

Crafting spaces between design and futures: The case of the Agbogbloshie Makerspace Platform.

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ABSTRACT

Written as a design studies inquiry, this article employs a futures studies technique – namely causal layered analysis (CLA) – to further examine a design practice case study. CLA is used as a lens through which to analyse the ideologies and worldviews embodied in the ‘design future’ postulated by the ‘Agbogbloshie Makerspace Platform’ in Accra, Ghana. Preliminary ideas regarding a fuller exchange between the disciplines of futures studies and design studies are suggested.

Key words:

Design; Futures; Causal Layered Analysis; Agbogbloshie; systems design; co-design; Afrofuturism; Afrikology; AfriDesignX

INTRODUCTION

In 2015, a network¹ of designers, technological innovators and material culture scholars from the cities of Dakar (Senegal), Accra (Ghana), Nairobi (Kenya), Cape Town (South Africa) and London (UK) known as ‘AfriDesignX’ was established to investigate ‘Design futures in Sub-Saharan Africa’ (Leverhulme Trust Annual

¹ AfriDesignX is a Leverhulme-funded network led by Cher Potter as Principal Investigator and Mugendi K. M'Rithaa and DK Osseo-Asare as key partners and advisors.

Review, 2015, p50). This ongoing network addresses an urgent need to better understand how a 'digital revolution' combined with unprecedented city and population growth on the African continent is resulting in new typologies of design². Design projects in each of the above-mentioned cities have been studied in terms of their response to local challenges, their application of vernacular design concepts and their implications for the future of crafts and production in particular regions on the African continent. However, the nature of the various 'design futures' embodied by these designs has not been critically examined. With reference to the Agbogbloshie Makerspace Platform (AMP)³ initiated by architects DK Osseo-Asare and Dr Yasmine Abbas, this paper employs Sohail Inayatullah's Causal Layered Analysis (CLA) as a framework for analysis to unpack stories about the future that this particular design project supports.

Before describing the project, it is necessary to understand the nature of the site in which it operates – Agbogbloshie. Popularly maligned as 'Sodom and Gomorrah' by non-residents, Agbogbloshie is a 20-acre scrapyard in the city of Accra, Ghana adjacent to the Old Fadama slum community. Here, over 7000 people work in poorly-equipped and poorly-constructed workshops (Fig.1), dismantling discarded automobiles, microwave ovens, old consumer electronics and more into component parts to be resold or re-used. While it could be argued that the economic activities of the district offer a constructive alternative to the take-make-dispose extractive industrial model, they are also responsible for the production of very high levels of health-threatening pollutants. As part of the recycling of particular substances such as rubber insulation and car tyres, high levels of carbon dioxin, carbon monoxide and other pollutants are emitted (Fig.2), effecting the health of both Agbogbloshie workers and residents of the surrounding areas (Minter, 2016). Jobs within this district are therefore considered part of a troublesome and unmanageable informal sector and these unregistered enterprises remain unsupported and unregulated by the state.

To assist Agbogbloshie workers in transforming this district into a safe and semi-professionalised economic area, based on the principles of the circular economy, Osseo-Asare and Abbas aim to refine existing practices of the workers *through design*. It is important to note that AMP is not a neat and concise design project, with perfectly finished products and a clear statement of intent. Rather, it is ongoing research-based design activity embedded within a particular community, exploring alternative futures around design production and knowledge sharing within and around this locality. On a practical level, this involves the architectural

² By design we refer to 'products, services, systems and experiences planned by a human maker', a definition adapted from the World Design Organization's (WDO) established definition of industrial design. (<<http://wdo.org/about/definition/>>).

³ More information about the project can be accessed at <<https://qamp.net/>>.

planning and construction of solar-powered on-site workshops (Fig.3), skills training regarding the use of machines, establishing new processes for controlling hazardous substances and an information-sharing platform that helps workers distribute materials and working methods. On a conceptual level, it involves mapping out an alternative production and health futures for the district at large, in collaboration with workers and residents.



Figs. 1 - 2. DK Osseo-Asare and Yasmine Abbas, Agbogbloshie site - fieldwork documentation, 2014
Fig.3. DK Osseo-Asare and Yasmine Abbas, Agbogbloshie makerspace/workshop design, 2014

In its application of CLA to this particular case study, the paper aims to:

1. Offer designers and design theorists a methodology for disclosing and organising the narrative framing of their work, particularly with reference to stories about the future.
2. Offer futures studies scholars a way to interpret the design principles and constraints, construction, craft and functionality of built artefacts as integral to any 'design future' scenario;

DELINEATING DESIGN FUTURES IN RELATION TO THE CASE STUDY

The term 'design futures' as used within the above-titled AfriDesignX research network has purposefully remained open for interpretation. However for the purposes of this paper, the term deserves further delineation in the context of design and futures studies.

Design in its modern and Western formulation, with its inception tied closely to the advent of 19th Century industrialism, is often considered hand-in-hand with economic growth and industrial advancements that look towards a 'better' future. As a contemporary and critical counterpoint to this logic, a set of practices referred to as 'critical design', 'speculative design', 'design fiction' and various other

nomenclatures have emerged over the past decade. While each sub-discipline varies somewhat in its motivations, as a general connecting principle these practices challenge industrial assumptions and operate outside of commercial concerns. They attempt to do more than make products more beautiful or processes more efficient. According to Tony Dunne and Fiona Raby, pioneers of the approach, practitioners who choose this pathway make artefacts that are designed to pose problems and ask us to imagine the future in a very different way (Dunne and Raby, 2013).

Designers Stephanie and Bruce Tharp offer the umbrella term 'discursive design' to describe these interrelated practices whose products function primarily to "raise awareness and perhaps understanding of substantive and often debatable issues" (Tharp and Tharp, 2013, p407). This latter approach to design lends itself to application within the field of futures studies, where future scenarios are developed in order to enlighten and raise debate on the possibilities we face as individuals, organizations, nations or worlds. Stuart Candy and Jake Dunagan's 'experiential futures' (XF) model emerges out of the field of futures studies and aims to manifest and embody designated future scenarios through the use of physical media. According to Candy, XF involves 'the design of situations and stuff from the future to catalyze insight and change' (Candy, 2018, p235). It may be argued, that to an even greater extent than is the case in discursive design practice, the craft, functionality, scalability and problem-solving aspects of the design artefacts themselves are secondary to the possible worlds the objects represent. Dunagan re-iterates this idea in his contribution to this particular special issue:

An important point that can be lost ... is that the artefacts and the experience is not the 'work'. The actual work and rationale for the method is that it will lead to better futures thinking, better decision-making and strategy, and ultimately, more preferred futures. (Dunagan, 2018).

