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Publication Date

2018

Repurposing the hacker

Three cycles of recuperation in the evolution of hacking and capitalism

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abstract

The spread of hacking to new fields brings with it a renewed necessity to analyse its significance in relation to industrial and institutional innovation. We sketch out a framework drawing on the idea of 'recuperation' and use it to situate an emerging body of work on hackers. By adopting the concept of recuperation, we highlight how hacker practices and innovations are adopted, adapted and repurposed by corporate and political actors. In other words, hacking itself is being hacked. We suggest three cycles within which this dynamics unfolds and can be studied: 1) the life cycle of an individual technology or community, 2) the co-evolution of hacker movements and relevant industries or institutions, 3) the position of hacking within the 'spirit of the times', or, differently put, the periodic transformations of capitalism.

Introduction

Back in 2010, when 3D printing was at the peak of the hype-cycle, activists from the Swedish Pirate Party showed up at an IKEA trade fair and solemnly announced that it was only a matter of time before 3D printing would disrupt the furniture industry, just like it had happened to the record industry after Napster. The ability to hack furniture would soon be in the hands of the people, and therefore the multinational corporation, with its questionable right-wing political connections, exploitation of labour, and environmental impact, was doomed.[1] Fast-forward to 2018, when IKEA will start commercialising its Delaktig line of sofas. The new line is meant to be a modular 'platform' which allows customers to perform 'furniture hacking.' The new sofa is arguably inspired by the practices of 'modifications on and repurposing of' IKEA furniture that are fostered by websites such as IKEA Hackers and in dedicated furniture hacking meetings.[2] The example above speaks of the failures of techno-determinism as a political ideology. But the main reason why we offer it here is because it exemplifies how rhetorics, practices and innovations coming from hacker cultures can be adopted by the corporate world and repurposed towards its own goals.

The expansion of hacker practices from software development to digital manufacturing, political activism, open hardware and DIY biology, as well as the creation of hacker- and makerspaces in many cities around the world, brings with them a renewed necessity to explore the political significance and limitations of hacking. The diverse array of practices and communities that go under the name of 'hacking' are unified under the credo that computer technologies can and should be repurposed. In addition, the practice of repurposing is often said to have a liberatory and subversive potential. But it would be problematic, not to say complacent, to take this emancipatory investment in repurposing at face value. Taking a historical perspective, one can find numerous hacker technologies or initiatives that were once said to be subversive, only to be accommodated within industrial and institutional innovation programs.

Making and DIY practices are often compared with the Arts and Crafts movement in the second half of the Nineteenth century (Dawkins, 2011; Luckman, 2013). The Arts and Crafts movement begun as a reaction to industrialisation, bringing together a social critique of the appalling living conditions of the English working class with an artistic critique of mass manufacturing and consumption. It is the ending of this movement, however, that is the most instructive when making a comparison with present-day hackers and makers. Eventually the artistic critique gained the upper hand over the social critique, and the movement metamorphosed into a distribution network for decorated hand craft. The betrayal of its initial, social aspirations is well captured by William Morris, the portal figure of the movement, although he made the following remark in a different context, namely in a novel situated at the time of a peasant uprising in Fourteenth century England:

I pondered [...] how men [*sic*] fight and lose the battle, and the thing they fought for comes about in spite of their defeat, and when it comes turns out not to be what they meant, and other men have to fight for what they meant under another name. (1888, p. 31)

Admittedly, it is a bit of a stretch to situate the hacker movement at the far end of an arc spanning two centuries and starting with William Morris. Still, his remark above offers us guidance when we follow the ruptures and frictions through which the aspirations of hackers are being passed on from one generation to the next, from one field of engagement to another, and from one geographical center of activity and influence to another.

In what follows we adopt the concept of *recuperation* and use it to situate an emerging body of works on hackers. This allows us to highlight how hacker practices and innovations are adopted, adapted and repurposed by corporate and political actors. Hacking often develops in

symbiosis with more powerful, institutional and industrial actors with diverging values and goals. Through such process, critical cultures and oppositional practices are co-opted, diluted, and transformed to serve institutional goals. Indeed, we reflexively ask whether other parties in this symbiotic-but-frictional relationship are no less resourceful in repurposing hacker practices of repurposing. In other words, we propose that *hacking is being hacked*. This pun plays on a proverbial hacker practice, the appropriation, reverse engineering and repurposing of tools and technologies. This practice lies at the core of hacking. It tells us that a superior armory (in terms of money, influence, technology...) matters not. All that can be set on equal footing by the disruptive inventiveness of the hacker.

