

Making things last:

The fluid order of bicycle repair

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MA in Sociological Research

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This dissertation is submitted in partial fulfilment of the requirements for the degree of M.A. in Sociological Research at Lancaster University.

I certify that this dissertation is entirely my own work

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Abstract

In the familiarity of everyday life, there is a danger that we become disconnected from the material infrastructure upon which such life depends. The habitual enactment of particular tasks allows the elements of routine to gradually slip from view. The objects of our world can break down, however. Over time, the links that hold an arrangement together tend to weaken. The practice of repair offers an insight into how this process is managed. In this dissertation I provide an account of how broken bicycles are returned to working order. Drawing on research conducted in two workshops, I employ the notion of practice to explore the elementary basis of bicycle repair. By focusing on the bicycle, the mechanic, and the workshop, I consider the ways in which the practice of repair is organised. It becomes clear that the elements of repair can only be understood in terms of the relations in which they are suspended and the other elements with which they are brought together. It also emerges that the repair of a bicycle is, at once, both the product of an established social order and the bedrock from which a future order will unfold. For the mechanic to encounter the broken bicycle in a way that yields repair, a careful balance must be found between continuity and change. The practice of bicycle repair should thus be organised in a way that allows for a certain fluid order to take shape.

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Understanding Repair

Our lives are lived through the use of, and engagement with, a range of everyday objects.

Miller's (2008) household ethnography of a street in London points to the great diversity of things that fill our world. But objects have a habit of breaking. They decay, and falter, and snap. There comes a time when they no longer seem to fulfil their function as well as they used to. The material components from which they are made are only stable in their arrangements and configurations for so long. Arguably, breakdown of one sort or another is constant. We might reasonably ask then, how we should understand and manage this process.

Graham and Thrift (2007: p. 1) consider processes of maintenance and repair to be the "the social equivalent of the humble earthworm in their remorseless and necessary character – and in the way in which they have been neglected by nearly all commentators as somehow beneath their notice". Drawing on Heidegger, they suggest that the objects and tools which help to shape the world are only brought into focus when they become inoperable. That our daily practices depend upon the stable assembly of all manner of materials and objects is only appreciated (or, rather, ruefully acknowledged) in the breakdown of this arrangement. The smooth flow of our world is interrupted by such an event and the onus shifts towards "restoration of the practical equilibrium" (2007: p. 2).

There is a danger that we attend only to the peaks and troughs of this recurring episode. On the one hand, we might be drawn to moments of catastrophe, in which the elements of a seemingly stable arrangement only become apparent in their spectacular dissolution.

Latour's (2004) reference to the *Columbia* space shuttle disaster in 2003 is a case in point. We might, on the other hand, emphasise the remarkable stability of an object and its faithful service to the routine accomplishment that seems to characterise much of everyday life. From this perspective, the focus is upon the reliability of materials and objects as the glue of a particular social order. It is a scenario that allows the elements of social life to slip to the background of our world. The reliability of objects enables practical equilibrium to be achieved.

The maintenance and repair of objects, whether they be space shuttles or door closers (Johnson, 1988), goes unnoticed in these stories. An object is often only understood in terms of its dependable functionality or its exposure as a fraud. It is less frequently conceived as somewhere in between. The work of repair is, seemingly, an unwelcome distraction from the successes and failures that make the world interesting. There is, however, much to be learnt in the spaces and times of transition between breakdown and restoration. I mean this in both practical and conceptual terms. In this dissertation, I will consider what happens to an everyday object during such moments of transition. By drawing on research conducted in bicycle repair workshops, I will use the notion of *practice* to both situate the bicycle within a wider social order, and to highlight the fluidity that typifies such order. It is through using such a framework that I aim to explore how bicycles are made to last.

It is necessary at this point to make three related observations. First, there is ambiguity in terms such as 'breakdown', 'repair' and 'restoration'. They invite the question of *what* has broken and *what* needs repairing. Broken bicycles, or the *Columbia* space shuttle, seem to

make sense as objects in need of repair. I have also hinted, however, that breakdown emerges through the disruption of an arrangement that spans the technical and the social. An object or a technology can only be said to fail if we relate it to the function that we, as social beings, expect it to fulfil. Our focus, in a state of practical equilibrium, is on the task at hand rather than the material infrastructure upon which completion of that task depends (Graham and Thrift, 2007). Should a component of that infrastructure crack, and thus bring attention to itself, it has only failed in terms of the wider sociotechnical arrangement in which it is implicated.

Second, and building on my first contention, the various material components and objects complicit in the completion of a particular task are always changing in their structure. They wear down over time. The parts of an object, and the links between them, tend to weaken in their stability. The material world changes with or without our intervention. But such decay might not draw attention if people are still able to do what they intend to do. There is nothing inherent in a crack or a tear that makes either necessarily problematic or one more problematic than the other. There are scales of 'brokenness' here, but they only make sense through the material and social relations in which an object is suspended.

Third, then, the breakdown of an arrangement might be catalysed through the 'failure' of a particular object but stability can often be recovered without fetching the toolbox. Many objects are thrown away. A replacement might be bought or other objects might fulfil the same role. The owner of a broken object might decide that they can do without it or postpone a decision until later. The shed or the garage can function as a holding space for such objects (Hetherington, 2004). Perhaps a task can be achieved through the emergence

of an altogether different arrangement. If a bicycle is broken, the car can be used instead. The task might even be abandoned. If a bicycle is broken, the journey might not be taken. It is revealing that some broken objects are repaired and others are not. Practical equilibrium can be recovered in various ways.

My intention in making these claims is not to disregard 'repair' as a meaningful term. Some objects *are* subject to a particular form of engagement that is geared towards restoring their functionality. My purpose, instead, is to avoid framing the repair of an object solely in terms of either its technical or social attributes. Bicycle repair can only be understood in terms of relations that span this divide. Repair work, even at the scale of restoring functionality in a machine, seems to consist of making a material arrangement somehow work *for us*. Indeed, it is only by adopting this relational perspective that we begin to understand how and why objects are treated in the way that they are.

If object repair only makes sense within a wider set of relations, how can we proceed without getting distracted by scale? Is there any sense in discussing the repair of an object, or are we inevitably pulled to ever more expansive arrangements? Some objects do make sense as coherent entities and are said to be broken. Their repair does enable a practice to resume. It is thus at the scale of *practice* that I wish to situate my analysis.

In order to establish why some objects last longer than others, it is helpful to reflect on how they are situated within the world of practice. We live our lives by carrying out particular practices. These are task-like enactments which ensure that stuff happens and things get done. They are a "routinized way in which bodies are moved, objects are handled, subjects

are treated, things are described, and the world is understood" (Reckwitz, 2002: 250).

Practices might include showering, commuting, or sitting down for an evening meal. From this perspective, there is as much interest in habit and routine as there is with the emergence of the spectacular or the novel.

It has been suggested that practices involve the integration of three elements (Shove and Walker, 2010; Shove et al, 2012). Firstly, there are the objects of this world, of which more will be said in due course. These are the things and the technologies and the tools that might be referred to as the material substrate (Graham and Thrift, 2007). Secondly, practices are only performed if the practitioner has a sense of their value. Such value is attached to the conventions and images and ideas that circulate through society. We draw on such meanings in learning how best to engage with the material world. Thirdly, the integration of these elements - of materials and meanings - requires a level of competence and skill. This is a form of practical knowledge which matures with experience and, indeed, through practice.

It is counter-intuitive to divide the elements of a practice in this way, however, because both their practical and their conceptual merit lie in their integration (Shove et al, 2012). Over time, and through their repeated performance, many practices become habitual. Thus, as we learn the skills required to get things done in a particular way, the elements of a practice tend to slip from the foreground to the background. In setting out to ride a bicycle, for instance, a novice is only too aware of the many elements that need integrating to stay upright. They can only learn to move on two wheels whilst maintaining their balance if they have a sense of what is 'supposed' to happen and if they learn to integrate the body and the

bike in particular ways. For the advanced cyclist, however, other matters might easily come to occupy the mind.

A focus on practice is linked to a concern with what people do as much as what they mean (Warde, 2005). Referring to social practices as 'task-oriented' is therefore misleading in some ways. It might imply that the performance of a practice is based on individual choice, and that we live our lives by freely choosing both the tasks that we wish to undertake and the means by which we wish to complete them. Various authors have highlighted the limitations of such an understanding (Reckwitz, 2002; Warde, 2005; Shove and Walker, 2010; Shove et al, 2012). We do, of course, make choices. But in taking practices, rather than individuals, as the unit of analysis it becomes clear that means and ends are limited by an arrangement or set of relations that extend far beyond the individual. Practices therefore represent more than individual performances through which different elements are skilfully integrated. They also exist as coherent and provisionally stable entities (Reckwitz, 2002). There are established ways in which elements are integrated and both the elements, and their integration in practice, are reproduced on this basis. For the purposes of this dissertation, I will make this point by focusing on objects and their repair.

In one sense, repair work is about reconnecting the links between the elements of a practice or arrangement in order that it might be resumed and practical equilibrium might be recovered. A bicycle is fixed in order that the practice of cycling might resume. Its renewed functionality is defined with respect to the wider sociotechnical conditions of its use. I attempted to present these points through the observations I made earlier. The repair of an

object is not only revealing in terms of the practice that is able to resume, however. There is also much to be learnt from treating object repair as a practice in itself.