While not commonly used for futures studies purposes, Bruce Sterling's diagram of 'Anticonventional objects' (Sterling, 2013) may help to characterize the unconventional design space that both experiential futurists and discursive designers are interested in with regards to their pursuit to expand our thinking around future possibilities. The diagram (Fig.4) shows conventional objects at the intersection of what is desirable, buildable and profitable, while anticonventional objects operate on the outer periphery of these commercial design standards. The latter are associated with ideas of the speculative, the illicit, the discarded, the magical - they are objects of possibility rather than probability. This 'shift in design from 'What's the problem?' to 'What's possible?'" was also the maxim for Kenyan-born designer Mugendi M'Rithaa during his presidency of the World Design Organization (2015 - 2017). As a spokesman for industrial design, he promotes a

move away from consumer demands towards the utilization of 'design as a catalyst for positive change' (M'Rithaa, 2018).

However, for M'Rithaa, functionality and scalability remain key design principles within majority world contexts (or [industrially] developing economies) and their respective communities. He actively rejects the above distinction between problem-solving and broad-based speculation - a sentiment mirrored by Alioune Sall, Director of the African Futures Institute. 'The future does not come by itself but has to be met and the conditions for its hatching have to be created' (Sall, 2003, p11). These conditions Sall refers to are the capacity to imaginatively explore long-term African futures without 'submitting to the dictatorship of urgencies and [...] hardships' (ibid.), alongside a deep consideration for how society is organized, how it produces and how it functions. As we shall learn in the analysis that follows, the present case study troubles the binary suggested by the 'anticonventional objects' diagram which assumes a separation between speculative and industrial or commercial praxis. Rather, it implies a 'both and' approach that invites us to explore the intersections of functionality and discursive provocation in a real-world project. Thus, the term design futures used in the context of this particular case study does not align to particular sub-divisions in design practice, but rather aims to encapsulate aspects of each.

CAUSAL LAYERED ANALYSIS APPLIED TO DESIGN PRACTICE

The use of Causal layered analysis within futures studies is 'not in predicting the future, but in creating transformative spaces for the creation of alternative futures' (Inayatullah, 1998, p815). The rationale behind this approach is that any future scenario developed by an individual or institution is underpinned by conscious and unconscious assumptions about the way the world works (or should work). Inayatullah argues that these assumptions need to be brought to light in order to fully understand the nature and implications of the future realities being proposed.

CLA offers an appropriate framework for the project in that it offers potential to illuminate the polyvalent situatedness of design production - as a process which simultaneously engages a bounded set of spaces, stakeholders and scenarios together with and in opposition to an open-ended terrain of alternate realities across space-time. The distinctive layered approach of the CLA technique when applied to a design artefact or system offers a neat structuring device through which it reveals to the reader the complex relationship between litany, systems,

design response, discourse/worldview and communal myth/metaphor. The approach involves analysis across four levels⁴:

1. *Litany* – popular, media-driven understandings of an issue;
2. *System* – critical understandings of the issue generated by academic research relating to social, structural and systemic realities;
3. *Worldview* – civilizational assumptions that underpin the issue; and
4. *Myth / metaphor* – archetypes, mythologies and proverbial truths that lend meaning to the issue.

The paragraphs that follow employ these four layers of analysis as a way to interpret the case study and the stories it tells about possible futures.

LITANY

In 2014, Agbogbloshie was described by media outlets from the Guardian to Al Jazeera as the world's largest e-waste dump (Guardian, 27 February 2014; Aljazeera, 1 January 2014), a 'hellscape' (Wired, 23 April 2015) where the developed world's discarded electronic and electrical devices 'go to die' (ibid.). This litany has been perpetuated by images which circulated online news sites such as New York Times under the heading 'A Global Graveyard for Dead Computers in Ghana' (nytimes.com, 4 August 2010) or Dazed Digital under the title 'Digital Wasteland' (dazeddigital.com, unknown.), portraying young men in an extreme environment burning cables and wires to collect copper. In October 2018, a Google internet search of 'Agbogbloshie'⁵ revealed top ranked news stories that included an article on the untapped potential of African landfills (United Nations News and Stories, 24 September 2018) and on Agbogbloshie as an 'urban mine' around which design innovation is being generated (Penn State News, 20 October 2018).

Given the mediation of the site in 2014, a typical reading of the 'issue' may have delimited the problem in rather a narrow sense, triangulating e-waste, environmental pollution and disenfranchised African people burning old electronics in a toxic/exotic (foreign) landscape. The subsequent changed narrative is in part due to recent academic and UN-sponsored research⁶ that has challenged

⁴ This particular translation of the CLA model is adapted from the text 'Transcendence of a method: the story of causal layered analysis' authored by Jose Ramos.

⁵ As retrieved on 20 October 2018, by entering the search term 'Agbogbloshie' and selecting the news tab - https://www.google.co.uk/search?q=agbogbloshie&safe=strict&source=lnms&tbn=nws&sa=X&ved=0ahUKEwjzdf65pLeAhXTNcAKHQhFDIIQ_AUIECgD&biw=1252&bih=685

⁶ See geographer Josh Lepawsky's writings on Agbogbloshie and the misconceptions around 'geographies of discards' as well as the Basil Convention reports on e-waste in Africa as examples.

exaggerated news media and shown the problem of electronics importation to be far more complex than headlines depict, with much of the waste generated within the region itself. Another factor that has impacted the narrative is Osseo-Asare and Abbas' design initiative the 'The Agbogbloshie Makerspace Platform' (AMP) begun in 2012. These designers argue publicly that to view Agbogbloshie as a dumpsite is a failure to recognise the extensive and elaborate systems of manufacture operating in and around the site - systems that entail maker communities engaged in recycling, repairing, reconstituting and inventing products using discarded components (Figs.5 - 7).

Ironically, despite Osseo-Asare and Abbas' vehement rejection of the hellscape narrative around Agbogbloshie, it was precisely this kind of narrative that has fuelled public interest in AMP.

The images of young Africans crudely burning the innards of old electronics to make a few bucks was so shocking to people in the West, and so burnt into the global imaginary, that the counter-narrative – that young people in and around these same spaces can be and already are 'makers' – surprised people. When this more hopeful message was obliquely linked to ideas of social entrepreneurship, it became even more appealing to international audiences (Osseo-Asare, personal communication, 2019).

