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# Beyond DIY in Electronic Music

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**Do-it-yourself (DIY) in electronic music represents a new paradigm that is not just about DIY. Doing-it-together (DIT) and the idea of community and shared experiences are at the root of DIY practice. This article discusses how the workshop and the event have become central to practitioners working in the field of DIY. Collective instrument building, the concept of the living installation, and performance are viewed as a holistic event. Some specific examples of the author's work known as Dirty Electronics are considered, where emphasis is placed upon experience rather than the 'something to take home' factor. These include the following works: *ICA Solder a Score*, *Noise Shadow*, *Still* and *Cut & Thrust*. Composing 'outside' electronics is regarded as a method for revealing processes that can be represented in other areas of the work beyond sound-generating circuits. The article also looks at how building circuits and sound devices acts as a way to create a *tabula rasa*, and how the idea of delegated performance, where instruments are played by 'non-experts', serves to establish a naïve approach and authenticity in performance. Through the sharing of information online and in workshops, the DIY community has become knowledgeable, which has resulted in a community 'full of experts' and the growth of custom-designed circuits. The rise of discrete hand-held music players, such as the Buddha Machine, and the boutique synthesiser are also discussed, and the physical artefact and sound object are seen as a vehicle for the dissemination of ideas. Finally, the question is asked: 'In DIY practice, where does the authentic document of the work lie?'**

## 1. BEYOND DIY

A new DIY community in music emerged in the late 1990s. It was perhaps a reactionary movement against the alienation and corporateness of digital technology. It addressed a one-size-fits-all mentality and tried to affirm an aesthetic from the bottom up, rather than top-down and driven by technology. Initially, a DIY approach offered an alternative approach with much in common with punk rock, knitting clubs or ham radio societies. From a music perspective, hacking, circuit bending, open-source hardware and software, and the appropriation of found objects for sound-making coalesced to create a new paradigm that ran alongside digital technology and communications. It can be argued that this paradigm has given rise to the growth of a new movement even though it purports to be about doing-it-yourself and shirks any formal school or doctrine. With the first decade of the twenty-first century over and the DIY

ethos firmly established to the point of becoming mainstream, what developments, if any, in this approach have occurred? While substantial documentation concerning sound devices and instruments, hacks, circuit bends and schematics is available – particularly via online forums such as Matrixsynth Blog, Make and electro-music.com – there is less discussion of music. Who ever talks about the music of the circuit bender Reed Ghazala? This article considers the aesthetics of a DIY approach to music. It looks beyond circuits and electronics and questions whether DIY is in fact about doing-it-yourself. The interdisciplinary nature of the DIY approach incorporates, for instance, the disciplines of electronics, engineering, graphic design and sculpture, and has resulted in a repository of artefacts. At the root of this approach a triangulation exists between sound/music, process and making, and physical object. This article also discusses the representation of these artefacts as artworks in their own right, as documentation or scores and as pedagogical studies or commercial products.

## 2. DIT

The notion of DIY is an oxymoron, since those who share a DIY aesthetic rely on each other to exchange ideas and work together as a form of counter-culture. There is a focus on DIT, doing-it-together, rather than doing-it-yourself. A DIT ethos has taken hold through the dissemination of ideas via online communities, workshops and performances. The term DIWO, do-it-with-others, has also been used to describe this collective process (Jo, Parkinson and Tanaka 2013). The DIYer needs how-tos, circuit diagrams and hack tutorials, and open source information to be able to do-it-themselves. The premise of a DIY aesthetic is an open-source mentality, sharing information and establishing like-minded communities. Amy Spencer describes this in *DIY: The Rise of Lo-Fi Culture* in relation to zine culture: 'the fundamental purpose of zine-making is to reach out to others, finding a common bond and [to] form alliances' (Spencer 2005: 31). This is also the case in terms of the DIY music community.

I have written previously about participation in a series of essays about digital cultures (Richards 2012).