Gregson et al (2009) attempt such an analysis by focusing on the maintenance and repair of household furniture. By tracing the lives of a dining room table, a television stand, and a leather sofa, they show how objects are in a continual state of becoming. In each of their examples, the object of focus carries particular meanings for its owners but these shift with the appearance of physical damage. Their stories show that whether objects are repaired, and how this is undertaken, is to do with the elements that would need bringing together if repair was to take place. These include the meanings ascribed to a particular object, the skills required for its maintenance, and the materiality of the object itself. They are each the product of a set of relations which extend far beyond the individual. This can be shown by focusing on the object in need of repair.

Objects are produced through a certain sociotechnical arrangement that is situated in both time and space. The production of an object can thus be considered a situated practice (see Lave, 2011). This practice requires integrating the materials and components from which the object will be made; a sense of what the object might be used for; and the competence required to work with certain materials and tools. An object is produced in accordance with the social and material context of its production. It provides solidity to existing meanings and ideas, and helps to anchor social life in an established order of doing things. Practices are therefore sustained, in part, through the design and production of objects which enable certain uses and prevent others. There is meaning and intentionality inscribed within the

materiality of an object (Dant, 2008). As Molotch (2003: 2) writes, “objects too have a life in them... in the way they sustain social practices just as those practices sustain them”.

An object can travel across time and space and thus become implicated in practices that are distinct, but not disconnected, from its production.¹ It is therefore not only the case that the *production* of an object is situated. Its distribution, its exchange, and its use are also situated practices that differ in terms of the elemental arrangements through which they take shape. The common element, however, is the object that is being distributed, exchanged or used. It has a particular arrangement of production invested in its form which serves as part of the material bedrock from which future practice can draw. Certain objects are too heavy or unwieldy to be distributed to particular places (Shove et al, 2012) and they fail dismally as something to kick about in the park. Indeed, some objects are easier to repair than others.

¹ Identifying the production of an object as a distinctive practice is not without problems. Various authors have, for instance, shown how objects exist in a continuous state of production (Gregson et al, 2009; Edensor, 2011; Strebel, 2011).

Entering the Workshop

My interest in how things last, and specifically bicycle repair, stems from personal experience. In early 2011, having been the victim of bicycle theft, I found myself drawn to the second-hand market. I wished to find a bike that had a story to tell – one that would point to historical specificity. In Miller's (2009) terms, I wished to 'buy time'. The Kalkhoff (or, rather, my particular Kalkhoff) is a sky-blue road bike that was manufactured in 1970s East Germany (see Figure 1). It has a steel frame and calliper brakes. The ten-speed gear mechanism is operated by a set of down tube shifters.² I bought it from a man in Bristol who takes in bicycles that have been scrapped and tries to return them to their former glory. For something that had lasted for 30-40 years, and could almost be labelled 'vintage', £80 seemed a small price to pay.

Six months later and the Kalkhoff had become a bit of a liability. The front wheel often failed to turn with the handlebars and the rear wheel had started slipping from the dropouts. Issues such as these tend to have rather painful consequences. The derailleur gear system also presented problems. During one ride - a very hilly 25 miles or so - I fell over my bike when trying to jump on and was left with only four or five gears for most of the journey. The novelty of having down tube shifters gradually wore off and the heavy frame became cumbersome. The chain was rusting and the handlebar tape was slowly peeling off. I liked the *idea* of fixing its problems but, soon enough, the Kalkhoff was confined to the garden shed.

² Down tube shifters are gear shifters located on the main frame of a bicycle, rather than the handlebars which is the more common arrangement on many modern bicycles.



Figure 1: The Kalkhoff (source: author)

*Having never previously owned a road bike, the drop-down handlebars were new to me.
The down tube shifters also took some getting used to.*

In spite of its limitations I wished to keep the Kalkhoff. I felt responsible for it. I saw in its failure to function as it should, a failure in my own ability to work with it. It is too easy to blame the rhythms of breakdown upon technological weakness. But such a conclusion sends a broken bicycle to the repair shop or, worse, to the rubbish tip. It places the blame with the punctured tyre, the rusty cables, or the faulty derailleur. The bicycle loses its value – it can no longer be trusted – and so it is passed to someone else for treatment of one kind or another. It might be returned to us but do we know its story? From a different perspective, failure is not inherent in an object. It is also linked to the cyclist. Indeed, there might be a far bigger story to tell about why the ‘cyclist’ and the ‘mechanic’ are given different labels...

It is through my experience with the Kalkhoff that I became interested in the detail of repair. The Kalkhoff and I had reached an impasse but I was not entirely clear as to our respective roles in moving beyond this arrangement. I wished to understand how the objects of our daily lives might be supported in return for the support that they give to us. I wanted to

learn about the knowledge and skills that are involved in the work of repair and to marvel, in the process, at the hybrid becoming of the mechanic and the bicycle. That the challenge of making things last might be, at once, both a social and technological challenge was a contention I wished to explore further.

This dissertation draws from research that I conducted in two bicycle repair workshops. In order to understand how bicycles *can be* made to last, it is necessary to explore how they *are* made to last. I therefore wanted to approach bicycle repair in terms of the elements that come together in making a bicycle *work* again. This meant attending not only to the broken bicycle but also to the mechanic. It meant following the wider connections and relations that are invested in their encounter, and recognising bicycle repair as involving more than just a bicycle and a mechanic. It meant using the messages that are relayed through the workshop as the signs of a particular social order - manifest at a certain time, in a certain place. More than anything, it required that I treat bicycle repair as a situated practice (Lave, 2011).

The first workshop that I visited was the Freewheelers Bicycle Workshop which is based in Lancaster, UK. Freewheelers are a co-operative business which put “values and principles, people not capital, at the heart of everything they do”.³ The workshop is run by three women who joined together in 2011 to set up the initiative. Learning from similar co-operatives, they secured start-up funding, bought the necessary tools, and each completed the Cytech 2 qualification in bicycle mechanics.⁴ Having made the necessary preparations, the workshop officially opened in October 2011.

³ <http://www.freewheelersbicycleworkshop.org.uk/>

⁴ The Cytech 2 qualification is the trade standard for any professional bike mechanic.

Freewheelers offer a range of services to the community. Their professional repair service takes up much of the mechanics' time. It is founded on a notion of transparency whereby the mechanics are upfront about the cost of particular repairs, and they involve the customer in deciding about the repairs to be undertaken. The workshop also takes in broken bicycles that are no longer wanted. The mechanics carry out the necessary repairs and then sell the bikes on. Many of the components that they use in the process are second-hand. In part, this aspect of the co-operative reflects its wider commitment to sustainable practice. As well as saving broken bicycles from landfill, Freewheelers aspire to re-localise the bicycle industry through stocking "British and environmentally friendly products".



Figure 2: Green Oil (source: author)

*The mechanics at Freewheelers are committed to a greener economy.
This is reflected in the organisation of their workshop and the products they have for sale.*

On a Wednesday evening, the workshop is opened up to members of the public who can pay to use the equipment for repairing their own bicycles. The 'Tool Club' is primarily for people that know a little about bike mechanics although an additional amount can be paid if skilled support is needed. Due to its size, and the number of stands that are available, the

workshop can accommodate up to four working mechanics. Finally, if lessons in repair are required, Freewheelers also offer a number of maintenance courses. These take place over a two to three hour period in which the attendees learn about a particular aspect of bicycle repair. It was through attending one of these courses that I made my first visit to the workshop.

The second initiative with which I worked was Bristol Bike Project, also located within the UK.⁵ It is similar to Freewheelers in many ways, but it operates on a larger scale and with a wider remit. The Project opened in December 2008 with the intention to redistribute bikes to refugees and asylum seekers. Through their involvement with Bristol Refugee Rights,⁶ the founders were aware of the difficulties that refugees faced in accessing transport, and the importance of being mobile in an urban environment (see Devenish, 2012, for an account of the Project's work in this regard). They began advertising for unwanted or broken bikes, using a back garden, and then a horse stable, to carry out the repairs on any donations. Once fixed, the bicycles were handed out to refugees. The Project rapidly grew and, in April 2009, they moved to a larger space in central Bristol which they converted into a workshop.

The Project's commitment to helping refugees has since evolved into the Earn-A-Bike scheme which takes place every Thursday. This enables people from marginalised communities to come to the workshop and learn some basic skills in bike maintenance and repair.⁷ With the support of a skilled volunteer, they spend 3-4 hours fixing up a broken bicycle which has previously been 'prepped' so that only certain repairs need to be made. At the end of their session, the 'project-user' takes away the bike that they have been working

⁵ <http://www.thebristolbikeproject.org/>

⁶ Bristol Refugee Rights is a voluntary organisation that "provides a place of welcome where asylum seekers and refugees can meet and be supported to play a full part in the life of the wider community and also campaign for the human rights of refugees and asylum seekers" (<http://www.bristolrefugeerights.org/>)

⁷ Not only refugees, but also recovering drug addicts and people with learning and mental health difficulties.

on. Up to six bicycles are handed out in this way every Thursday. Each Wednesday, project-users are able to return to the workshop for free repairs. The shift from merely handing out bicycles to involving the recipients in the repair process reflects a belief in empowerment and self-reliance over charity. As a result of this commitment, the Project won the 'Grassroots' category of the 2011 Observer Ethical Awards.