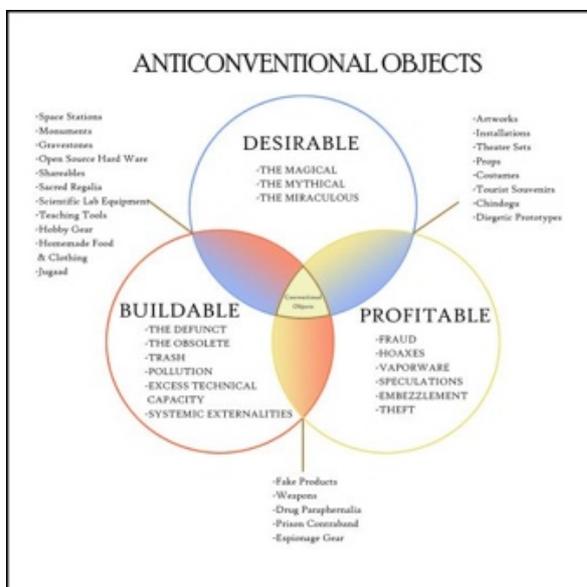


Fig.4. Bruce Sterling, 'Anticonventional Objects' diagram, 2013



Figs.5 - 7. DK Osseo-Asare and Yasmine Abbas, scrap organisation and metal smelting activities - fieldwork documentation, 2014

SYSTEM

In situating Agbogbloshie within broader systems, we encounter problematics related to economic, environmental and socio-cultural factors. Firstly, misunderstanding around informal production and commercial sectors have resulted in the existing ecosystem of recycling, repair and manufacture receiving little governmental support. Secondly, environmental factors related to hazardous wastes and their handling and disposal have not been adequately communicated to Agbogbloshie workers. Finally, in order for Agbogbloshie workers to better thrive in their professions, technical know-how and recognised standards of practice need to be addressed.

For Osseo-Asare and Abbas, the design response called for methodological approaches that prioritise user-oriented systems modelling (systems design), participation among different interest groups (co-design) and methods that ensure safety and product/system/process repeatability (engineering skills and standards).

SYSTEMS ARCHITECTURE

Osseo-Asare notes that despite various government efforts to sanitise and restore the area, the perspectives of the recyclers, makers and inhabitants based at the site have rarely been taken into account with regards to envisioning Agbogbloshie's future (Covertruth.com, 3 April 2017). In fact, government restoration efforts have been largely disputed by local inhabitants who would be required to leave the area in order for these plans to be implemented (Safo, 2002). In order to better understand the production and commercial system at Agbogbloshie and the lives of the community inhabitants, Abbas and Osseo-Asare conducted interviews with approximately 700 individuals - roughly 10% of people working in the site. Interviewees included amongst others plastics recyclers, copper extractors, metal workers, computer repairers and refurbishers. In accordance with Mark Maier in 'The Art of Systems Architecting (2010)', the focus of these interviews was to better

understand the activities and ambitions of the people who live and work on the site. "A systems approach is one that focuses on the system as a whole, specifically linking what is desired with what is feasible.... grounded in the user's purpose." (Rechtin and Maier, 2010, p8).

From this, we were able to recognise that making is a spectrum, which goes from unmaking and remaking to making anew. We worked with makers to spatially map the work areas to understand where different activities happen - where workshops are located, where disassembly takes place, where scrap is stored... We collected data (Fig.8) about the waste stream and modelled these flows all the way from the import of products, their reuse, their recycling and ultimately to their export (Osseo-Asare, personal communication, 2018).

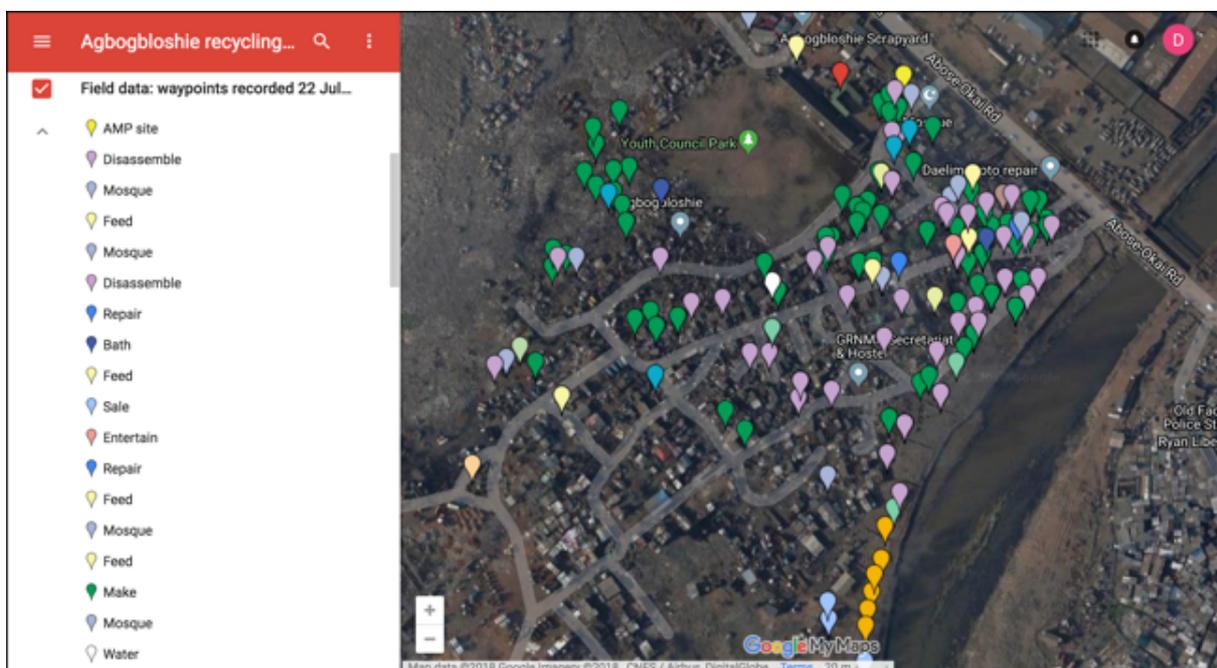


Fig.8. DK Osseo-Asare and Yasmine Abbas, Agbogbloshie recycling and maker ecosystem - fieldwork documentation, 2014