Blogs and user-group forums have helped fuel the act of participation and the need to be actively involved. It is an age of participation where being a passive observer is not enough. Nicholas Bourriaud's seminal text *Relational Aesthetics* highlights that 'artistic praxis appears these days to be a rich loam for social experiments' (Bourriaud 2002: 9). He goes further by stating:

The possibility of a relational art (an art taking as its theoretical horizon the realm of human interactions and its social context, rather than the assertion of an independent and private symbolic space), points to a radical upheaval of the aesthetic, cultural and political goals introduced by modern art. (Bourriaud 2002: 14)

Claire Bishop has also viewed a growing trend in Northern Europe of what she defines as participatory art (Bishop 2006). Bishop looks beyond arts policy to an underlying aesthetic of an art where the social dimension of participation is central. The works of Camnitzer, Joseph Beuys, Lygia Clark, Jef Geys and Tim Rollins are all seen as epitomising this aesthetic (Bishop 2011).

Bourriaud sees participatory art has having its roots in Duchamp and the Fluxus movement:

Spectator 'participation', theorised by Fluxus happenings and performances, has become a constant feature of artistic practice. As for the space of reflection opened up by Marcel Duchamp's 'art coefficient', attempting to create precise boundaries for the receiver's field of activity in the artwork, this is nowadays being resolved in a culture of interactivity, which posits the transitivity of the cultural object as a *fait accompli*. (Bourriaud 2002: 25)

### 3. TWENTY-FIRST-CENTURY HAPPENINGS AND THE EVENT

In terms of music, the workshop has become central to the DIY approach. Many of those discussed in this article – for example, Nicolas Collins, Tom Bugs, Martin Howse, Pete Edwards, Gijs Gieskes and Kazuhiro Jo – are actively involved in a variety of workshops and participatory events. Within my own practice as Dirty Electronics there is an attempt to provide a dynamic experience for participants (Dirty Electronics 2013). Building creates an extended discourse with a group to enable experimentation through performance and sound making, and 'demands' meaning through shared experience and invested interests. This has led me to view Dirty Electronics more like a twenty-first-century happening and to question the use of the term 'workshop'. In many instances, describing Dirty Electronics as a workshop undermines the music or art. Workshop suggests an adjunct to the art: for example, workshop followed by performance or exhibition. Despite being often left to the perils of arts organisations' and

institutions' 'speak' – 'build your own synth in a workshop ... culminating in performance' – I have come to consider Dirty Electronics as a holistic event.

At this point I would like to consider Dirty Electronics as an example of how participation and the holistic building and performance event has shaped a particular approach and understanding beyond DIY. In Dirty Electronics' *ICA Solder a Score*, part of the Notation and Interpretation Festival at the Institute of Contemporary Arts (ICA), London, the building of devices and the creation of the piece took the form of a living installation. Comparisons may be made with Alison Knowles' *Make a Salad* or the crochet works of Sheila Pepe where the gradual unfolding of an event and the process of making something dictates the conditions of the work. *ICA Solder a Score* was seen as 'a unique participation opportunity for visitors to the ICA' (Institute of Contemporary Arts (ICA) 2011). Attendees were invited over a period of five days to take part in building a large patchwork-quilt-like instrument in the ICA's Lower Gallery (white cube space) and to explore ways of performing and interacting with the instrument. The starting point for the work was to question: 'Wherein lies the composition/work, and could a schematic constitute a form of musical score?' The sound object/instrument was explored on many different levels as a schema for the entire work. There was no audience or spectator participation as such: attendees pre-registered and had prior knowledge of activity and involvement. There was a clear distinction between listener/observer and participant. Within the gallery space the building area was roped off, allowing for public access and viewing of the entire instrument-building process. In theory it would be possible for gallery visitors to return to view the work at different stages of its development. The resulting sound composition revolved around the idea of creating a giant modular system, where each individual sound device could be connected together on the floor of the Lower Gallery. The construction/playing of the modular system became the conclusion to the 'performance'. This mode of presentation emphasises the process of the work in 'gallery' rather than performance time and presents a number of different criteria for composition.

