the public and not the manufacturers. This has to be balanced by technical experts that can explain why certain functions help keep the printer working. Following the principles of open source development (opensource.org) will allow a community of enthusiasts to maintain, update and customise the software on the same level as we envision the access to the physical components

Transparency

We believe it quite literally should also be physically and visually open. Visually this implies that its possible to see inside the printer and view how it works. Physically it should be demountable using ordinary tools and use standard objects that the public can buy and replace themselves.
In addition, taking future technology into account: we exemplify this with making the circuit board easily removable, and ensuring there will be space within the artefact to accommodate new types of hardware, such as connections. The circuit boards could simply be RasberryPi: a well known basis for open and hackable software and objects.

Ink

By implementing a CISS (Continuous Ink Supply System), the sensitive mechanism that directly applies the ink on paper will rarely need to be removed. By opening the artefact and its functionality, it will encourage users to experiment and test different substitutes for traditional ink, and the printer may become a tool for exploring other materials and uses, such as printing biomaterials, circuits and homemade inks.

Access to information

How the printer actually works should also be included in an educational manner so that the users can obtain a functional understanding. This includes informing about what components need to be replaced and what are likely solutions to problems. Users will be able to repair the printer with the technical know-how or that other users can obtain enough knowledge to repair the printer for others.

Design for elimination	MI-Printer (Machina Impressorium)
Erasure of *need* and *want*	1. No scanner/copier 2. No lcd-memory card requiring an interface
Functional substitution	1. Substituting the shoddy printer with our sturdy printer. 2. Substituting proprietary cartridge with alternative visions about ink.
Product multipurposing	Able to support multiple types of ink. Hackable.
De-materialization	1. Less use of plastics, less technical components 2. More metal and sturdier components
Re-materialization	Open ink standard.
Symbolic Devaluation	Material components signifying an indisposable and open object 1. Use of transparent material - glass 2. Strong iron bolts and screws 3. Use of “built-to-last” nozzles and wires Open in the sense of being accountable: 1. Open/Transparent and refillable glass cartridges 2. Open-source 3. Open-components: 3d-printable replacements Repairable 4. Use of standard components - screws 5. Material about functionality for learning how the printer works and how to repair or append it.
Destruction of sign value	Use of heavy material

Prohibition	1. Support open-cartridges 2. Support refillable cartridges 3. Support future laws regarding: 3.1. Heavy-taxation on printers 3.2. Collateral payment on printers 3.3. Ban on non-refillable cartridges
Recoding	
Transformation of the sign value	Disassembling the manufacturer/supplier relationship of ink/printer. Heave/Sturdy and functional object with aesthetic qualities.

Conclusion

In this project we have presented a cursory attempt at recoding printers. We have tried to move beyond creating "*less bad"* by also trying use contrary/critical/diametrical solutions for signal power. By rethinking and recoding the printer, the aim would be to alter our relationship with the machine, by giving full, open access to the software and hardware. Creating a beautiful object that would have a sculptural essence, and by making some panels transparent, have the potential to increase understanding of, interest in, and connection to the machine.

Fry mentions the ideal forms by Plato's concept of the good "*an aesthetically ideal form which through its realisation become absolute truth"* (Fry, 2010). Fry points to the coupling of perfectionism with happiness (as in Rolex) is still present in the postmodern society. We tried to build on this naivè concept of good as a way to incorporate value.

The process by which we arrived at this object and theory was based on the basic assumption that front-loading values is the only way to create sustainable artefacts. When the social, environmental, cultural, aesthetics comes first, the artefact will by the nature of the process start from "scratch". Attempting to consider these things first lead to a re-thinking of the assumptions that seems to be the accepted norms. It may seem counterintuitive to remove functionality from an object (as we have removed scanning and copying), but our argument is that it is better to have something reasonably sustainable that does one thing and does it well.

Though we have not looked at the production chain as it works today, it is highly likely that this will uncover unethical practices on multiple levels, negatively impacting the environment and lives of people all over the globe. It is unlikely that it is possible to produce these goods without exploitation of people, resources and the environment. Dubious business practices where the goal

is to increase consumption by designing for planned obsolescence is depleting the planet, and must be addressed (“The light bulb conspiracy”, Dannoritzer 2010).

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Figures / Images

Figure 1:

Mike Judge. *Printer scene*. Still image from:

Office Space. Dir. Mike Judge. Twentieth Century Fox, 1999.

Figure 2:

residentskitz. *Everytime I run out of Ink. I just buy a new.* Digital Image. *Reddit, the front page of the internet.* Imgur, n.d. Web. 6 Dec. 2009. <http://www.reddit.com/r/pics/comments/abrcu/every_time_i_run_out_of_ink_i_just_buy_a_new>

Figure 3:

Anglepoise Desklamp. N.d. *Wikipedia, the Free Encyclopedia*. Web. 16 Nov. 2014. <http://commons.wikimedia.org/wiki/File:Anglepoise1227.jpg>.

Figure 4:

Spltz, Renè. *Steuergeraït Und Plattenspieler CS 11 Studio 2*. 2010. Museum Fur Angewandte Kunst, Frankfurt. *Flickr*. Web. 16 Nov. 2014. <https://www.flickr.com/photos/renespitz/4640779325/in/photostream/>.

Released through CC 2.0 <https://creativecommons.org/licenses/by-nd/2.0/>

Figure 5:

Piero. *Harley Davidson Duo-Glide 1961*. Digital image. *Wikipedia, the Free Encyclopedia*. Wikimedia, n.d. Web. 16 Nov. 2014. <http://commons.wikimedia.org/wiki/File:Harley-Davidson_Duo_Glide_1961.jpg>.

Figure 6:

Stanley Kubrick. *Mitchell Transcriptor Hydraulic Reference Turntable*. Still image from: *A Clockwork Orange*. Dir. Stanley Kubrick. Warner Brothers, 1972. Film.

Appendices

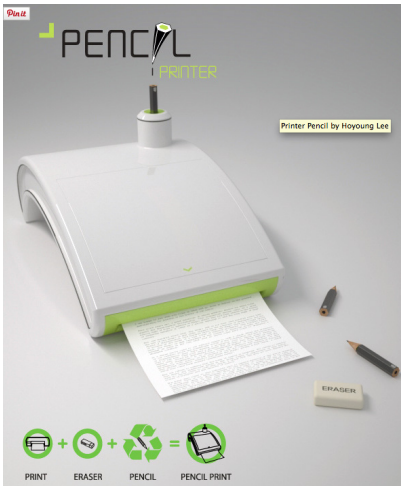
Appendix 1: Google result “beautiful printer”

Appendix 1: Google image search: beautiful printer

Appendix 2: Other approaches

http://www.wired.com/2013/08/3-clever-new-ideas-for-printers-from-samsung/#slideid-423566 Environmentally friendly to dispose of. However politically and ethically reinforcing the concept of disposability and printers. In our view a negative overall that shows how market logics often override real needs.	

Using old coffee grounds to print. Concept only. **Riti Coffee Printer** (Jeon Hwan Ju)	

Hoyoung Lee (http://www.inewidea.com/2010/02/09/21045.html) Using old pencil stubs to print, concept only.	

Hosung Jung, Junsang Kim, Seungin Lee & Yonggu Do (http://www.yankodesign.com/2011/09/29/the-art-of-solar-printing/)	

Appendix 3: Sketches