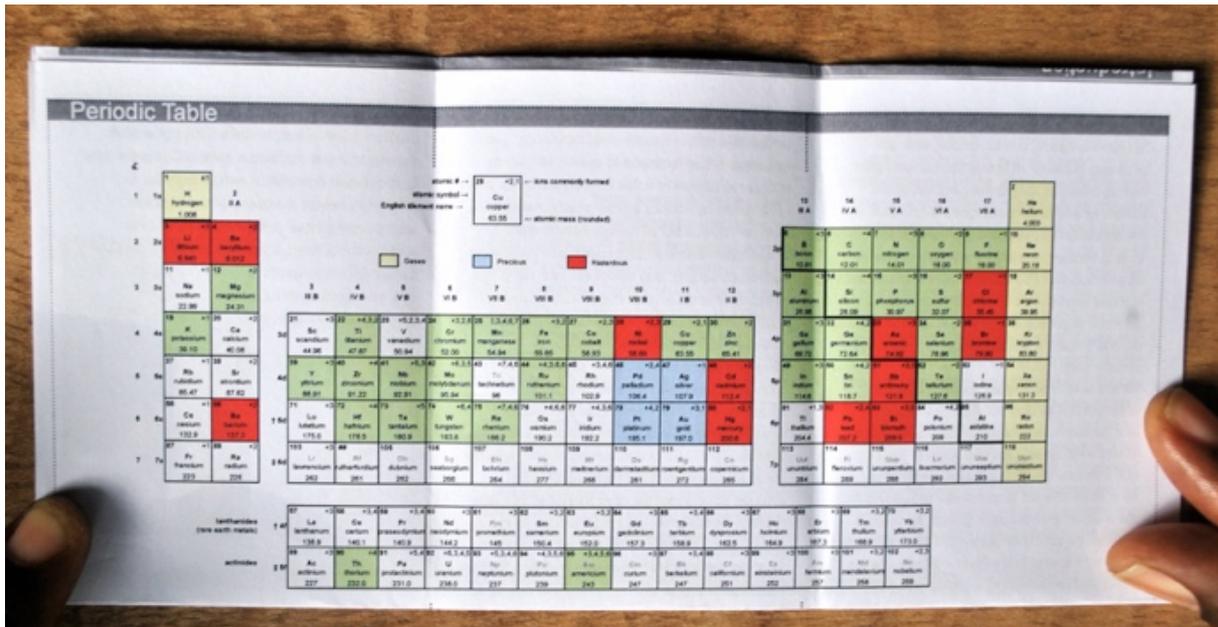


Fig.9. Ivy Asuo, Agbogbloshie distribution of materials in 3E stream, 2014

CO-DESIGN WORKSHOPS

Following these interviews, the 'AMP Makers Collective' was established with participation to date of over 750 grassroots makers and scrap dealers from Agbogbloshie and Accra's informal sector, alongside more than 750 students, recent graduates, young professionals and researchers working across STEAM fields of science, technology, engineering, arts and mathematics. Members of this collective conducted a series of workshops with community leaders, public health experts and environmental experts in order to better understand the nature of the materials being handled (Fig.9) and the environmental hazards they produced. This transdisciplinary and participatory approach to design-led research is based on the understanding that 'changes in the socio-technical systems of complex organisations are driven by co-design processes in which citizens and designers play a meaningful role' (Manzini, 2011, p199). Here, the designer adopts 'the role of mediator (among different interests) and facilitator (of other participants' ideas and initiatives) but involves more competences ... in terms of creativity and design knowledge' (Manzini, p200). These competencies include the ability to select from distinct design approaches and to conceive and realize artefacts that manifest participants' views.

In this case, the research findings were translated into plans for three design components that function together as AMP. These components are designed to assist grassroots makers to gather the resources and tools that they need for their specific area of production, to learn through shared practice and to produce better quality items in larger quantities. Firstly, a makerspace kiosk - this is a modular construction system that is mobile and expandable, featuring two prefabricated light-gauge steel semi-octet truss frames with bifold hangar doors installed on

recycled tire foundation pads (Figs.10 – 11). The structure can be assembled, disassembled and reassembled in situ and as needed. This micro-architecture is designed to be constructed using tools and material readily available at the site and can be plugged into pre-existing spaces of manufacture. Secondly, maker toolkits – these are customizable for a given community's requirements, to support what makers want to make. Finally, a mobile app for Android, that amplifies makers' capacity for making and trading through information-sharing. The app is designed to establish a digital network linking recycling with digital fabrication and distributed manufacturing, as well as providing people with a better understanding of the hazards of certain materials.

ENGINEERING SKILLS AND STANDARDS

The initial stage of prototyping involved finding the appropriate materials at Agbogboshie and building the tooling, jigs, rigs, templates and fixtures that enabled people working in the site to make the prefabricated steel truss elements of the kiosk within their existing work spaces (Fig.12). A set of toolkits or 'standards' were established following workshops in bench skills, metal and machine processes, fabrication and thermal joining techniques. The construction of the kiosk itself was tested under the constraint that it should ultimately require two people and four hours to assemble or disassemble a single module by hand.

The toolkits went through many iterations in order to rethink and understand how people were making things – and how some of these processes could be improved and retooled. It is important to understand that young men working in these kinds of informal grassroots spaces, are learning largely through apprenticeship. They learn in a heuristic way – by doing, by making actual things – which can be radically different from how textbooks of engineering or architecture describe processes of construction (Osseo-Asare, personal communication, 2018)

The structural frame includes allowances for solar-powered electricity generation, water collection and water filtration; a prefab floor structure; and a hydroponic wall system. The internal toolkits, which are still in the process of being researched and developed involve work benches and a ceiling-mounted CNC robot (Fig.13). The self-contained, mobile and modular nature of the structure borrows design principles from both robotic spacecraft and human space stations. This led to the designers referring to the kiosks as 'spacecraft'. However, the concept of 'spacecrafting' has subsequently been developed – Abbas and Osseo-Asare now employ the concept of 'spacecrafting' to refer to a knowledge regarding how to craft what you want or need out of your space (environment). The notion of crafting – that is the activity of making well by hand – becomes in this context, 'a place where space is crafted across physical, virtual, augmented and digital realities' (<https://qamp.net/spacecraft/>).



Figs.10 - 12. Agbogbloshie Makerspace Platform in situ construction, 2014



Fig/13. AMP CNC tooling prototype, 2014

THE DISCOURSE AND WORLDVIEW

In order to envision alternative futures, CLA offers a way in which to investigate how the discourses we use to understand the idea may be complicit in our framing of the issue (Inayatullah, 2004, p17).