As a not-for-profit Community Interest Company most of the mechanics at the project are volunteers.⁸ On a Tuesday evening, for instance, skilled volunteers are invited to the workshop to prepare bikes for the Earn-A-Bike scheme. Volunteers are also needed on a Wednesday and Thursday. As with Freewheelers, however, the Project also generates a certain level of income from some of its services. Two mechanics are employed to provide a professional repair service for the community. Some bikes that are donated to the Project are refurbished for sale. The Project also offers a two-stage maintenance course which takes place over two Saturdays. On a Thursday evening the workshop holds the Bike Kitchen which fulfils a similar role to the Tool Club at Freewheelers. There is also a Women's Night held every Monday evening, as well as an evolving programme for teaching young people about bike mechanics.

In total, across the two organisations, I spent around 50 hours in a workshop environment. Given my lack of knowledge about the repair of broken bicycles, I was keen to find out what bicycle mechanics actually do. There were three aspects to my research and these came in sequence. First, I observed. I watched the mechanics move around their workshop, moving from one task to another. I tried to gauge their puzzlement or frustration and to capture the moments of setback or success. I witnessed their interactions with customers and grew to

⁸ Bristol Bike Project is also run as a co-operative and a social enterprise.

identify with the particular bicycles and problems that they encountered. I noted the tools that were used, and the changes that were made. Over time, I built a picture of how mechanics fill the space of the workshop and what the repair of a bicycle involves.

Second, I chatted to the mechanics that are involved in repairing bicycles. Treating bicycle repair as a situated practice might suggest that there is little to learn from such discussions. There is a tendency with such an approach to emphasise the habitual nature of what people do. In the establishment of routine, the elements of a practice can slip from view. And the establishment of routine is not a product of individual endeavour. Indeed, it might be said that people are recruited to a particular practice rather than the other way around (Shove et al, 2012). Nevertheless, along with Hitchings (2011), I found that mechanics are able to talk about their practices. They were able to tell me about the problems that they solve, the challenges they have, the relations they build. In talking to mechanics, I learnt about what they do and how they do it.

Nine of the conversations I had were voice-recorded. These involved the three female mechanics from Freewheelers and six mechanics (one female, five male) from Bristol Bike Project.⁹ The interviews varied in length, ranging from 30 to 60 minutes, and were semi-structured according to the workshop in which the mechanic worked, their involvement in bicycle repair, and previous conversations (see Appendix 1 for a sketch of the questions asked). Most of the interviews took place within the workshop. Many were spontaneous, arranged only moments before. They were often accompanied with cups of tea or coffee. In

⁹ In the chapters that follow, I have used pseudonyms when quoting from the interviews. Most of the participants were happy to be identified, however, and in some cases it is likely that an educated guess can be made about who said what. For those participants that did wish to remain anonymous, I have made every effort to ensure that this is the case.

one instance, we shared a Danish pastry. In all cases, the mechanics spoke with passion about their involvement in bicycle repair.

Third, in my research, I began to repair bicycles myself. In the course of my conversations – in becoming familiar with the workshop environment – I realised that I too could be a mechanic. This was, after all, the practical aim of my research. I wanted to get the Kalkhoff back on the road. And so I attended evening sessions in which I used the workshop and the tools to repair my own bike. But I also helped other mechanics with making repairs to bikes owned by the workshop. Through taking these steps, the learning continued. I began to *feel* the practice of bicycle repair and so my knowledge of how it proceeds, and how it comes to a grinding halt, evolved.

Solving Problems

To understand bicycle repair as a situated practice means exploring how such repair proceeds in accordance with the materials and skills that it enfold. I wish, in this chapter, to focus on the repair of a bicycle in terms of its local emergence – that is, through the interactions that take shape between the bicycle and the mechanic. It is a practice of engagement that revolves around *finding* and *solving* problems. Sennett (2008) suggests that this relationship is recursive – thus, it is in the solving of problems that the mechanic, or craftsman, finds further problems.¹⁰ If there is any achievement of practical equilibrium in the practice of repairing a bicycle then it is in maintaining a steady balance between the two. In the case of my own research, these problems revolve around whether the components of a bicycle can be said to function in the way that they are supposed to. The bicycle, and the mechanic, each play a role in this dynamic.

The bicycle consists of components, all of which are links between other components. According to Burr and Leng (1912), the bicycle is a chain. It is, in some ways, a chain of knowledge. Within each link, experience of how things work best together is solidified. At one level there are discrete components that are assembled together in a particular way to form a bicycle. At another level, each component consists of materials that have in various ways been manipulated and shaped to fulfil their function as the parts of a bicycle. Various options have been tried and tested and have had some sort of effect. It is on the basis of learning about these reactions - of things happening, of contradictions being overcome, of problems being solved, of being able to cycle - that the bicycle comes to reflect in its form

¹⁰ Sennett (2008) aims to understand how people become engaged practically but not necessarily instrumentally. His argument is framed in relation to the craftsman but many of his points are equally applicable to the mechanic. Indeed, there is no clear line between the two.

what seems to work well. It evolves over time and in accordance with the endeavours and needs of its handlers. Those that engage with the bicycle are continually learning about how it can be made to work best and the bicycle responds in its emergent form.

Given that the bicycle has had around 200 years to evolve in this way,¹¹ with the collective effort of all those that have in some way worked with the bicycle and its components, it is not surprising that it tends to be spoken of in positive terms. In the course of my own research, the bicycle was frequently characterised as a model of engineering. As a functioning machine, it carries the rider from 'a' to 'b' more efficiently than other solely human-powered methods of movement. It can be taken into intimate spaces and carry the rider "along the journey of life" (Amos, Bristol Bike Project). The learning curve was steep, however. Bijker (1997) provides an intriguing account of how the bicycle evolved in the 19th Century. In the course of just 30 years, between 1860 and 1890, it matured from a running machine into a two-wheeled 'safety' bicycle. During this time, various innovations were tried and tested in order to establish how the emerging 'bicycle' worked best in the practices to which it was enrolled.¹²

It seems that much of the learning might be complete. As Taylor (2008: p. 215) notes, there were "major improvements in bicycle design in the late 1880s that resulted in a safer, more comfortable form of transportation, one essentially no different from the bicycle we ride today." The bicycle seems to have changed little over the past 120 years. It is not infallible, however. Sometimes, a link of the chain, a component of the bicycle, can break. It is

¹¹ Or more, depending on your reluctance to draw lines.

¹² In particular, Bijker (1997) explores the emergence and subsequent demise of the high-wheeled 'Ordinary' bicycle (later called the Penny Farthing). He associates its rise and fall with competing notions of the bicycle as a sporting machine and as one for safe transport. Its development also links with certain advances in technology (e.g. the invention of the pneumatic tyre which played a key role in reducing vibrations and led to the two wheels of a bicycle reverting to similar size).

constructed of materials that wear down and weaken over time. In the moment of breakdown, the bicycle switches from a coherent entity enabling certain movement, to an arrangement of individual components that no longer 'enable' in the way they used to. The cyclist's practical equilibrium is disturbed. The components of a broken bicycle are projected from the background to the foreground but we might not fully understand a bicycle in terms of its constituent parts. There is, perhaps, a tendency to shy away from such failure, to pass the responsibility for repair onto someone else. In the course of my research, however, there was strong evidence that working with the individual components of a bicycle can also be enabling in some regards.

I've got a bike frame coming so I'm gonna build up a new bike. Yeah, so that will be exciting. It's quite a nice frame someone's given me. That will be fun, building that up. It helps you appreciate the bike more, definitely. So you've put the blood, sweat and tears into it – you've actually made it rather than just buying it and just riding it without really understanding the mechanics of a bike. It definitely puts a different context on it, you know, when you build them up... Well it's not blood, sweat and tears, but a bit of thought and a bit of motivation. Sometimes, it's blood, sweat and tears...

(Rhys, Bristol Bike Project)

Many of the participants in my study talked of building a closer relationship with their bicycle through involvement in its assembly and/or repair. A broken bicycle provides an opportunity for finding and solving problems and, in the process, for learning how it can be made to work. According to the mechanics that I spoke to, such learning is continuous. There are always more components to understand, more problems to encounter, more

skills to perfect. Differently skilled mechanics can thus engage in the common act of finding and solving problems whilst attending to the same object. Indeed, the bicycle was considered exemplary in this respect.

Yeah, aside from what it actually enables you to do, in terms of being mobile, I think they're great to work on actually. This is something I've only discovered recently from doing the project – there's so many different sorts of facets to a bike, some of which are really quite complex like wheel-building or maybe servicing hubs, they do require a certain level of skill, and there's other things which are really very straight-forward which are still important like replacing cables or fixing a puncture, you know, that's the most obvious thing but without that... So I like that about bikes in so much as you've got different facets to them, and different standards and levels of skill that you need to work on them. I think that's a great thing about bikes. I feel like it can be quite a levelling sort of thing and I guess that's got something to do with it as well, the whole skill-sharing sort of thing.... (Hamish, BBP)

The levelling potential of a broken bicycle is linked to the different standards of skill that are required to repair faulty components and the possibility to share these skills. In the practice of repair, the skill of the mechanic develops. The mechanic learns what works and what fails to work. They learn what intervention has the desired effect. They learn how to integrate the elements of their practice in a way that yields improvement. In future acts of repair, such knowledge is applied and develops further. The bicycle, in its responses, in its ease of play, has a role in this dynamic. Again, it seems to excel in this relationship.

There's definitely something there with the bicycle, it's a bit of a magical object... it's almost like a channel for people to learn through... Maybe it's partly because everything is so kind of visual and you can see the way things are working and it's kind of intuitive and it makes sense. So it's right there in front of them and it's really obvious – anything that they do has a consequence and you can see that happening. It's really tangible to see improvements that you make. (Norman, BBP).