Many soldering and circuit-building workshops and events – for example, the Bent Festival or Maker Faires – show participants hunched over soldering irons in deep concentration. The 'work' is meditative. In *ICA Solder a Score*, the idea was to break up this focused yet singular engagement with the task in hand. This involved the use of different materials and modes of construction other than electronics and soldering, which in turn influenced the design of the instrument. The *ICA Solder a Score* instrument is based on a modular feedback concept consisting of a



Figure 1. *Noise Shadow*, Full of Noises Festival 2013.

bespoke printed circuit board (PCB), wooden mounting board and tin/metal touch electrodes (Richards 2011). Details of the act of making, the tools used in the construction (soldering irons, hammers, saws, tin cutters), the affordances of the tools and the physical gestures relating to their use, a dramaturgy of such, were all considered. The participatory events of Dirty Electronics involve social engineering extending from the banquet-styled table of soldering, through to the sharing of tools, and the collective expenditure of energy related to specific tasks and performance. As Christine Ellison (Pollyfibre) states: 'Production happens through action and action becomes production' (Pollyfibre 2013). Designing the instruments for these events is therefore not just about sound generation, but also about the 'theatre' of construction.

In recent works of Dirty Electronics, there has been a continued exploration of a range of readily available materials for building purposes. The piece *Noise Shadow*, commissioned by the festival Full of Noises (Full of Noises 2013), utilises paper, sticks, wood and bamboo alongside electronic components. Large DIY paper loudspeakers with bamboo chassis act as makeshift screens in a wayang-like shadow performance (Figure 1). Multiple mini vibration speakers (transducers) are attached to the paper at different points. Each transducer is fed with a discrete signal resulting in a diffuse soundfield. As well as thinking in terms of building materials and 'labour', placing electronic circuits alongside arguably very 'low' forms of technology, such as the stick or paper, forces the listener and observer to re-evaluate the idea of technological progress. With the ever-decreasing size and miniaturisation of electronics, the work of Dirty Electronics often attempts to re-size technology to human scale. The idea expressed by David Tudor of composing inside electronics is re-addressed with the intention of thinking of composing 'outside' electronics, where a music driven by electronics is also

extended beyond the circuit. This idea will be discussed in more detail later. The electronic instruments of Gijs Gieskes in particular highlight the paradox of high and low technologies through the use of different building materials (Gieskes 2013a). Gieskes has used the Dutch saying 'houtje touwtje' to describe his work, which literally translates as 'small sticks and string' (Gieskes 2013b). Gieskes' work is highly idiosyncratic and, to use a British idiom, 'Heath Robinson': for example, the Casio SK-1 #4.<sup>1</sup>

#### 4. COMPOSING 'OUTSIDE' ELECTRONICS

The work *Still* differs from other Dirty Electronics works in that it appropriates and modifies an existing object/circuit, that of a disposable flash camera, and investigates how the charging and discharging process of the circuit can be realised in sound, light and movement. An intertwining slowly evolving upward glissando is created from multiple charging flash circuits that are modified to make sound. Each camera contains a vactrol (resistive opto-isolator) to track the charge of the 'flash' capacitor and to open a low-pass filter on an oscillator. As the capacitor charges, more harmonics in the oscillator's waveform become audible and the sound becomes brighter and louder. In addition to this, a small coil pick-up and pre-amp are used to create high-frequency sound that is produced by electromagnetic interference when the camera flashes. A choreography is based around holding a still position and 'rising' gestures, and finding the limits of balance and imbalance within a posture. As the cameras flash, the audience is left with a physical outline of the performers. The charging process and camera flashes are looped to create an evolving continuous texture and image burn-in (afterimage).