AFROFUTURISM

Given the project's focus on African innovation and its overt references to interstellar exploration, it has been described within the 'design world' as operating within the Afrofuturist cultural tradition (Dezeen, 16 May 2016). This characterization is challenged by its designers who point out that Afrofuturism—as first introduced by Mark Dery in his classic text 'Black to the Future: Afro-Futurism 1.0' – is originally an emergent approach pioneered in the USA by artists such as the sci-fi novelist Ralph Ellison and the jazz musician Sun Ra. It offers an enabling environment for African-Americans to liberate themselves from Euro-American control of time and space, and thus overlaps with American notions of Afrocentrism. Complexifying this re-presentation of a diasporan future of the African continent that is philosophically and technologically transcendent, Kodwo Eshun points out in his essay 'Further Considerations of Afrofuturism' that Afrofuturism is an activist approach that offers counter or alternative future

scenarios that centralize Africans as a way to reorient attitudes towards Africa in the present (Eshun, 2003, p292).

Contentiously, the South African media artist Tegan Bristow distances the Afrofuturist approach from any direct African territorialisation, writing that “Afrofuturism has nothing to do with Africa, and everything to do with cyberculture in the West” (Bristow, 2012, p25). To some extent, this stance is supported by Osseo-Asare and Abbas who take issue with Afrofuturism representing a glossy techno-aesthetic of pure fiction where the allure of exciting futuristic visions out of Africa coincide with non-functioning technologies that can never be real(ized) in Africa. They contend that both African and non-African actors actively adopt and seek to reinvent Afrofuturism (as a tactic to acquire resource, exposure and opportunity, on one hand, and as a strategy of wealth creation through mass commercialization, on the other hand) as something African-generated.

International audiences embrace Afrofuturist visions like those portrayed in Black Panther that take place in fictional countries such as Wakanda. However, when these African futures are depicted as being part of global geopolitical realities and every day existences, they are often less compelling (Osseo-Asare, personal communication, 2018).

The primary concern for Osseo-Asare and Abbas is not whether Afrofuturism centralizes Africans or decentralizes global narratives, but rather how to instrumentalize it as a practice of equitable future-making. Afrofuturist and futures studies scholar Dr Lonny Brookes⁷ goes some way to address this disconnect between fictional futures and real-world experience in his concept of ‘futuretypes’. The term is a play on the concept of prototypes and refers to the emergent samples or early models of futures that can be identified within a given community. To capture futuretypes, he suggests using ethnographic research to map the everyday routines, daily movements, embodied experience and future imaginings of a group of people and use these as a basis for speculating what forms of digital design might be most useful to this particular group (Brookes, 2017, p1766). While Brookes’ research operates within diasporic communities in the USA, it is applicable here in that he collapses fiction and reality, not only to be psychologically emancipatory, but also to inform design practice and R&D of real technology.

‘MAKER’-ORIENTED FUTURES

⁷ Dr Brooks is a contributing author to the recently published ‘Afrofuturism 2.0: The Rise of Astro blackness’ (2016) as well as a co-editor on an upcoming special issue of the Journal of Futures Studies titled ‘When is Wakanda? Afrofuturism and Dark Speculative Futurity’ (2019).

The title of the project as assigned by Osseo-Asare and Abbas implies a conscious framing of the Agbogbloshie *Makerspace* Platform in terms of 21st Century maker culture. The proposition of this global cultural movement as espoused by Science fiction writer and technology activist Cory Doctorow in his book 'Makers' (2010) is as follows: Technology enables makers to network like never before and provides the tools - cognitive, social and physical - that allows them to share ideas to improve and build on their inventions. In accordance with this proposition, AMP aims to fuse digital and physical processes of production offering both a digital platform that enables information-sharing between Agbogbloshie makers and those further afield, as well as an open construction system that serves as an architecture for hosting physical spaces of making within Agbogbloshie. We might relate this to the 'Mixed Responses' approach⁸ suggested by DfD (design for development) educator James Fathers (2004) who emphasises the centrality of information technology and industrialisation to any design project aimed at improving well-being.

The maker movement's fundamental assumptions of sharing and equity are challenged by science educators Angela Barton and Edna Tan. They point out that the main pillars that underpin maker culture - *making* as a set of activities, *makerspaces* or *fab labs* as communities of practice, and *makers* as identities - have a white, middle-class bias (Barton and Tan, 2015). They impel us to ask: who is able to call themselves a 'maker' and what activities constitute 'making' - that is, who are the assumed members of this particular culture club? In this regard, Osseo-Asare insists, "practices such as [those] at the Agbogbloshie site have always been in the realm of making, hacking and repair, even before the so-called 'maker movement' was established... To frame the maker culture as foreign [in the Agbogbloshie context] is highly problematic and exacerbates the belief that solutions come from outside of Africa. There are already makerspaces in Ghana.... let's see them as makerspaces and bring them into the discourse." AMP then, instrumentalizes maker-ism in order to operate as part of an international network, but simultaneously positions Agbogbloshie makers as pre-emptive to the movement itself.

If AMP originates with the understanding that Africans are already 'makers', there is a tension that underpins this notion. On the one hand, technology scholars such as Ron Eglash point out that "Fixer practices are quite prevalent on the African continent due to economic necessity: the expense of new devices, the paucity of products or replacement parts, and the need for means of employment" (Eglash, 2014, p128). Anna Waldman-Brown et al. in the paper 'Fabbing for Africa's

⁸ According to Fathers, this marks the third wave in DfD, following post WW2 'Reconstruction' (1940s - 1960's) and 'Appropriate Technology'/'Design for Need' (1970s - 1980's) which offered new visions for international aid intervention.

Informal Sector' (2014) opens with the statement "To manufacture anything in Sub-Saharan Africa (SSA) requires the same creative 'maker' sensibility that is valued throughout the fab lab community" (Waldman-Brown et al., 2014, p1). On the other hand, it is important to note that the AMP spacecraft aims to *upgrade* makers' capabilities to produce designs of quality through workspaces, technologies and skillsets associated with maker culture. The authors of this paper alongside the designers of AMP argue that despite a global media celebration of Africa's necessity-driven ad hoc 'hacked' innovation, maker capacity on the African continent is constrained rather than facilitated by a focus on makeshift solutions and *ultra*-low-cost delivery.

An aspect of maker culture that AMP actively aligns itself with is the notion of informality. AMP's distributed informal solutions stands in opposition to a top-down model currently being proposed for Agbogboshie, which is based around a large centralized factory supported by a German development agency GIZ. This mechanised 'formal' solution seeks to monetize e-scrap as a large-scale profit-making operation that consolidates wealth for the benefit of owners and shareholders, done in concert with government policy. While this proposal promises improved health and working conditions, it assumes control of production and circulation within Agbogboshie (giz.de, 2016). Informality is, as in the case of hacker culture, of which global maker culture is an offshoot or allied force, a defiant insistence that human beings should retain the right to remake the world themselves, without externalized systems of control.