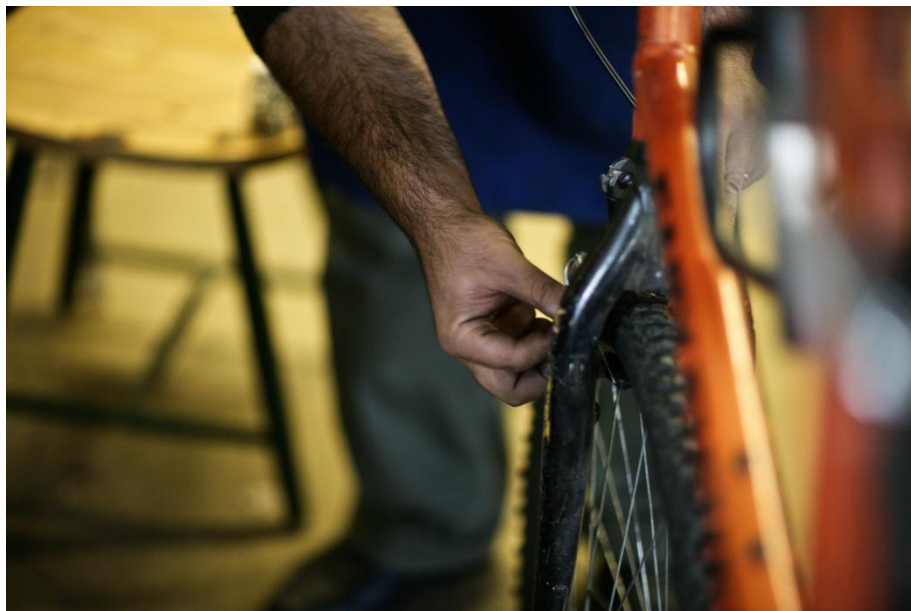


Figure 3: Fixing brakes (source: Bristol Bike Project)
Repairing a bicycle involves solving problems.
The replacement of rusty brake cables is a common task

The bicycle mechanics that I spoke to invariably referred to punctured inner tubes or rusty brake cables as the most basic problems that need repairing . In attending to such issues, the learning mechanic is privy to the fruits of his or her labour. Where the components of an object are exposed and of reasonable size, the link between the cause and effect of a mechanical problem is tangible. Possible solutions can be tried out and evaluated with

immediate reference to the symptoms of failure. There is also little danger that a mistake will prove irreversible or that harm will come to those that carry out repairs. Sophisticated tools are not required. Knowledge is made accessible.

It's a very sort of simple, mechanical object... most things you can do with a spanner and a set of Allen keys... tools that people might have used before in their life... And as an object I think it's really simple... ok things might go ping and everything falls on the floor, but generally it's only three or four bits that you need to find again. Even if you don't have anyone around you or you don't have a book there to explain what is going on you can probably figure out in what order to put it back on. Or even if you stick it back on in the wrong order it will probably still work... And also most problems you can solve in a short amount of time... so yeah I think it lends itself nicely for that. And it's big as well - you can see what's going on...
(Hazel, BBP).

The description of the bicycle as 'simple' is in some ways misleading and in other ways not. In the words of De Laet and Mol (2000), to whom I will return, certain technologies can be 'advanced in their simplicity'. Such simplicity allows for the mechanic to achieve a measure of competence in repair work with relative ease. It also allows for interactions with simple technologies to become ever more sophisticated. Our ability to find and solve problems develops in complexity and skill. And so it is with the repair of a bicycle. In the earliest stages of learning, the exposure of a bicycle's components enable the mechanic to make visual links between the symptom and the cause of a problem. Not all problems have an obvious cause and solution, however. There were many instances during my research when

the mechanics needed time to uncover the root (or, rather, route) of a problem. They had to unearth the faulty components through a practical exploration that would provide clues as to the cause of malfunction.

We've gone through different stages – I think we've got a bit more efficient now. You learn which bit to do first... and what would be a waste of time. A lot of it's just trial and error – adjusting brakes or whatever – maybe with more knowledge you'd know what problems are straight away but maybe you wouldn't – opening things up to work out why something has become loose (Pippa, Freewheelers)

It is not only that the bicycle allows for exploration in problem-*finding*, then. It also allows for exploration in problem-*solving*. Both problems, and their solutions, tend to reveal themselves over time and through interaction. The bicycle is prodded and probed, and it seems to “talk back” (Rosie, Freewheelers). It is through repeated interference with the bicycle that a mechanic becomes skilled in its repair. This communication is a multi-sensual engagement. It is a learning process in which the mechanic develops a tacit knowledge of how the bicycle should look, how it should sound and how it should feel (see Dant, 2008 and 2010). It is a knowledge that evolves through interactive practice with the parts of a bicycle and it is a knowledge that can be applied in future repair work. Indeed, it is worth stressing the *variety* of bicycles that mechanics tend to handle. They differ in their age, their make and, relatedly, the functioning of their components.

And there's lots of variation as well so there's lots of variants of gears and brakes that you might not have come across. You know, you might be used

to cantilever brakes or v-brakes, and some other funny thing shows up.

(Jeremy, BBP)

In encountering new components and new problems, the possibility that mechanics can try something out on a bicycle without causing irreparable damage remains important to their learning. It enables the mechanic to proceed through trial and error and to develop a feel for where problems might lie. There is difference in the problems that a mechanic deals with but there is also similarity. The bicycle allows for the mechanic's tacit knowledge to be both applied and improved. Rusty brake cables on two different bicycles will similarly need replacing but their removal may vary depending on the brake mechanisms of which they are a part. A mechanic's exploration of a problem is rarely aimless. It proceeds according to an intuitive sense of how a symptom might be linked to a cause. The bicycle invites such links to be made but it also enables new ones to be established.

Yeah, actually bikes change quite a lot and there are specific courses for mountain bikes and road bikes, and then more advanced ones, because the technology develops all the time - different materials for the frames etc. But then there's also some stuff that's always the same or some kind of knowledge that you can apply to newer stuff. But maybe the first time you see it, it takes you a while to work out how it's going to work. (Rosie, Freewheelers)

The bicycle, then, is an object that allows for knowledge about its inner workings to be accessed and embedded in the tacit knowledge of the mechanic. Its components provide ready indication of whether they are willing to work together and they provide subtle multisensual hints about how their collaboration might be brought about. Indeed, it is not

only that old knowledge is extracted from the bicycle/mechanic, but that new knowledge is also imposed/embedded. The flexibility of the bicycle, and the honing of skill, mean that elements can be brought together in new ways and that new solutions can be found.

It's a very ad hoc scenario here generally speaking. We wing it and make it up as we go along a lot of the time. You know, that's how solutions are found. I love that, it's how you find creative solutions. Because we haven't got this, that, that or that, we'll have to do it with something else, in my case, a power drill or preferably an angle-grinder - the loudest most dangerous tool in the project. So I really like the fact that it's practical, hands-on effectiveness and really we're there to get the job done in a whole-hearted and good-natured way. (Amos, BBP)

I suggested at the beginning of this chapter that the achievement of 'practical equilibrium' in the practice of repairing bicycles is to do with achieving a steady balance between finding and solving problems. Whether the bicycle enables the ongoing flow of problem finding and problem solving is partly to do with the flexibility that is, or is not, invested in its design. As I have shown, many of a bicycle's components are designed and linked in a way that enables mechanical problems to be found and solved in equal measure and recurring manner. Through trial and error, and a process of exploration, the mechanic develops a tacit knowledge of what might be wrong with a bicycle, and how it might best be repaired. It is through a multi-sensual engagement with the bicycle that problems can be found and, just as importantly, problems can be solved. By way of concluding this chapter I wish to compare the bicycle to the Zimbabwe Bush Pump.

The Zimbabwe Bush Pump 'B' type is, according to De Laet and Mol (2000), a fluid technology. It works in different ways because it is caught up in different arrangements – it has different definitions and is therefore differently situated.¹³ In terms of its mechanical working, of particular interest here, the pump is advanced in its simplicity. The network through which it can be made to work is not overly complex and, as a result, it shifts relatively easily between the 'broken' and the 'fixed'. Neither category is an ultimate state because the bush pump is made to last, not to be immutable. In the water-scare communities of rural Zimbabwe "an object that isn't too rigorously bounded, that doesn't impose itself but tries to serve, that is adaptable, flexible and responsive – in short, a fluid object – may well prove to be stronger than one which is firm" (De Laet and Mol, 2000: p. 226).

The components of the Zimbabwe bush pump are manufactured in Harare. The drill required to bore the well is produced in the same factory. With a set of instructions, the local community in need of the pump are brought together in its assembly and installation. It is the components of the pump, rather than the pump itself, which are distributed to communities in need. Once installed, the pump is designed in such a way that, should it malfunction, it is relatively simple to repair. Faulty components, even those hidden from view underground, can be removed for inspection without the need for full disassembly. If a component of the pump appears beyond repair then replacement parts are available from Harare. But most of the components do not break beyond repair.

¹³ De Laet and Mol (2000) consider the Zimbabwe Bush Pump in terms of its role as a water-producing device, a type of hydraulics, a sanitation device, a technology of manufacture and design, a focus around which the local community is mobilised, and a resource for building Zimbabwe as a nation. In each arrangement, it works, and fails to work, through a different set of relations which nevertheless have a common component – the bush pump itself.