The idea combines the approaches of both Steve Reich and David Tudor, music as a gradual process (Reich 1974) and composing inside electronics (after Tudor's ensemble *Composers Inside Electronics*), but the process is not only considered in relation to sound, but also choreography. At the heart of Sherry Turkle's *Evocative Objects: Things We Think With* is the theory that physical objects help our cognitive process (Turkle 2007). Discussing the work of the anthropologist Lévi-Strauss, Turkle states: 'Material things, for Lévi-Strauss, were goods-to-think-with and ... were good-to-think-with as well' (Turkle 2007: 4; see also Lévi-Strauss 1966). In *Still*, all performers are involved in the building stage that serves as a means to analyse and create thinking time and to

<sup>1</sup>Heath Robinson was an illustrator whose subject matter often consisted of eccentric and absurd fictional machines such as the pancake-making machine and the professor invention for peeling potatoes.



reflect on the process and how this process can be taken forward 'outside of the electronics'. The work gives rise to an investigation of an object and its behaviour through the procedure of de-construction and construction. The building process helps to form an understanding of the potential of the work amongst the performers providing a *modus operandi*. The idea of object as process is similarly expressed by John Cage: 'Object would become process; we would discover, thanks to a procedure borrowed from science, the meaning of nature through the music of objects' (Cage 1981: 221).

## 5. INDIVIDUAL VERSUS COLLECTIVE BUILDING

The collective build has a very different set of parameters and objectives from the construction of individual devices, the 'something to take home' and 'I made it' factor being significant goals in many DIY workshops. Materialism also plays a significant part in the economics of these workshops, where participants are willing to pay for synths and sound devices but not necessarily an intangible experience. Often there is an element of tokenism in the DIY aspect of these workshops, an issue Jo discusses in the article 'Workshopping Participation in Music' (Jo et al. 2013). The use of printed circuit boards, for example, speeds up the building process by essentially making the circuit connections for participants. This in turn reduces the chance of error and enables 'completion'.

At Ptarmigan in Tallinn, Estonia, there was an attempt to explore the relationship between the process of individual self-built devices and a larger group-built construction in the Dirty Electronics piece *Cut & Thrust*. The work was spread over two days and began with the building of individual circuits that could be used in a modular system based on a network of amplification, feedback loops, interference and modulations. The work moved from being based around multiple individual circuits built on stripboard (Veroboard) and table/workbench and soldering-iron activity, to the construction of a singular large-scale device taking inspiration from the original concept of the breadboard with a wooden base, and nails as terminals and touch electrodes connected using wire and wire-wrapping techniques (Figure 2). Conceptually, the work shares similarities with *ICA Solder a Score* and the idea of individual circuits and metaphorically speaking voices combined in larger modular and collective configurations.

A defining aspect of the collective build of *Cut & Thrust* was the breakaway from workbench and tabletop activity to the use of an empty room and floor space. Although there are some considerable practical considerations in the use of tables and

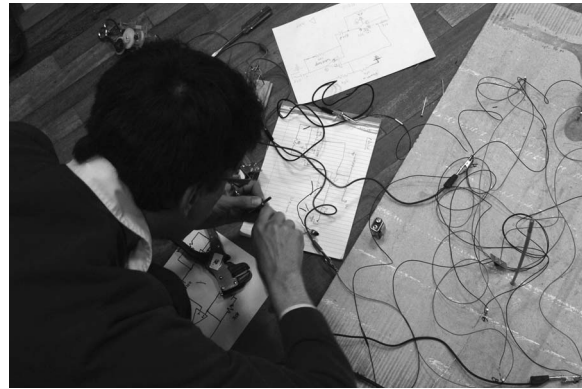


Figure 2. *Cut & Thrust* Ptarmigan, Tallinn, Estonia 2012.

benches, the floor provides a un-demarcated space, an open domain that is ultimately suited to group work. In terms of Dirty Electronics, this has become the case for building and performance. Ironically, it is the archetypal electronics lab, due to its limited/specialised usage, that has become the least suitable space for a Dirty Electronics event.