AFRIKOLOGICAL FUTURES

The AMP represents an engagement with indigenous R&D and a commitment to the idea that problems on the African continent are better tackled using transdisciplinary, co-design methods that prioritise local stakeholders and African design solutions. In his book 'Afrikology and Transdisciplinarity: A Restorative Epistemology' (2012), the Ugandan development specialist Dani Wadada Nabudere offers an epistemology of restorative rights on the African continent anchored in a strategy of transdisciplinary⁹ African problem-solving. When viewed in the context of design aimed at improving human well-being and meeting basic needs, the philosophy seems to call for a three-pronged approach: (a) a research strategy that crosses many disciplinary boundaries and community perspectives; (b) the development of design responses that reposition African culture and collectivism as a key tool in solving current social challenges and (c) an acknowledgement that the academic world has been built on a Western premise

⁹ It should be noted that 'transdisciplinary design' is also a recognized approach to design, which emphasizes 'collaborative design-led research and a systems-oriented approach to social innovation...' in which designers 'work in cross-disciplinary teams' (<https://www.newschool.edu/parsons/mfa-transdisciplinary-design/>)

that has mapped the world into categories of first, second and third; and an active rejection of this.

Nabudere advocates 'doing justice to communities' capabilities to reflect and act without losing sight of the structural circumstances that enable and at times constrain them. It is about people's strength' (Wanda, 2013, p23). This alignment with 'capability' and 'strength' rather than 'need' marks a notable departure from the lexicon of well-meaning 20th Century 'Design for Need' movements, which emphasise the designer as "a 'seed project' helping to form a corps of able designers out of the indigenous population of a country... firmly committed to their own cultural heritage...and their own needs" (Papanek, 1972, p95).

AMP then, aims to put forward an Afrikological, maker-oriented futures model rather than an Afrofuturist one, prioritising African-produced futures that enhance existing community capabilities. The proposed 'production future' manifested in AMP is less about bringing Makerbots and Arduinos into use and more about supporting the long-standing fixing and making traditions already established in Ghana. Blacksmithing and pot-fabrication collectives, wire recyclers, television repairers and others within Agbogbloshie intersect with international developments in innovation to challenge both local and international top-down socio-political solutions. In challenging discourses around African futures, Osseo-Asare and Abbas present spacecraft that function not as interstellar modules, but as terrestrial workshops made from local and international upcycled e-waste that support design research with grassroots makers to produce consumer goods.

MYTH / METAPHOR

The design problem being addressed in AMP is two-fold and interdependent: (a) Agbogbloshie is both misrepresented and misunderstood as a dysfunctional and uninhabitable site outside of its local community and as such (b) makers that operate within Agbogbloshie are marginalised and lack the support to further develop their skills, tools and trades so as to amplify their reputation as makers. While the latter is addressed through a combination of in-situ design processes; the latter involves outward-facing storytelling tactics for international audiences of the project. In response to the media representations of Agbogbloshie as a 'hellscape', 'graveyard' or 'wasteland', Osseo-Asare and Abbas consciously borrow craft and scientific metaphors associated with globally-recognised maker culture and space exploration to describe the project. In doing so, their project "combine(s) instrumental functions for the user, with communication to audiences" (Borland, 2011).

According to the project website qamp.net:

AMP spacecraft is an alternative architecture *for making*.

Small-scale, mobile, incremental, low-cost and open-source, spacecraft operate as a set of tools and equipment to *craft space* in different ways, enabling makers with limited means to jointly navigate and terraform their environment (qamp.net).

Their metaphorical strategy offers a revised perspective through the use of incongruity (Fernandez, 1986, 10), where the perceived contradictions between poverty and waste materials on the one hand, and exploratory capacity and high-tech tools on the other, provides a way to capture interest.

DISCUSSION: CLA IN RELATION TO EXISTING 'READINGS' OF DESIGN

It could be argued that design(s) – from architecture and urbanism to product and beyond – are most frequently evaluated by the industry on two primary levels, that of functionality and construction. Here, functionality relates not only to the degree to which a product fulfills its mechanical purpose, but whether the design meets the needs of the intended user; while construction relates to the materials and processes used to craft the artefact. This crude simplification appears to do little justice to principles reflectively laid out by adherents to particular approaches, such as industrial design (Rams, 2012), co-design (Manzini, 2011) or systems design (Rechtin and Maier, 2010). However, the authors would argue that underlying all such principles, notions of functionality and construction remain implicit. Even in the case of speculative design which is often geared towards an audience rather than a user, artefacts *function* to generate ideas outside the boundaries of what is deemed likely and are *constructed* according to recognised techniques in craft and design practice – and are evaluated as such. “Success occurs when an idea has been developed [in design terms] to a point that an audience can engage with it” (Ebrahim, Hastrich, unknown).

To the extent which CLA presents a method for deconstructing and reconstructing alternative futures –not assessing an individual project circumscribed by prescriptive design requirements nor speculative propositions conceived entirely to provoke– designers can gain a deeper and more expansive model for conceptualizing both the impact and design intent of their activities. For the designers of AMP then, CLA suggests a counter-mode of comparison with/in relation to both vertical and horizontal systems of valuation that reaches beyond conventional frameworks for analysing design(s) which tend to rely on metrics of

assessment. That is to say, as per above, that design(ers) too often become preoccupied with questions of functionality –“Does it work?”– at the expense of probing deeper and wider to determine –and articulate– the contextualised meta-project of any given design challenge.

In the case of design history and critical design theory, methods of analysis might include any number of humanities-based lenses including post-colonial studies, heritage studies, social history, structuralism, post-structuralism – the possibilities being far too exhaustive to deal with adequately in this paper. CLA’s novelty in these contexts, is not its constitutive discourses of poststructuralism, macrohistory and postcolonial multicultural theories (Inayatullah, unknown, p1) in and of themselves; rather it is the way in which CLA acts as an ordering device for these theories with the aim of deepening stories about the future. Using the model of litany deconstruction/consideration of the issue within broader systems/examination of underlying cultural narratives/metaphoric analysis offers a manageable set of steps by which to investigate a designed artefact. Considered in reverse order, CLA reveals to the designer, design historian or design theorist the ways in which metaphor, worldviews, systems and litany *cause* particular design solutions to emerge.