But an inquiry into hackers must not stop short at this forever-postponed promise of emancipation. The predominant case-based approach to the study of hackers risks falling into this trap. With each new hacker project scrutinised in a case study, from community WiFi networks to self-reproducing 3D printers, a variation of the same promise is being rehearsed. In order to register the systematic way in which this promise fails to deliver, however, we must connect the case studies in a longer time frame. This helps us to see how hacker technologies and organisational practices can be made to serve other ends than they had originally been intended for. With the rolling out of 'open innovation' strategies, companies and governments have refined and generalised the methods for tapping into the time and enthusiasm of hackers (Mollick, 2005). Hackatons are now staged by corporations and universities. 'Civic hacking' sessions are organised by local governments as forms of engagement with technologists and entrepreneurs. Digital fabrication practices adopted by maker cultures are used to position a city or a country within the global hi-tech economy. Do-it-yourself approaches to life science research are labeled 'biohacking' and function within an ecology of biotech companies. Methods are developed to render this processes ever more reliable and cost-efficient.

By pointing to such examples, we insist on that the entire life cycles of hacking practices, from its initiation to its recuperation, must be accounted for. Note to be taken, our proposition is not to produce an exact, empirical chronology over past events. Rather, what we propose is a general, analytical framework for studying hacker practices as moments in larger processes of transition and change. But change too is differentiated and does not unfold at the same speed everywhere. It is in order to discuss this with more analytical precision that we propose three cycles or time intervals within which hacker practices can be situated. The first one spans the life cycle of an individual development technology or community (the two being closely intertwined); the second accounts for the evolution of the hacker movement taken as a whole, or, a branch of this whole (such as the open source initiative, the hackerspace movement, etc.); the third locates these two cycles inside the 'spirit of the times', or,

differently put, the overall transformations of capitalism. The distinction between cycles that we suggest is always only heuristic, and where the line is to be drawn between one and the other temporality is somewhat arbitrary and can only be decided on a case-by-case basis (Chiapello, 2013). Furthermore, the cycles we describe fold into each other. Short term cycles occur within long term technological and political transformations, and all changes come about within and contribute in shaping the general evolution of capitalism.

Recuperation and historicisation

The theoretical framework that we are sketching here has been developed in numerous intellectual traditions before, albeit under other terms than 'recuperation'. What these approaches have in common is an interest in the question of how men and women make history at the same time as history transforms them. Collective efforts to impose some degree of rationality on the world are inevitably carried away by the maelstrom of change and chance, that is to say, by history. Examples are abundant of how processes of co-optation and transformation have then turned those efforts into the very opposite of what was first intended. An emblematic case is the Russian Revolution, which provided one reference point for Guy Debord's reflections on 'recuperation', the other one being the integration of surrealism and dada in commercial pop-art (Barbrook, 2013). In Gilles Deleuze, and, further down the stream, Antonio Negri, preoccupation with the same traumatic experience can be read out from the notion of 'apparatuses of capture', although the sharp end here is pointing at political parties and trade unions turned self-serving and bureaucratic (Deleuze and Guattari 1987). In many branches of social movement theory, likewise, close attention is given to co-optation and/or institutionalisation processes. The latter tradition, grounded in empirical studies, has an advantage over the more abstract and philosophical approaches, in that recuperation is here understood to be a two-way process. Recuperation is both a subversion of the goals of a social movement, and the means through which those goals can be realised (Meyer, 1993; Hess, 2005). The same ambiguity is foregrounded by the two authors we are leaning on here, Boltanski and Chiapello, in their discussion about the assimilation of critique (2005). Critique, once assimilated, becomes a source of legitimacy in capitalism *and* a constraint on capital's accumulation. It is in this double-edged sense that we want to submit the possibility that the figure of the hacker has been hacked.