The pump is simple enough, mechanically, to allow for 'ingenious adaptation'. It can be made to work without its original components. Once embedded within particular communities, the design and manufacture of the Zimbabwe bush pump is therefore on-going. Its breakdown and repair allow for surprises and for lessons to be learnt. Its future is uncertain. It is not predetermined in its working form but can be made to work in new ways that simultaneously suit the needs of its user community and the tools/resources they have at their disposal. In its evolution, and the community's ownership of this process, the situated bush pump thus comes to contain a variant of its environment. There is little likelihood of it becoming an alien object and, in this respect, it is made to last.

If there is a hero in this story, or a 'heterogeneous engineer', then it is a fluid hero. That is, "[t]he success of a technology does not necessarily depend on an engineer who masters the situation and subtly subdues everyone and everything involved" (De Laet and Mol, 2000: p. 227). How the pump evolves and how it changes is not dictated by a single manufacturer, designer, global conglomerate, nor any other single controlling entity. Indeed, the designer behind the bush pump is characterised as a mere facilitator – a peripheral agent. Control over how the pump is made to work is decentralised – it is distributed, along with the components of the pump, through the different communities in which the pump can provide a useful resource. On this basis, I tend to agree with De Laet and Mol that through the bush pump, power is dissolved. Furthermore, "sometimes abandoning control may contribute to spreading what one has been making" (De Laet and Mol, 2000: p. 250).

The bicycle, similarly, allows for power to be dissolved. In its breakdown and repair, the assessment of whether something works or not,¹⁴ as well as the capacity to make that something happen, can pass to the bicycle's user community. It allows for faulty components to be identified and removed, and for new working arrangements to evolve. The broken bicycle invites the user to take ownership of its future and to learn in the process. The interplay of problem-finding and problem-solving is not contained within a powerful core. The bicycle's on-going emergence rather belongs in the public domain – the result and the medium of collective action. Like the bush pump, the bicycle's design and manufacture is also decentralised – this time, throughout the workshops, garages and sheds in which problems are fixed (often creatively), and broken bicycles are restored to working order. Like the bush pump, the bicycle is also a fluid entity. The bicycle, also, is advanced in its simplicity.

¹⁴ Drawing on the auto-salvage yard, Soderman and Carter (2008) make a similar point. They suggest that a sense of agency is recovered in deciding whether and how second-hand material can be of value.

The Limits of Knowledge

I suggested, in the previous chapter, that the bicycle is simple enough for the mechanic to explore, and thus to learn, how it can be returned to working order. It allows for connections to be made and for problems to be solved. For many cyclists, however, a broken bicycle is not so simple to fix. In certain cases - in certain spaces - the practice of repair does not unfold. The mechanic and the bicycle only bring certain possibilities to their encounter. Their interaction is, in some ways, predetermined by the wider structures *from* which they emerge, and *within* which they are situated. These relations enable the process of problem-finding and problem-solving to recur, but they can also prevent it. So, whereas a broken bicycle can be empowering, it can also prove disempowering. There are barriers to the practice of repair and these span the social and the material. In this chapter, I wish to consider the moment at which a problem proves irreparable and a broken bicycle must be passed to someone else for its. In particular, I want to explore why such moments come to be.

As in Chapter 3, the bicycle is repaired in ways that demand varying levels of skill. It can be broken in different ways and, for it to 'work' once again, (only) certain problems need addressing. A mechanic may be skilled in working with some components but less skilled with others - a faulty headset is not solved by truing the rear wheel. A mechanic can therefore be presented with problems that make little sense. Whether they lack the necessary tools and equipment, or the confidence and skill that are required to use them, they are missing one or more of the elements that need integrating for repair to take place. It means, in many instances, that a mechanic yields control over the future of a bicycle to someone else. They enrol the expertise of someone that is differently situated within the

many relations that surround a broken bicycle and its repair. The bicycle repair shop is a common port of call. It provides a service through which the cyclist need only engage with their bicycle as a working object.

And I kind of think, yeah, bike mechanics could be for everyone. But that might just be an idealistic view that I hope for. I don't really know. But I think everyone's capable within the realms of physical capability... But maybe people not having the confidence to think "oh I could actually do this job myself". That's probably actually a massive part of it, so people think "this person's paid to do a job, they must be good at the job so I'm going to leave it to them, to the guys that know what they're doing", but not having the confidence to actually get stuck in themselves. (Norman, Bristol Bike Project)

The delegation of work means that the practice of repair, of finding and solving problems, is relocated. It is organised according to the terms of someone else. They find their own problems and fix them in their own way. Indeed, sending a broken bicycle to a repair shop means submitting to the relations through which such a service operates. During my research, it was suggested that professional outlets tend to withhold certain knowledge from their customers. The repair shop has little interest in equipping the cyclist with information that might lessen their custom.¹⁵ The owner of a broken bicycle is therefore prevented from making informed choices about the repairs that need to be made, and how this should happen. Knowledge about how a bicycle can be made to work is held within a

¹⁵ Bicycle repair shops were, for instance, seen to pay more attention to maximising profit than minimising waste. The use of second hand components in repair work generates less income for the service providers than the use of new parts.

centralised social unit. In submitting to the control of a business, the cyclist is rarely privy to the process of repair. It is only through transparency, however, that a cyclist becomes knowledgeable about how to repair bicycles, or, at least, how bicycles should be repaired.

...the shifters had these tiny screws which loads of shifters have and they were stuck... That was really difficult to explain to her because we needed to drill these and it might go wrong... I think a bike shop maybe would have just said “you need new shifters” and she would have believed, you know because people don’t know. Whereas we were trying to save the shifters and it worked, but maybe sometimes the answers we give to people are a bit weird, like “we are going to do this” and maybe they’re not used to that. But I think then at the end they really appreciate it because they know what’s happened and they go over the bike and it’s working. (Rosie, Freewheelers)

Conventional repair shops were rarely seen to involve the customer in the repair of a broken bicycle. The cyclist is thus removed from the learning that comes with finding and solving problems. Much of the time, they are drawn to such delegation because they lack the necessary elements to engage in the practice of repair themselves.¹⁶ The cyclist and the mechanic are enrolled differently within the social and material arrangements that surround the repair of a broken bicycle. Whether they have the skills, the tools and the confidence to repair a broken bike is to do with the relations in which they are suspended.

¹⁶ Of course, a cyclist might also lack the time to carry out bicycle repairs. As noted by Hazel in Chapter 3, however, many of the problems that are encountered with a broken bicycle can be solved in a short amount of time. I therefore have greater interest in the (perceived) lack of knowledge that directs a cyclist to the repair shop.

In the discussions that I had, for instance, several of the mechanics referred to entrenched notions of masculinity and femininity as impinging upon the repair of broken bicycles. In many parts of the world, practices that involve oil and grease, and spanners and hammers, are associated with dominant versions of masculinity (see Bix, 2009, for instance). As products of our time, we are socialised into such lines of thinking and acting, and systems of meaning therefore have practical consequences. Indeed, they have implications for the repair of a bicycle.

Most women, I think they just come because they don't know anything about their bike and they want to learn. Talking from personal experience about learning from men, from having a dad as a kid when I was growing up, I know that quite often men or people that know what they're doing will just go "look, I'll just do it for you". And maybe with mechanics there's obviously more men who know about mechanics so women, maybe quite often, just don't get the chance to learn...So I think that's maybe the appealing thing from one side, that women come and they know that they're not gonna have that confrontation and they'll get the chance to learn it. (Hazel, BBP)

The cyclist and the mechanic bear the marks of a social system. It is a system that organises who is likely to learn the intricacies of a bicycle and who is less likely. They encounter a broken bicycle with different resources at their disposal for they are situated differently. It may be that such differentiation is arranged along gender lines. Other factors might also play a role. Having the necessary elements available, and the skill to integrate them, might also relate to class, or age, or some other structure within which a cyclist is situated.

I'm sort of from the dirty handed school of life, so I feel like I'm sort of slightly underclass as a consequence of that. I think there's the white-collar/blue-collar thing. I think there's a massive divide in this country on that front and those who don't get their hands dirty have a sort of cultural disdain of those who sweat, and those who actually manually exert themselves.... other people actually do the bodily work of making shit happen... I mean a lot of people aspire towards that lazy-assed way of everything working... hence we get a lot of our donations from people like that - perfectly good bikes, you know, they ride them five times and they get a puncture, and it's been sat in the garage ever since so they give it to us... I think there's something of a compartmentalised world of expertise where what you do is take it to the place it will be mended because you don't know about such things... (Amos, BPP)

If the cyclist lacks the skill, the confidence, the desire, or the sense of responsibility, to repair a bicycle then it is unlikely that they will take ownership of the repair process. We should not be led into thinking, however, that the blame lies merely with the cyclist. They are the offspring of a social arrangement that links many forms of practical work to the working class male. They are also borne of a structure that tends to value the new over the old. Indeed, this is perhaps most clear when we switch our attention from the cyclist and the mechanic to the broken bicycle that is encountered.

A bicycle is repairable to the extent that its problems can be isolated and treated. Replacing a broken bicycle is not the same as replacing a faulty screw. A problem is being isolated and treated at a different level. 'Brokenness' is defined at a different stage of interaction.