CONCLUSION

If CLA is understood ‘not [as] a statement about the future, but a method for analyzing statements or images about the future’ (Ramos, 2015, p25), then its application to examples of design practice seems appropriate. An interpretation of the layers in relation to statements and images of the AMP design project, might offer the following levels of analysis:

1. *Litany* – dystopian media representations of exotic bodies in toxic environments versus techno-Utopian visions of Agbogbloshie as a large-scale innovation hub.
2. *System* – charting of design process including: mapping of materials and production ecosystems on the Agbogbloshie site through activities of recycling, repair and making anew; documentation of workshopping and skill-sharing; physical prototypes of AMP spacecraft
3. *Discourse and worldview* – imposed narratives of Afrofuturism by design media; self-assigned narratives of maker-oriented futures and revised DfD models by AMP designers; new narratives of Afrikological futures explored by authors.
4. *Myth/metaphor* – AMP publicity materials’ use of craft and scientific metaphors associated with maker culture and space exploration to subvert dystopian litany around Agbogbloshie.

Seen through the lens of CLA, the objective of AMP is the physical and metaphorical transformation of the Agbogbloshie site from a dysfunctional site of subsistence on waste to a site of creativity and productivity. Ultimately, AMP has a vision of African-produced futures¹⁰ and employs a model of Africa-based innovation to achieve this. The design response thus calls for approaches that prioritise supporting user-oriented ecosystems, participation among different interest groups both locally and internationally and methods that ensure safety and product/system/process repeatability. Methodologies used within these approaches include systems mapping (systems design), workshops (co-design), designer toolkit development and collaborative construction of prototypes (engineering crafts and standards).

This vision of an African-produced future(s) is supported by metaphors of makerspaces and spacecraft, where makerspaces correlate to ideas of contemporary design practice, collective activism and self-determination; and spacecraft are associated with cutting edge technology, mobile architectures and alternative worlds. Aside from re-enforcing the underpinning ideologies of AMP as they connect to maker culture, these metaphors also produce unintended connections with Afrofuturist tropes of gleaming space-age aesthetics and fictional technologies. In writing this paper, the authors were invited to consider how each of these future-facing worldviews provided a particular story of the future connected to the project. An engagement with CLA invited us to posit a broader and deeper framework for both AMP and African futures - that of the Afrikological, maker-oriented future.

For futures studies scholars, especially those interested in the intersections of futures studies and design practice - the application of CLA to design may well have been previously encountered. Futurists Stuart Candy and Jake Dunagan have been using Causal Layered Analysis as scaffolding for undergraduate students at Carnegie Mellon School of Design to learn how to inquire into and 'read' design artefacts and query the makers of them (Candy, personal communication, 2018). Futurist Peter Saul has employed CLA within commercial product environments as a means of co-producing preferable futures and then evaluating new product concepts in relation to these scenarios (Saul, 2002). Designers Santini Basra and Chris Strachan of Odd Studio have produced a set of playful design tasks and tools that can be used to 'workshop' CLA's levels of analysis with the aim of producing a preferred future complete with design prototypes (jfsdigital.com, 6 October 2016).

¹⁰ By 'Africa', Osseo-Asare and Abbas are referring the continent of Africa as opposed to a delineation of Sub Saharan Africa.

However, in all of these examples, the design object itself remains either symbolic, conceptual or playful. The authors of this paper argue that the design process and principles of built artefacts - that is, the precise constraints, construction, craft and functionality of artefacts - offer integral insights into the ideology that underpins any 'design future' scenario. This integration of the technique of CLA and the process of designing artefacts thereby offers a broader 'reading' of the physical construction of futures.

"But, as I have tried to develop, it is this futuring that can aid in problematizing present structures and grammars, and thus create the possibility not of a recovery of the past, but of the creation of new discourses, new *constructions* of the real"
(Inayatullah, 2004, p133).

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REFERENCES

- Aljazeera. (1 January 2014). *Ghana's E-waste Magnet*. Retrieved on 11 August 2018 at <https://www.aljazeera.com/indepth/inpictures/2014/01/pictures-ghana-e-waste-mecca-2014130104740975223.html>
- Barton, A. C., & Tan, E. (2015). *Designing Equity-Oriented Makerspaces Part I: Interrogating the Equity Challenges in the Maker Movement*. Retrieved on 22 December 2018 at <https://edwp.educ.msu.edu/green-and-write/2015/designing-equity-oriented-makerspaces-part-i-interrogating-the-equity-challenges-in-the-maker-movement/>

- Borland, R. (2011). *Objects in Development*. Unpublished PhD. Retrieved on 20 December 2018 at <https://objectsindevelopment.net/author/ralph-borland/>
- Bristow, T. (2012). 'We want the funk: What is Afrofuturism to the situation of digital arts in Africa?'. *Technoetic Arts*, 10(1), pp.25-32.
- Brooks, L. A., & Saveri, A. (1 January 2017). 'Expanding Imagined Affordance with Futuretypes: Challenging Algorithmic Power with Collective 2040 Imagination'. In *Proceedings of the 50th Hawaii International Conference on System Sciences*.
- Candy, S. and Dunagan, J. (2017). 'Designing an experiential scenario: the people who vanished'. *Futures*, 86, pp.136-153.
- Candy, S., 2018. 'Gaming futures literacy: The Thing from The Future'. *Transforming the Future (Open Access)* (pp. 257-270). Routledge.
- Covert Truth. (3 April 2017). *Agbogbloshie: Toxic Waste Dump?* Retrieved on 11 August 2018 at <http://www.coverttruth.com/posts/abbogbloshie-toxic-waste-dump>
- Dazed Digital. (unknown). *Agbogbloshie: Digital Wasteland*. Retrieved on 11 August 2018 at <http://www.dazeddigital.com/photography/gallery/17500/3/agbogbloshie-digital-wasteland>
- Dezeen. (6 May 2016). *Agbogbloshie Makerspace Platform creates mobile workshops for world's largest e-waste dump*. Retrieved on 11 August 2018 at <https://www.dezeen.com/2016/05/16/agbogbloshie-e-waste-dump-makerspace-platform-spacecraft-mobile-architecture-workshop-ghana-julien-lanoo-photography/>
- Doctorow, C. (2009). *Makers*. Macmillan.
- Dunagan, J. et al. (2018). 'Strategic Foresight Studio: A First-Hand Account of an Experiential Futures Course'. Special issue of the *Journal of Futures Studies*, Dec 2018. p(tbc)
- Dunne, A. and Raby, F. (2013). *Speculative everything: design, fiction, and social dreaming*. MIT press.