Furthermore, by teasing out hacker claims about having a proactive approach to technology, rebelling against epistemic hierarchies, disrupting established codes of knowledge, and so on, we develop a critique of hackers immanent to their own justifications and interpretative frameworks. From such a perspective we can see that it is not only individual technologies

that are regularly being repurposed. It is repurposing as such, as a mode of engaging with the world, and not only with technologies, that has been adopted and cultivated by institutional and corporate actors. Differently put: the very idea that tinkering offers a way to subvert the agendas of the powers-that-be has become a foundational myth of contemporary capitalism. By saying that, we do not deny a real potential in the practices of hackers. The label 'hacking' encompasses a broad and diverse set of subcultures that pursue different, if not opposite, goals and cannot be dismissed as a single entity, hence doomed to be recuperated by its enemies. All that we insist on is that the promises it makes of a democratic computing that counters state and corporate power must be weighed against an anticipated, future recuperation of that same practice. Indeed, what makes the theoretical concept of recuperation so attractive is that it allows us to steer a middle path between, on the one side, debunkings of the techno-fantasies of hackers (Edwards, 1997), and, on the other side, celebratory reiterations of the hacker's own self-understanding (Himanen, 2001).

Hacking has been condemned as 'gentrified', that is, displaced by non-conflictual corporate cultures, leaving little room for its role as an agent of collective and individual liberation (Scott, 2015). Yet we are rather proposing to learn from the defeats of past generations of hackers without concluding in advance that the enthusiasm of present-day hackers is to no avail. Following recent scholarship in the field, we aim at accounting for the contradictions and tensions within hackerdom (Aguiton and Tocchetti, 2016; Coleman, 2013; Maxigas, 2017) as we take measure of the distance travelled between the ethical and political aspirations of hackers, on the one hand, and the realisation of those aspirations, on the other.

We do not suggest that the hacker movement was recuperated in one single stroke, a point-of-no-return when everything turned foul. The question where in time to locate the decisive break with the past can only be answered provisionally. Crucially, the practitioners do not agree among themselves. Was it the World Wide Web, was it the launch of the Open Source Initiative, was it the announcement of Makerbot Industries that it would abandon open hardware? Collective representations of idealised pasts and desirable futures are always contested. It shifts in the course of the life cycle of a technology or community. For example, as a technology matures, it tends to grow a market around itself, laws are written to cope with its disruptive effects, and career paths are established in connection to it. In short, the stakes in it grow. External interests put their weight behind internal factions that are perceived to be the most accommodating towards business and/or state authorities. This influence might be so strong that the community loses its autonomy over how it understands and represents itself. It might be that the contest over representation is carried out to the point where the very existence of a conflict line has been rendered unrepresentable. It is for this reason that historicisation is key in an inquiry guided by the concept of recuperation. It takes measure of

the distance that has been travelled from one pole, the future as it was imagined by hackers in the past, to the opposite pole, how that past is being represented by hackers today. Finally, the outcome of recuperation processes is not decided in advance, but rather depends on the balance of forces and the unfolding of the struggle between them. Hackers do resist recuperation, and routinely engage in conflicts over the propriety, meaning, and use of the technologies they develop and care about (Hess, 2005).

Hacker cultures in perspective

What is a hacker? While acknowledging the contradictions and the diversity of hacker cultures, at the same time we argue that these multiplicities add up to something singular, a unifying hacker identity (Best, 2003; Coleman and Golub, 2008). We do not pretend to summarise the wealth of recent research on hackers, varying from the governance of free software development (Musiani, 2012; O'Neil, 2009), the performative and aesthetic side of hacking (Bazzichelli, 2013; Coleman, 2013) or the gendered construction of hacker communities (Adam, 2003; Dunbar-Hester, 2010). Yet by pointing at some recurrent cultural traits we recognise the possibility of stringing together a coherent narrative. Opposition to proprietary software or technology and associated intellectual property rights (such as software patents), paired with a rejection of surveillance and censorship are the few concrete points of contestation that hackers unanimously rally behind. It is easy to reach an agreement on these issues, because, as Chris Kelty has lucidly argued, what is at stake are the technical and legal preconditions for the 'geek public' to exist as such. With a term borrowed from the computer world, Kelty describes this kind of politics as 'recursive'. Recursive politics is geared towards strengthening and expanding the conditions for the geek public to continue to exist and grow, i.e. the very technologies and digital spaces that hackers inhabit (2008). Hackers' struggles over recuperation are aimed at protecting their self-determination and autonomy by fending off communication platforms, intellectual property laws, or business strategies that would integrate hacker products or processes as an appendage of some structure that lies outside their control. This looming scenario would invert the autonomy of hackers to its opposite, namely heteronomy.