Making a transition from the faulty bicycle to the faulty screw is partly to do with the skill of the mechanic. But the broken bicycle also plays a role. It is an object to which we react. It has a particular form. It is an object which, in some way or another, needs repairing. As in Chapter 3, the design of a bicycle can be helpful in this endeavour. A punctured tyre can be removed and its hole can be sealed. A rusty brake cable can easily be replaced with a new one. But the bicycle can also be a hindrance in the practice of repair.

Bike mechanics, and everything that's evolving with bicycles and technology with bicycles, is definitely making bicycles less serviceable. You see now a lot of units are just getting sealed up so you cannot get inside there. So things like bottom bracket units... or when we were looking at the wheel hub? So at the moment you can take off the cone, you can see each individual bearing inside and so if one bearing is worn you can just replace that one bearing and seal it back up and that's all good to go. Whereas now they actually sell effectively the cone and the bearing and the race on the inside of the hub in a sealed unit so once that's gone you've just gotta replace the whole thing... And I think that's true for so many things.

(Norman, BBP)

Whereas the bicycle consists of many components that are accessible and of reasonable size so as to enable repair, some components are sealed up. They prevent problems from being isolated and treated. The process of finding and solving problems is brought to a premature end. In the case of a malfunctioning wheel hub, the mechanic may well be able to identify the problem. Even though the bearings are not exposed, the mechanic can *sense* that the problem is, indeed, a worn bearing. If such a bearing is accessible then it can be replaced

and the wheel hub can be repaired without excess waste being produced (i.e. the other bearings and subcomponents that sit within the unit). The sealing of units thus prevents the mechanic from extracting the full value of a component – the other bearings might not be worn but they must nevertheless be discarded.¹⁷ In this way, the mechanic must often submit to the power of a system which places less value on the repairable.

I find it offensive that you have to throw a whole wheel away just because they don't sell you this bit that they are actually producing. I think that's planned obsolescence; definitely, there's no other way of calling it. They are saying we'll give you these cheap wheels but because they are cheap you need to keep buying them in a year and a half. And that they don't tell you in the shop, that's what really annoys me - that people buy these bikes and they look really nice and they have lots of gears, but they have a freewheel instead of a cassette which is a way of having a seven-speed but actually the quality is much worse. They have wheels that are really basic so they cannot be serviced and things that people don't see because for them it's a wheel. (Rosie, Freewheelers)

The need to replace bicycle components, before they have had opportunity to last, was frequently linked to their being cheaply made and mass-produced. As with the mechanic, then, the broken bicycle also bears the marks of a wider system. It is manufactured in relations of production that manifest in the shape of sealed components, parts that cannot

¹⁷ One argument for encasing bicycle components within sealed units is that they remain in working order for a longer period of time. Protection from the elements need not require that components become inaccessible however. Some gear systems are contained within the rear wheel hub of a bicycle but they can still be accessed for repair.

be replaced, and weak materials. They also manifest in suspension mechanisms and hydraulic brake systems that require specialised machinery if they are to be interfered with.

You see lots of bikes around that seem to be, in my opinion, over-engineered, you know with lots of suspension and stuff. And I imagine 90% of people haven't got a clue how to fix it if needed. So I think that would contribute to people just chucking a bike away, especially kids' bikes, they seem to have lots of gears as well, you know, just for riding up and down the street. (Miriam, Freewheelers)



Figure 4: The Viceroy (source: author)

*In the end this child's bike could not be repaired as its saddle post was bent.
The range of tools that Freewheelers own can be seen in the background.*

At some stage of problem-finding and problem-solving, both the cyclist and the mechanic must submit to the systems of provision that are already in place. All bicycles, all components, all materials, are sealed to some extent. The broken bicycle cannot be repaired in completely new ways. Indeed, if it could be, the mechanic would also be an engineer, a

welder, and a miner. The replacement brake cable comes from somewhere. And so do the new bearings for a wheel... if only the hub could be opened up. It becomes apparent at such moments that the mechanic has only limited resources at his or her disposal solve the problems that are found. At this point, the mechanic must relinquish control over a broken bicycle to the terms on which other people, other industries, find and solve problems. So while the bicycle might be compared to the Zimbabwe bush pump, it might also be compared to a modern pop-up toaster.

Every morning, in kitchens throughout much of the Western world, the toaster is enrolled in the preparation of breakfast. For many of us, the making of toast is so habitual that it can easily pass beneath our notice. It is merely one other task that colours the flow of our morning routine. Along with various other kitchen utensils and food items, the toaster is just another object caught up in such ritual. As Molotch (2003) remarks, the toaster provides a 'semiotic handle' that guides us in our endeavours. We are well practised in its use and it makes sense to us. We know how to connect it to the mains, and we know how to insert the bread. We know how to use the dials and levers in a way that will produce toast. We know how to give the toaster power in order that it might serve us. The elements of this practice – of making toast – are integrated on such regular occasion that they become part of our disposition, our practical knowledge, of how to make the world work. Indeed, if we are to dwell for too long upon the elements of toast-making, and the way in which they interconnect, then breakfast might never be made.

I will hazard a guess, however, that the modern toaster is, for most of us, a black box (or cream, or red, or pink). It is a box in the sense that its outer casing is solid and fixed. It is also a box in the sense that it contains things that are unknown to us. Much of the knowledge

contained within a toaster's working is hidden from our view. Should the toaster break down, and fail to provide us with toast, few of us would venture inside to inspect its components. Perhaps, if it were possible, we would undo a couple of screws and remove its box-like casing. But the screws of a modern toaster are difficult to find. Even if we were to somehow strip the toaster of its outer layers, it is unlikely that we would fully understand its internal workings. The apparent simplicity of a toaster, as a device for heating bread, belies both a complex interior and a complex exterior.

Thwaites (2011) grapples with such complexity in attempting to make a toaster from scratch. It turns out, for instance, that a standard toaster is made up of at least 404 individual bits and at least 38 different materials. There are plastic casings, copper wires, brass screws, rubber bungs and "a strip of weirdly damp paper" to name but a few. Such components are made from materials which are extracted, treated and brought into reaction in particular locations a long way from the kitchen. The production and distribution of a toaster is dependent upon an infrastructure that is industrial in its scale and global in its reach. It is an infrastructure that, over time and space, becomes ever more sophisticated. As Thwaites explains:

I'm interested in the economies of scale in modern industry, the incremental progression of science and technology, and exploring the ever-widening gulf between general knowledge and the specialisms that make the modern world possible. (2011: 15)

For the breakfast-maker, with only certain resources at hand, the layers of knowledge and skill that go into making a toaster work are inaccessible. They are presented in solid, impenetrable form. Where the Zimbabwe bush pump was fluid, the toaster is fixed – a finite

entity. It seems to work in one way and one way only. The toaster's production leaves little space for our own innovations. Thus, in its breakdown – in its failure to present us with toast – the toaster becomes an alien object. The breakfast-maker is not empowered in such moments because problems cannot be solved without submission to the terms of something other. We become subject to the control of a system which removes our waste and pulls us towards a cheap replacement. In the case of toaster failure, we are often helpless in our surrender. The category of 'non-working' becomes a final state. The toaster is not designed to be fixed.

I suggested in Chapter 3 that the broken bicycle allows for a sense of agency to be recovered by the mechanic. I suggested that, like the Zimbabwe Bush Pump, the bicycle represents the dissolution of power – the power to innovate, to fill spaces, to bring the bicycle into the future. The bicycle is not always a channel of empowerment, however. It can only be made to work in certain ways and there is, therefore, a rigidity to its functioning as a resource in everyday life. Only certain components will do the job and we have only restricted insight into their inner workings. There is a practical knowledge embedded in its form which the mechanic will never fully master. The bicycle is the product of a layered, complex, and sociotechnical machinery that the mechanic could never aspire to control.

Wednesdays and Thursdays

The bicycle is, at once, both fluid and fixed. It changes in its form and, as such, it can shift from the 'working' to the 'broken' to the 'repaired'. It has gaps which can be filled and it can be made to work in new ways. It is always incomplete. The bicycle is also the product of an order, however. It is suspended in relations that constrain what is possible. It holds a form that bears the marks of the wider system from which it emerges. The bicycle's future is not, entirely, uncertain. The mechanic has similar traits. He or she only has a measure of competence. Mechanics are anchored in the structure of a social architecture. Their knowledge is borne of a world that differentiates. They are situated. But mechanics also learn. They discover what works best and bring this knowledge into effect. They find and solve problems and, in the process, they become more adept in such practice. It is through an understanding of both order and progress that I wish to frame the practice of bicycle repair. In this chapter, I hope to consolidate these points by focusing upon the workshops through which such practice unfolds.

The workshop is an organising element in the repair of broken bicycles. It is not a neutral space. It is a normative medium through which bicycle repair happens. Indeed, along with the bicycle and the mechanic, it is one of many such elements. The workshop ensures that repair is practiced in a particular way. It also shifts, however. It is a different workshop at different times. I will use Bristol Bike Project as an example. On a Monday, the workshop is used by women and women only. They either bring their own bicycles or work on bicycles that have been donated to the project. Certain bicycles are fixed and certain skills are employed. In the on-going flow of practice, in the interaction of bicycle and mechanic,

certain structures of meaning are brought into play (see Chapter 4). The practice of repair comes to reflect the manner in which such elements come together.