## 6. THE NAÏVE AND EPHEMERAL MUSICAL INSTRUMENTS

A DIY approach has enabled musicians and performers to create their own sound devices and consequently change the relationship between musician and instrument. This is true for both software and hardware instruments. Where building and making are part of the creative process, it follows that the concept of musical instrument is not fixed and is always evolving. The idea of mastering an instrument to become a virtuoso becomes obsolete when the instrument is continually changing. A DIY approach therefore encourages working with sound objects and instruments from a naïve stance since the object is always offering a mode of exploration and discovery. This idea was frequently discussed between myself and Taku Lippit, who was then the Artistic Director of STEIM (Studio for Electro Instrumental Music), Amsterdam. Lippit was concerned with developing a performance system based around the practice of turntablism (Lippit 2004). Becoming highly skilled and virtuosic on this system was a natural step for Lippit given that virtuosity and 'battles' are part of the turntablist tradition.

As Dirty Electronics, I was drawn to a very different way of thinking about an instrument. John Bowers and Phil Archer in their article 'Not Hyper, Not Meta, Not Cyber but Infra-Instruments,' present an alternative view of a musical instrument that is ad hoc and always in a state of flux (Bowers and Archer 2005). The idea of an ephemeral musical instrument was something I had considered and was interested in (Richards 2007/8). These ideas were also informed by

Alvin Toffler's *Future Shock*, where Toffler presents a world where everything is disposable (Toffler 1970), and the work of Negroponte, who considers that, in the realms of software and through the influence of digital technology, we live in a state of constant upgrades (Negroponte 1995). The idea of an ephemeral musical instrument or infra-instrument is problematic, for example, in the New Instruments for Musical Expression (NIME) community. Marcel Wanderley has expressed his frustration over idiosyncratic devices that only serve their inventor and offer little, in technological terms, back to the community.<sup>2</sup> He argues that without standardisation of instruments, how can a performance practice or music be developed? Furthermore, from a developer's point of view, how can such ideas be commercially exploited?

In Dirty Electronics, each event is based around a 'new' instrument. This approach puts many things into question such as rehearsal, repertoire and the very essence of the music itself. It is concerned with finding the moment of discovery to enable constant exploration and maintain a naïve stance. It is a means to create a tabula rasa. Not only does the instrument need to be explored through play, but also the music discovered. This approach enables a common point of departure at events in which participants 'start from scratch'. With the creation and re-creation of instruments, a DIY approach questions the instrumental tradition and encourages an experimental practice.

## 7. DELEGATED PERFORMANCE

In the case of a participatory event such as Dirty Electronics, it is not just the sound devices and instruments that are approached from scratch, but also the ensemble. Each event has different participants: the ensemble is in constant flux. This takes the idea of fresh discovery not only through the instrument and sound object, but also through delegated performance. The creator of a sound object, instrument or performance has an informed position. Through delegating the performance to a 'non-expert', clichés can be avoided and the idea of naïve and authentic performance can be taken further. The work of Pina Bausch epitomises this approach in such works as *Kontakthof*, in which performers over the age of sixty-five are chosen for their non-expert, naïve and ultimately authentic movement (Bausch 2007). A similar ideology is also present in Cornelius Cardew's Scratch Orchestra in relation to the formation and direction of the orchestra: the direction of the orchestra was often given to the youngest member (Tilbury 2008). Claire Bishop in *Artificial Hells: Participatory Art and the Politics of Spectatorship*

<sup>2</sup>In conversation with the author.

discusses how delegated performance can be used as a way of outsourcing authenticity:

Although the artist delegates power to the performer (entrusting them with agency while also affirming hierarchy), delegation is not just a one-way, downward gesture. In turn, the performers also delegate something to the artist: a guarantee of authenticity, through their proximity to everyday social reality, conventionally denied to the artist who deals merely in representations. By relocating sovereign and self-constituting authenticity away from the singular artist ... and onto the collective presence of the performers who metonymically signify an irrefutable socio-political issue ... the artist outsources authenticity and relies on his performers to supply this more vividly, without the disruptive filter of celebrity. (Bishop 2011: 237)

In the works discussed above, *ICA Solder a Score*, *Noise Shadow*, *Still* and *Cut & Thrust*, there is a focus on delegated performance. Within Dirty Electronics it is about working with the 'authentic', and participatory events, stemming from the DIY movement, have provided a forum for this.

## 8. TRIAL AND TRIAL: THE EMPIRICAL

Many circuit benders have moved into bespoke circuit and instrument design. It is perhaps inevitable that trial-and-error procedures associated with circuit bending and hardware hacking have become less about trial and error through the process of learning by mistakes. The DIY movement in music has become full of experts. The British electronic instrument maker Tom Bugs, who specialises in designing custom-made modular synthesisers, states that his interest in electronic sound devices grew from circuit bending (BugBrand 2013). Another notable example illustrating this move from circuit bending to circuit design is Pete Edwards of Casper Electronics. Edwards, a prolific circuit bender, moved to Europe in 2011 to develop his interest in custom circuits (Edwards 2011). The NovaDrone and The Drone Lab are examples of his recent work in this area (Casper Electronics 2013). The interest in custom electronic instruments and bespoke circuit design has grown since the introduction of Nicolas Collins' *Handmade Electronic Music: The Art of Hardware Hacking* (Collins 2006).

## 9. BOUTIQUE SYNTHESISERS

Out of the DIY electronic music community has come the 'boutique' synth, which is not only made in workshops but also sold either as a kit or ready-made online and through small specialised shops. Tom Bug's Weevil, Martin Howse's blackdeath noise synth (discussed in more detail below), the synths of Jessica Rylan (Flower Electronics) and Dirty Electronics' Mute Synth are but a few examples.

These synths, as the term 'boutique' suggests, are made in small numbers serving DIY and music niches. The term 'boutique' here is not used in the pejorative sense, but to refer more specifically to a device made in small numbers as an alternative to mass-produced items. With regard to Dirty Electronics, the physical artefacts, instruments and sound objects have their origin in participatory events and can be seen as by-products of the creative process. There is often a focus on touch-based devices where the conductivity of the skin is used as the main control of the instruments combined with generative processes. Consequently, the sounds of the devices have an indeterminate characteristic. Composition is approached through touch strategies and performance actions rather than the control of discrete sound events.

There is a crossover between the boutique synth and the 'personal' sound machines and music players such as FM3's Buddha Machine: 'a small plastic box that plays meditative music composed by Christiaan Virant and Zhang Jian' (FM3 2013). Introduced in 2005, the Buddha Machine – based on cheap, low-bit sound resolution prayer machines found in Buddhist temples – presented an alternative to MPEG culture. It was small, compact, self-contained and of-the-hand, containing a 'minimal' nine loops. Jeremy Wagstaff went as far as referring to the Buddha Machine as the 'Anti-iPod' (Wagstaff 2007). Wagstaff elaborates:

But there's something else at play here. FM3, operating in China, away from the early years of the iPod craze, had no idea that the device would inspire a minibrainstorm among those who would eschew the iPod's sleek surfaces and rounded edges for the Buddha Machine's cheap plastic and ill-fitting parts, and the iPod's emphasis on sound quality and abundance of choice for a tinny speaker and nine hard-wired tracks. (Wagstaff 2007)

The Buddha Machine as a discrete sound device demonstrated a new model for the dissemination and presentation of music and further opened up the idea of listening 'through' physical objects. What is most striking is that objects such as the Buddha Machine blur the boundaries between product and artwork.