Attempts to extend the political agenda of hackers beyond recursive issues, to include, for instance, gender equality or solidarity with maquiladora workers producing consumer electronics, can be met with resistance from within the geek public. This is not to say that hackers oppose feminism or workers' rights. However, as those issues are not 'recursive' in the sense described above, many hackers perceive them to be unrelated to what really matters to them the most, computers and internet freedom. The importation of political agendas not of

their own making can be received as another threat to their autonomy, and is a source of tension between politically minded hackers, on the one hand, and hackers of an avowedly apolitical persuasion, on the other (Coleman, 2013). In contrast to a traditional social movement, where it is the interpretative framework that the members gather around and have as a common ground, hackers are drawn from diverging, sometimes opposing, ideological backgrounds. Indeed, agnosticism towards questions about values and politics is a prerequisite for managing cooperative development projects involving such a heterogeneous constituency (Irani, 2015b). An exemption is made for recursive politics, however, as here it is zealotry, not agnosticism, that is prescribed. This is only possible because the core issues are being framed as not having to do with politics in the first place. In different words, conflicts do not concern mutually excluding but equally merited value judgements. Opposition to online censorship, internet traffic discrimination or digital surveillance is the common sense viewpoint on how a technical system must work, or, at the least, how it works most efficiently. These factual observations are not open to contestation except by the technically impaired. This paradoxical way of conceiving politics testifies to a strong continuity with a longer history of politicised engineering cultures (Gillespie, 2006; Layton, 1986). The narrative is particularly effective, as it provides an extraordinary springboard for mobilising support and allies around a narrow set of political issues, on the condition that those issues are not framed as 'political' (Söderberg, 2013).

We propose that the imperative to be pragmatic, problem-oriented, and, subsequently, to suppress ideological and value conflicts, makes up an overarching narrative or ideology in its own right. Correspondingly, a row of negative traits, that of being irrational, ideologically driven, and/or self-serving at the expense of public interests, are assigned to monopoly interests and lobbyists, state authorities and security services, and entrenched bureaucracies both in the public and private sector. More abstractly conceived, these opponents embody instances of a centralised mode of organising all things in society, and they can therefore only be resisted with the help of decentralisation. The importance of this value is obvious in the case of peer-to-peer filesharing. Filesharing offers a near perfect technical implementation of the famous devise coined by the founder of the Electronic Frontier Foundation, John Gilmore: 'The Net interprets censorship as damage and routes around it' (1993). By substituting the word 'censorship' with 'copyright' in the quote above, we get close to the ideas expressed by filesharing activists.

Decentralisation is valorised as a general movement by which every passage point, on every level in society, is made susceptible to circumvention (Musiani, 2012). For instance, the digital currency BitCoin is admired for having created a distributed monetary system without any central banking or state power guaranteeing its value (Maurer, Nelms and Swartz, 2013).

BitCoin builds on top of advances made in cryptography. Originally classified under the same trade restrictions as arms, cryptography has since been diffused to private users and is hailed as a bulwark against excessive, state surveillance and control (Levy, 2010). A decentralised mode of production is contrasted, explicitly or implicitly, against the predominant, centralised mode of mass production. What is being decentralised in these cases is the capacity of hackers and individual users to repurpose tools, as an ideal ubiquitous repurposability is the warcry summing up this political program. This provides the means without specifying the ends to which users must commit. Only thus it can be passed off as a neutral rallying point. Repurposing nevertheless has a political and ethical bite, because it is what allows the individual or a network of individuals to circumvent the laws, controls and costs imposed on them by centralised (state and monopoly) power. Taking foothold in the self-understandings and justifications of hackers, we propose a framework for studying the coevolving relation between them and institutional and industrial actors. At stake is the autonomy of the hacker public, both in terms of the legal and technical, recursive preconditions for its continued existence, and in terms of the control it holds over its own self-representations. In our framework for studying the relation between hackers and institutional and industrial actors we make an analytical separation between three time intervals, within which a full life cycle of this evolving relation can be said to run its course.