We had quite a lot of volunteers straight from the beginning that were coming in so quite often there was more people around to be able to help and there were women coming in to fix their own bikes... we were sometimes repairing the bikes from the project but now it's just too busy most of the time. It's just women coming in and fixing their own bikes with the help of us. There is like a pool of maybe five regular volunteers. Pretty much most of the women that come in, they definitely need help. There are a few regulars who come just to use the workshop and they know what they're doing. (Hazel, Bristol Bike Project)

In designating a particular evening of the week as Women's Night, and in providing a particular space for such an evening, the workshop is a central element in the practice that unfolds. It takes a mediating role in the encounter between a broken bicycle and a female mechanic. The space is ordered in a way that enables women to repair bicycles. It provides the bike stands, the tools, the repair manuals, and, importantly, the assistance that enable repairs to take place. But the workshop shifts in its role. It is an organising entity that is brought into alternative arrangements, depending on *who* is invited to attend. On a Wednesday evening, it is home to the Bike Kitchen. This is a workshop to which anybody can come along and fix their bicycle.¹⁸ It tends to be mostly men. In this workshop, the practice of repair unfolds differently.

¹⁸ Freewheelers, similarly, organises its workshop in such ways. It holds a 'Tool Club' every Wednesday evening for mechanics to come and use the tools and equipment to repair their own bikes. The first Wednesday of each month is for women only.

I think it isn't so much a skill-sharing space. And to be fair it isn't really meant to be I suppose. It's meant to be a space where people can come and use the space and use the tools, use the work stands, and it's actually pitched on the website that you don't really receive much help. Someone might be able to give you a pointer here and there but we expect you to be able to fix your bike rather than come and we'll fix your bike for you... It's interesting to look at the contrast of the two. I'd say there's definitely an idea of if you bring your own bicycle, if your own bicycle needs fixing, you know you've got three hours and you know you've paid four pounds, you wanna kind of get your money's worth and you wanna kind of be heads down and get on with fixing your bike. (Norman, BBP)

The descriptions of Hazel and Norman stand in sharp contrast. There is a difference between a workshop that only caters for women and one that (mainly) hosts men. Yet there are links between the practices they portray. They proceed on common ground. The tools are a relative constant in this regard. They provide assurances as to how things should be done, how bicycles should be fixed. The many boxes of spare components remain in the same place, ordered along the shelves or hanging from the rails that line the ceiling. Their positioning gives sense to a movement and it is a meaning which remains stable so long as the components are still there. The social arrangements that take up the workshop space are themselves repeated. Women's night is held *every* Monday evening and the Bike Kitchen is held *every* Wednesday evening. Many of the same people are there. A practice is established in such routine.

One woman sort of came as an apprentice because she didn't know much at all but she had a real interest in bike mechanics so she just used to come and help and learn like that. And then there's a few sort of odd ones that just come back maybe every week for a month or two, just sort of tinkering away on their own bike, they keep coming back, like "my brakes are still not perfect!". And then they just hang out and help other people as well. (Hazel, BBP)

The bicycle itself might also be a constant. Some attendees on a Monday and Wednesday night bring the same bicycle, week in, week out. But like the tools of the workshop, the broken bicycle might also pass onto someone else, into some future arrangement of repair. The continuity of a practice – its stability as a coherent entity - is ensured through the sharing of its constituent elements. I will make this point by referring to the project's Earn-A-Bike scheme (see Chapter 2). On a Tuesday evening, volunteer mechanics repair bikes that have been donated to the project. This workshop closely resembles those which I have already described. The spare brake blocks are still boxed, and the spare wheels are still hanging. The same kettle boils. Mechanics are still repairing bicycles. The mechanic, however, is also equipped with a 'prep sheet'. There are boxes to tick once certain components are checked for their performance and, in case of fault, attended to. Perhaps, then, there is a different order to this repair. I will have to venture into Thursday to explore this point.



Figure 5: The Workshop (source: Bristol Bike Project)
*The organisation of the workshop gives sense to particular movements.
Spare wheels can be seen hanging from rails.*

On a Thursday, Tuesday's bicycle is enrolled in further acts of repair. The broken bicycle is passed, overnight and without its physical movement, from one mechanic to another. Its provision ensures that, at least within the parameters offered by a broken bicycle and the other elements served up within the workshop environment, the practice of repair is stable. The same prep sheet is taped to the bicycle's frame. In certain terms - in the integration of certain elements - the workshop on a Thursday is similar to that of a Tuesday evening. The practice of repair is reproduced.

There is an important difference, however. On a Tuesday, the bicycle is repaired by one or more mechanics. On a Thursday, the bicycle is repaired by one or more mechanics *and a project-user*.¹⁹ The Earn-A-Bike scheme redistributes second hand bicycles to people from

¹⁹ Bristol Bike Project has a referral system in place with a variety of organisations within Bristol. Their main link is with Bristol Refugee Rights but project-users also include people with learning difficulties, recovering drug addicts and people from other marginalised groups.

disadvantaged communities. In return for the bike, the recipient must first attend a 3-4 hour session at the workshop in which they learn how to carry out basic repairs through completing the repairs on their own future bike. They are supported by a skilled mechanic who ensures that the necessary repairs are made and that, as far as possible, their apprentice takes ownership of this process.

Especially with something like a bike, where it's so tangible because you fix it up, and then sit on it and you cycle off, it carries you off. And if you know you've made that happen through putting some time and energy in, and learning new skills in the process, I don't think it can not be an empowering experience. Even if you don't necessarily realise it at the time. Maybe if you had a bad experience and it wasn't done right, and you felt the person you were working with wasn't very supportive or made you feel like you didn't know what you were doing, then it would be a sort of disempowering thing. It would probably not be a good experience. So I think as long as the people that are working... that supporting and helping the project-users is done right - that's really crucial - then it should always be an empowering skill. (Hamish, BBP)

Thus, on a Thursday, Tuesday's bicycle is enrolled into a different set of relations and the practice of repair unfolds anew. Indeed, the bicycle is in some ways a different bicycle to the one encountered on Tuesday evening. It has had stuff done to it. It has been *prepared* for the Earn-A-Bike scheme. The prep sheet, it turns out, also bears the mark of practice. It conveys a division of labour. Boxes have been ticked. For one reason or another, the majority of bikes that are donated to the project are mountain bikes from the 1990s. As a

mark of the time, they are simple enough to fix and the workshop tends to provide the necessary infrastructure for such repair to occur. Nevertheless, there are important reasons for the broken bicycle's preparation in advance of an Earn-A-Bike session. The prep sheet represents the differentiation of skill.

And how I see it now is that all the bikes that have been prepped have problems that can be solved. You know, we know that they can be solved within three to four hour time slots. That's how I look at it. So they're there waiting to be solved and sorted out. But we know that that can be achieved rather than going to something not knowing. So I think the preparation is absolutely crucial. That happens a lot, you know, you get a bike and then you start working on it and then you realise, "ah, actually..." and then the person you are working with as well is going to lose interest. So I think it's good to be able to go to a bike and say "right, we've got this, this and this to do" and to be able to explain to them and for there to be that sort of clarity around it. Because I think it's easier to engage them like that. (Hamish, BBP)

The workshop space, along with the tools, resources, and many of the bikes and mechanics that the workshop contains, passes from one day to the next. It is through these subtle, elemental incursions upon future practice, that the workshop is stabilised as a coherent entity and bicycle repair becomes an established practice. The workshop becomes a meaningful space and the repair of broken bicycles accords with such meaning. But the workshop allows for different encounters to take place. It is organised so that bicycles can be prepped but it is also organised so that bicycles can be earned. Indeed, one practice

feeds into the other. The repair of a bicycle is not merely the product of an established social order. It also provides the bedrock for a new social order to emerge. Practices yield change which future practice must in some way accommodate. The elements of bicycle repair do not flow unchanged through their integration. They mature with their integration. The mechanic, the bicycle and the workshop are all shifting and they can come together in new ways.

In the earlier days everyone just wanted to sort of service the community really and so they let too many people in, if you came in here it just looked like a sweatshop and I think some of the volunteers forgot that this was a place to enjoy.... It has got borderline dangerous in the past, I'd say, just because it was too liberal and no one was taking control but now we've got this sort of coordinator system so we've got some people that are sort of nominally in charge, running the session... We've cracked down on all that which makes us more professional, it makes our integrity and makes our boundaries, and I feel much safer within such boundaries. I didn't like it beforehand. People were stressed, my colleagues were stressed, there wasn't much communication between people, it wasn't pleasurable...

(Amos, BBP)

Bristol Bike Project is an evolving workshop and this takes shape in its organisation of repair. It is not only that the workshop manifests difference of a cyclical order (i.e. it is not only that Women's Night is held every Monday evening and the Bike Kitchen is held every Wednesday evening). There is also linear progression here (Lefebvre, 1992). From its inception, Bristol Bike Project has become more professional. The prep sheet has been redesigned; more

tools have been bought; new workshops have been established. In some ways, it is the fluidity of the workshop that has allowed the practice of repair to become more organised. In other ways, the organisation of the workshop allows the repair of bicycles to proceed in fluid order.

I very much feel a man out of his time in a way, in as much as all the protocols and procedures and bureaucracies and health and safety and risk assessments... It's not that I'm saying we don't have anything like that but it's very much a culture of common sense here... It's not the sort of stuff that you ever find on forms or papers or in organisations that are over-regulated. So if you like, it's the sort of lack of regulation that allows the heart to pump. These over-regulated things are like a restrictive rib cage, they have sort of bureaucratic corset on the thorax of the organisation which sort of strangles the heart out of it. But this place doesn't. Infrastructure's coming as we need it and not the other way around.