Returning to the idea of the boutique synth, there has been a growth in the use of microcontrollers such as the Atmel AVR and PIC (programmable integrated circuit). An early example of such work is *1-Bit Music* by Tristan Perich, where the electronics are housed inside a clear CD jewel case (Perich 2013). The electronic components are arranged resembling a face reminiscent of Nam June Paik's 'friendly robots'. The use and popularity of AVR microcontrollers has in part been influenced by the active DIY community using Arduino, an open-source physical computing platform based around the Atmel AVR microcontroller. Perich has also worked with the AVR microcontroller to produce the Loud Objects' Noise

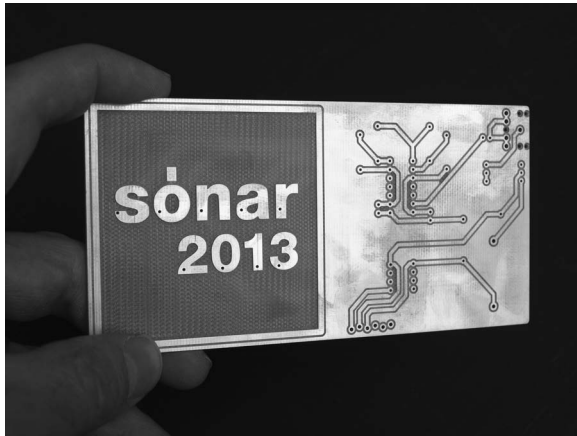
Toy, a miniature two-button synthesiser with a red-solder-masked PCB. The Noise Toy explores the intersection between a music player, with a fixed set of parameters or algorithms, and a musical instrument. The use of microcontrollers softens the idea of hardware because code (for example C or Assembly language) is written to the microcontroller via a computer. An advantage of using microcontrollers is that less discrete electronic components are needed in a circuit design. And of course, it is possible to re-program the microcontroller. The distinction between soft and hardware becomes blurred.

Martin Howse's blackdeath noise synth, inspired by the work of Leif Elggren, also uses an AVR microcontroller and is, in Howse's own words, 'the first open hardware/free software noise synthesiser with the plague inside' (Howse 2013). A set of algorithms, based on plague simulations, is written to the instrument's microcontroller and acts as data generation for 'granular re-synthesis of incoming audio signals or self-generated feedback' (Howse 2013). What is most significant about the instrument is that the PCB is designed with a prototyping area enabling users to test and run their own code. The generative nature and the ability to reconfigure the device using software present, amongst other issues, the idea of code as composition or documentation (this idea will be returned to later in the article). The open-source nature of Howse's device has also encouraged a community of DIY enthusiasts to share and hack code for the synth. Furthermore, Howse has also developed the micro-blackdeath, which is a hybrid microcontroller and analogue synth: the analogue part being like Tom Bugs' Weevil with CMOS-inspired circuitry.

It is in this hybrid area between microcontrollers and analogue electronics that the Dirty Electronics' Sonar 20th Anniversary Synth exists (Richards and Frize 2013). The pocket synthesiser is designed to be made in a short participatory event/workshop and uses the Sonar logo as a basis for a graphical PCB (Figure 3). A programmable integrated circuit (PIC) microcontroller is used to create control and sequencer information, whilst the sound synthesis, oscillator and noise circuit, is analogue. The synth is played by touching different combinations of letters of the Sonar logo. Similar to Howse's micro-blackdeath, new and customised code can be directly uploaded to the synth. It is through combining both digital and analogue techniques that new possibilities arise, not only in synthesis and circuit board design, but also in user-group interaction and engagement with the DIY community.

A particular feature of Dirty Electronics' boutique synthesisers is that the printed circuit board functions as an artwork or as a form of music graphic (album cover). This feature is perhaps most marked in Dirty Electronics' Mute Synth, which was made in





**Figure 3.** Dirty Electronics Sonar 20th Anniversary Synth CNC routed test circuit board 2013.

collaboration with Mute Records and graphic designer Adrian Shaughnessy, who has designed numerous album sleeves and written extensively on the subject of music graphics (Shaughnessy and House 2003; Shaughnessy 2008). The Sonar 20th Anniversary Synth follows in this vein, where the graphics, which are also a functional part of the electronic circuit, are central to the design.