- Ebrahim, Z and Hastrich, C. (unknown). *Design Fiction*. Retrieved on 20 October 2018 at <http://designresearchtechniques.com/casestudies/design-fiction/>
- Eglash, R., & Foster, E. K. (2014). On the Politics of Generative Justice: African Traditions and Maker Communities. *What Do Science, Technology, and Innovation Mean from Africa*. MIT Press.
- Eshun, K. (2003). 'Further considerations of Afrofuturism'. *CR: The New Centennial Review*, 3(2), pp.287-302.
- Fathers, J. (2004). The role of design in development since 1945. *Proceedings of The Gregynog Development Colloquium*, Powys, Wales.
- Fernandez, J. W. (1986). *Persuasions and performances: The play of tropes in culture*: Indiana University Press.
- GIZ, (2016). 'Environmentally Sound Disposal and Recycling of E-waste in Ghana (E-Waste project)'. Retrieved on 15 January 2019 at <https://www.giz.de/en/worldwide/63039.html>
- Guardian. (27 February 2014). *Agbogbloshie: the world's largest e-waste dump*. Retrieved on 11 August 2018 at <https://www.theguardian.com/environment/gallery/2014/feb/27/agbogbloshie-worlds-largest-e-waste-dump-in-pictures>
- Inayatullah, S. (1998). 'Causal layered analysis: Poststructuralism as method'. *Futures*, 30(8), pp.815-829.
- Inayatullah, S. (2004). *The causal layered analysis (CLA) reader: Theory and Case Studies of an Integrative and Transformative Methodology*.
- Inayatullah, S. (unknown). CLA Defined. Retrieved on 6 July 2018 at <http://www.metafuture.org/cla%20papers/Inayatullah%20CLA%20defined.pdf>
- Journal of Futures Studies - jfsdigital.com. (6 October 2016). *Odd Studio's Cultureberg: Causal Layered Analysis meets Design*. Retrieved on 20 October 2018 at <https://jfsdigital.org/2016/10/06/odd-studios-cultureberg-causal-layered-analysis-meets-design/>
- Leverhulme Trust, Annual Review 2015. (2015) *Design Futures in Sub-Saharan Africa*. Retrieved on 11 August 2018 at

<https://www.leverhulme.ac.uk/sites/default/files/Publications/LEVERHULME%20AR15%20LO-RES.pdf>

- Manzini, E., & Rizzo, F. (2011). 'Small projects/large changes: Participatory design as an open participated process'. *CoDesign*, 7(3-4), 199-215.
- Minter, A. (2016). 'The Burning Truth Behind an E-Waste Dump in Africa' at *Smithsonian.com*. Retrieved on 16 January 2018 at <https://www.smithsonianmag.com/science-nature/burning-truth-behind-e-waste-dump-africa-180957597/#WzswtUIBi6ElpTbB.99>
- M'Rithaa, M. (5 March 2018). *Socially Conscious Design: A key strategy for addressing expansive issues encompassing the social, geo-political, economic and environmental on the African continent*. A keynote presentation on behalf of AfriDesignX at the LCF Research Fortnight conference 2018, London, U.K.
- Nabudere, D.A. (2011). *Afrikology, Philosophy and Wholeness: An Epistemology*. Pretoria: Africa Institute of South Africa.
- New York Times. (4 August 2010). *A Global Graveyard for Dead Computers in Ghana*. Retrieved on 11 August 2018 at <https://www.nytimes.com/slideshow/2010/08/04/magazine/20100815-dump/s/20100815-dump-slide-TTVC.html>
- Osseo-Asare, DK. (18 May 2018). *Agbogbloshie Makerspace Platform (AMP): The Future of Making*. A paper in the proceedings of the 5th AfriDesignX Conference 'KpaKpaKpa: Design Concepts from the African Continent', London, U.K.
- Papanek, V. and Fuller, R.B., 1972. *Design for the real world*. Thames and Hudson.
- Penn State News. (21 September 2018). *TED, Penn State and a makerspace in Ghana: DK Osseo-Asare and Yasmine Abbas design as research*. Retrieved on 11 October 2018 at <https://news.psu.edu/story/537864/2018/09/21/research/ted-penn-state-and-makerspace-ghana>
- Qamp.net - Agbogbloshie Makerspace Platform project website. (2017). Retrieved on 2 July 2018 at <https://qamp.net/>
- Ramos, J. M. (2015). Transcendence of a Method: The story of causal layered analysis. *CLA 2.0: Transformative Research in Theory and Practice*, 25-44.
- Rechtin, E., & Maier, M. W. (2010). *The Art of Systems Architecting*. CRC press.

- Rosenfield, K. (2012). *Dieter Rams: 10 Principles of 'Good Design'*. Retrieved on 20 August 2018 at <https://www.archdaily.com/198583/dieter-rams-10-principles-of-%25e2%2580%259cgood-design%25e2%2580%259d>
- Safo, A. (2002). *End of the Road for 'Sodom and Gomorrah' Squatters*. News from Africa. Retrieved on 20 October 2018 at http://africa.peacelink.org/newsfromafrica/articles/art_827.html
- Sall, A. (2003). *Africa 2025: What possible futures for Sub-Saharan Africa?* UNISA Press.
- Saul, P. (2002). Using futures studies to design tomorrow's products: a case study. *Foresight*, 4(2), 21-24.
- Sterling, B. (2013). *Anti-conventional Objects diagram*. Retrieved on 1 August 2018 at <https://www.wired.com/2013/10/design-fiction-anticonventional-objects/>
- Tharp, B.M. and Tharp, S.M. (2013). Discursive design basics: Mode and audience. *Nordes*, 1(5).
- United Nations News and Stories. (4 September 2018). *Turning e-waste into gold: the untapped potential of African landfills*. Retrieved on 15 September 2018 at <https://www.unenvironment.org/news-and-stories/story/turning-e-waste-gold-untapped-potential-african-landfills>
- Waldman-Brown, A., Obeng G.Y., Adu-Gyamfi, Y., Langevin, S. & Adam, A. (2014) 'Fabbing for Africa's informal sector'. Retrieved on 5 January 2019 at <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.635.8804>
- Wanda, R.E. (2013). Afrikology and community: Restorative cultural practices in east Africa. *Journal of Pan African Studies*, 6(6), pp.1-26.
- Wired. (23 April 2015). *Inside the Hellscape Where Our Computers Go to Die*. Retrieved on 11 August 2018 at <https://www.wired.com/2015/04/kevin-mcelvaney-agbogbloshie/>