(Amos, BBP)

Conclusions

At the very beginning of this dissertation, I pointed to the vast array of objects and material things through which our lives are lived. I noted that such objects can sometimes break down and I raised the question of how this process should be understood and managed. The material world is often only described in terms of its reliability as a stage for social life to unfold, or in terms of its dissolution. I suggested, however, that there is much to be learnt in the moments between the apparent failure of an object or technology and its return to working order.

In particular, I was keen to explore how things are made to last through their repair and maintenance. The notion of practice is helpful in this regard. It suggests that objects only make sense, and only 'work' (or otherwise), through the web of social and material relations in which they are suspended. In adopting such a framework, a certain object is just one of many elements that enable things to happen in ways that we find meaningful and useful. Each element, furthermore, is the product of connections that extend beyond its conventional bounds. The repair of an object therefore proceeds in accordance with the wider social order from which its elements emerge and which makes the integration of such elements possible. Object repair can thus be considered a situated practice. It unfolds in line with circumstance.

It is through applying this conceptual framework that I explored how bicycles, in particular, are made to last. Drawing on empirical research, I considered some of the elements that are brought into play in the act of repair and how, as a result, the act of repair is both enabled and constrained. Thus, in Chapters 3 and 4 I focused on the broken bicycle and the

mechanic. My intention was to show that whether and how a bicycle is repaired relates to the flexibility of a bicycle and the potential for the mechanic to learn.

In Chapter 3 I suggested that the bicycle enables, in its very design, for problems to be found and solved. It is characterised by a simplicity that invites the mechanic to learn what works and, in the process, to become more skilled in returning a bicycle to working order. I proposed that the accessibility and size of the components, as well as the simplicity of many of the tools that are needed, invite even the most inexperienced of mechanics to make connections between the cause and effect of a problem. I went on to suggest that even where the cause of a problem and its solution are not immediately obvious, a broken bicycle allows the mechanic to explore, experiment, and proceed through trial and error in ways that are productive.

Through finding and solving problems in this way, the mechanic builds a practical and tacit knowledge of what works and what fails to work. It is through multi-sensual interference and interaction with the components of a bicycle that such knowledge is learnt and embedded. Finally, and on this basis, I suggested that the bicycle allows the mechanic to find creative solutions to a problem. In other words, it is not only that old knowledge is being extracted, learnt and then applied. New knowledge is also being made. The bicycle can be made to last in different ways depending on the resources that are to hand. In the practice of repair, the mechanic is finding and learning how this is so.

I suggested, therefore, that the bicycle can be compared to the Zimbabwe Bush Pump. It is fluid in its working and also in its repair. The design of the bush pump enables it to work in various ways. Some things are left uncertain. It is in the transitional stage of repair (rather than the definite states of 'working' or 'non-working') that a mechanic is invited to fill such

gaps of uncertainty. I suggested, then, that a broken bicycle enables a sense of agency to be recovered. That is, in the breakdown of components, and in the foregrounding of those components, the mechanic has a role to play in making them work together once again. I related this to a sense of power – of power to affect the world in a way that consists of finding and solving problems. The bush pump, for De Laet and Mol (2000), represents the dissolution of power from a controlling entity that structures our practice and renders us helpless in moments of breakdown. I represented the bicycle in similar terms – it is an object through which power can be dissolved. It is in this sense a *fluid* object.

While the bicycle can be made to work in different ways, however, it can only be made to work in certain ways. It empowers the mechanic, but it can also disempower the mechanic. It is a fluid and emergent object but it is also fixed and anchored. Each link of a bicycle, I suggested, represents layers of materialised knowledge. It is knowledge - refined over time - that is presented in material form. The bicycle is a product of practice and the elements of such practice encroach upon its reparability should it become a broken object. I showed that the mechanic is similarly constrained, equipped only with certain resources. He or she is situated in terms of the knowledge and skill that can be brought to bear on a broken bicycle. If the mechanic is unable to make the links that connect the symptoms of a problem to its cause, then the process of problem finding and problem solving is brought to an abrupt end.

I therefore suggested that there are barriers to the repair of a bicycle. The broken bicycle and the would-be mechanic are each the product of a wider system of relations and they are constrained as such. They are limited in their capacity for change and there is no guarantee that their encounter will yield a working bicycle. For certain cyclists or mechanics,

presented with certain problems, the practice of repair does not unfold. In these moments, the cyclist or mechanic becomes subject to the power of someone or something else. It might be a husband that always does the mechanical work or a gender regime that links masculinity to hammers and spanners. It might be a bicycle repair shop that hides its practical knowledge in cost or a capitalist system that profits from the obsolescent and the cheaply made.

I therefore linked the bicycle to a modern toaster. Drawing on the endeavours of Thwaites (2011), I suggested that the toaster resembles a black box. Its outer casing belies a complexity in how it is made to work. Toasters are not designed to be repaired. They might be reliable over a period of time but they prevent the user from taking responsibility for their longevity. They tend to be fixed in their broken form because the knowledge invested in their form tends to be concealed. The production of a toaster is industrial in its scale and global in its reach. There is little prospect of its user ever mastering such complexity. And so, often before the first problem has been solved, the broken toaster is sacrificed.

At some stage, the bicycle mechanic must also yield to the control of another. It is inconceivable that he or she can take full ownership of the repair process in its widest conception. But the mechanic and the broken bicycle can still be brought into productive interaction. In Chapter 5, I focused on another element in the organisation of bicycle repair. By focusing on the workshop I wished to demonstrate how the practice of repair proceeds in accordance with its most immediate environment. Using Bristol Bike Project as an example I showed how the workshop can be seen as a normative medium through which the repair of broken bicycles is organised. I suggested that there is continuity in its structure and that this allows the workshop to become a meaningful entity.

Yet, within the same four walls, Bristol Bike Project comprises a number of different workshops. At different times, on different days of the week, the repair of broken bicycles is also slightly different. The elements of practice are similar enough to be commonly labelled as bicycle repair, but they bring particular relations into play. The mechanics have different levels of skill and the bikes have different problems. The structures of meaning that bear down upon the repair process also vary. There is fluidity here. But it is ordered. Indeed, the different practices feed into one another. It is this sense of fluid order that allows the flexibility of the bicycle, and the skill of the mechanic, to be brought into productive harmony. It is through this fluid order that the bicycle is made to last.

There has been a political thrust to the arguments I have presented. Exploring the relations through which bicycle repair is situated does not in itself reveal how such practice *should* be organised. It does not tell us whether bicycles *should* be made to last. It does, however, enable me to situate my own normative stance through identifying where ‘good’ interventions can be made.

One such intervention is to shift, both conceptually and practically, from differentiating the ‘cyclist’ and the ‘mechanic’. Indeed, there have been times during this analysis that I have switched between the two with little comment. It is through doing mechanics that a cyclist becomes a mechanic but there is no particular level of competence at which such a label becomes valid. The bicycle is ‘advanced in its simplicity’ and, as such, its performance can be manipulated with little more than a cough. There is a much finer line between the cyclist and the mechanic than their alternative labelling would suggest. They can be one and the same. Perhaps, instead, we might refer to the ‘cyclicanic’. As with the Zimbabwe Bush Pump, perhaps the bicycle really excels as a model of engineering once its use incorporates

its repair. They can proceed together, as part of each other. Is there a need to compartmentalise these forms of engagement?

This move represents a broader concern with how the production and the consumption of everyday objects might be brought into closer affinity. My interest in confronting this boundary ties in with many of the points that I have made in this dissertation. Perhaps the real value of an object can be found through engaging with its on-going production and making it last. There is a sense of empowerment that comes with taking an object into the future, and taking ownership of its changing form. There is a sense of achievement in finding creative solutions to problems. If we know how things work, if we know about the objects of our world, then we can strive to make them work *better*.

It is not a task to be taken lightly. In writing this very dissertation, I have struggled incessantly with moving from what is already there to building something different; from finding problems to solving them; from reading the sealed to writing the open; from bemoaning the fixed to embracing the fluid. As I have shown, the bicycle sometimes errs towards the immutable. The mechanic and the bicycle are each suspended in relations that constrain possibility. But their encounter also lays the ground for future practice. The repair of a bicycle is situated within a particular social order but it is one that enables as much as it restrains. Perhaps, as with the workshops that I visited, repair can be organised in a way that allows new futures to flourish. Perhaps there are futures in which the bicycle is entrusted to the cyclicanic...

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Appendix A

Interview Schedule

How did you become involved in fixing bikes?

How does it compare to other work that you have experienced?

Do you enjoy it? Why/why not?

Is it how you expected it to be?

What are the major challenges?

Are certain bikes easier to fix than others?

Are there any bikes that you particularly like working on?

What are the most common problems that you have to repair?

What are the signs of a cheaply-made bike?

Are there bikes that proved especially challenging to work on?

Where do your new components come from?

How do you decide which suppliers to use?

Is it important where they come from?

Is it hard to find components that work with each other?

Do you ever use second-hand components? When?

Are you ever limited in the work you can do by the tools that you have available?

Do you plan to buy more tools?

What's the aim of the maintenance courses you run?

Do you enjoy them?

Are they successful?

Why don't more people know how to fix bikes?

What's the aim of the tool club/bike kitchen?

What benefits do people get from fixing their bike?

How do *you* learn to fix bikes?

What do you do if you can't solve a problem?

Did you already have useful skills in this area?

Are there further skills you wish to develop?

How are your relationships with other co-operatives/bike repair shops?

How is the bike industry changing?

Do you have anything else you wish to add?