Aside from the visual aesthetic of the artwork PCBs, the use of PCBs opens the door to the ideas of duplication, fabrication and commercial exploitation, in short the creation of a product. Marcus Boon considered the Buddha Machine as ‘a strange kind of DIY mass production’ (Boon 2006: 12). The Stylophone and Stylophone Beatbox would also seem to fall into this category. Some of the ideas behind the DIY movement in music have seeped into what could be considered the mainstream. A prime example is the Korg Monotron, a synth that is analogue, self-contained, battery-powered, with open source schematics and annotated circuit board, and which is community driven. It is clear that the development of the Korg Monotron stems from a DIY ethos with its designer, Tatsuya Takahashi, being in the hand-made electronics duo sharinnosaihatsumei. Takahashi states:

Our initial motivation was not to deliver something for the DIY crowd. It was to provide engagement with real analogue sonics at a price point that I could have bought when I was a kid. To rid analogue of its snobbery and make it available. The low price point and the inherent simplicity of the analogue circuit just happened to resonate with the DIY crowd. Obviously the hacker-friendly PCB markings and disclosure of the schematics were instrumental in making the DIY appeal happen. (Takahashi 2013)

## 10. ARTEFACT AS DOCUMENT

Working within the realm of DIY electronic music, a multiplicity of related material is produced: physical

artefacts, assemblages, hacks, bends, circuits, schematics, texts, code, images, audio and video of performances, experiments, happenings, participatory events and experiences. It is not just about sound. The physical artefacts produced through DIY and DIT practice constitute a form of documentation. As David Fuller discusses in his paper ‘An introduction to automatic instruments’ and as mentioned by Riis in his article in this issue, the ‘machine’ acts as a form of documentation, an encapsulation of a compositional idea (Fuller 1983; Riis 2013). Schematics take on a greater significance not just as a plan of a functional circuit, but a document that reveals an artistic process. The sound object, built in a participatory event such as Dirty Electronics, is the authentic document. It implies activity and action and reveals the possibilities of the work in all its forms from music, instrument building, as a living installation and group performance. By owning the object/documentation there is a feeling that the performance or event can be recreated. Mass production methods, such as the printed circuit board, could also be seen as a way of creating multiple documents for dissemination that in turn provide a more ‘authentic’ mode of experiencing the work. In DIY practice there is an emphasis on making and exploring the sound objects directly.

## 11. CONCLUSION

‘experiential interactive product’ appears like a contradiction in terms. While experience is intangible, volatile, an interactive product is tangible, a mass-produced piece of technology. The ‘electronic gadget’ is the very prototype of a material purchase. (Hassenzahl 2013)

In DIY practice and electronic music, a tension exists between materialism and experience. This is summed up by the title of Boven and Gilovich’s paper ‘To Do or to Have? That Is the Question’ (Boven and Gilovich 2003). As Hassenzahl also states: ‘The challenge of designing interactive products ... is to bring the resulting experience to the fore – to design the experience before the product’ (Hassenzahl 2013). Beyond DIY in electronic music a complex inter-relationship between different art forms exists. It is a radical intermedia art, in which radical here denotes ‘from the root’ and ‘to start from a clean slate’. When looking at the results of this practice-based research presented in this article, a number of clear strands emerge that point beyond DIY. These include growing trends in participatory art, DIT and large group performance; extended musical process, where building and making artefacts and instruments inform and dictate music; the blurring of boundaries between musical instrument and composition; an attempt to find the ‘authentic’ through delegated performance; the rise of the DIY expert and boutique

synthesisers; and the idea of the physical artefact or machine as a document of composition/artwork.

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