First cycle: incorporation of the single technology or community

The first interval by which a case study of hackers can be framed spans the life cycle of an individual development project and associated community, including its evolving relationship to entrepreneurs, start-ups and state institutions with stakes in the undertaking. An adequate understanding of a technical product or innovation must weigh in the whole genealogy of its development, from start to finish, in the course of which project goals and individual motives, not only the technology, undergo transformations (Oost, Verhaegh, and Oudshoorn, 2009). Hacker innovations are routinely used as blueprints for commercial applications. One such example is Internet Relay Chat (IRC), a text conference technology based on an open and distributed architecture and developed since the 1980s (Latzko-Toth, 2014). IRC later inspired contemporary social media, most notably Twitter, which among other features has adopted the pound sign (#) used in IRC channels to aggregate messages on a specific topic. Yet technological co-optation only represent one phase of a broader and more complex cycle. Resistance to such appropriation is a further point of interest. This resonates with many approaches in social movement theory, where the waxing and waning of popular mobilisations are studied. A synthesis between social movement studies and technology studies offers a promising point of departure for studying hacker practices in this cycle. David

Hess has suggested the concept of *technology-oriented and product-oriented movements* to describe civil society mobilisations that pursue social change directed towards building and diffusing alternative technologies (2005). Technology-oriented movements often emerge in entrepreneurial environments and sometimes need to accommodate processes of co-optation by industrial actors as a condition of achieving their goals. This extends a tradition in social movement scholarship of looking at processes of incorporation and co-optation. Hess identifies three phases in the co-evolution between a social movement and the product innovation. Firstly, the goals of technology-oriented movements are articulated in close liaison with entrepreneurs and companies willing to create a market for the new product. Secondly, as the product matures, the design and meaning of the alternative technology are transformed under pressure from market and mass production constraints. Thirdly, this transformation gives rise to 'object conflicts' between the movement and its for-profit allies, and among different fractions of the movement. Conflicts revolve around the proper design and/or the adoption of a transformed technology, as measured against the original grievances and values acclaimed by (a fraction of) the movement.

Object conflicts that can be seen as 'material traces' of recuperation processes are at the centre of Maxigas' work, where hackers refuse the latest iteration of a technology or a service (2017). Hackers have written software which enables them to use 'evil and broken' new technologies like Facebook chat and Twitter through older interfaces; use browser extensions which make it considerably harder and slower to look at websites; and refuse to adopt new generations of mobile phones. Countering the assumption that hackers are all enthralled by the idea of technological progress, Maxigas teases out the Luddite aspect of hackerdom, where ethical and/or aesthetic considerations often triumph over functionality. It is thanks to their technical expertise that they can adopt and adapt new technologies selectively, in a reflexive move aimed at resisting incorporation and transformation practices embodied in commercial objects that are based upon designs and processes originating in hacker cultures. The Ronja project is another example of an object conflict located in the life cycle of an individual product or community. Ronja was a homebuilt hardware device for sending data developed in the Czech wireless community. The project was initiated in 2001 and lasted till 2006. At first, the vision behind it was to create a 'user-controlled technology' and a communication network that would be resistant to eavesdropping and surveillance. As the product matured and market demand for Ronja devices grew, more pragmatic goals became predominant, chiefly the goal to provide cheap and fast internet access. Its obsolescence was inscribed in the rhythm of the innovation processes and the market diffusion of industrial development. A rift emerged between those who wanted to make the necessary shift in scale for the technology to keep up with commercial actors, and those who championed the communal and convivial relations that thrived around the original, rudimental device. The

opposition between the two cannot be reduced to idealists confronting entrepreneurs, as the rift was reflected in a conflict between, on the one hand, the idea of user-control, and, on the other, the goal of countering surveillance by a maximum diffusion of the Ronja device (Söderberg, 2013). The same dilemma has been registered in media activists as, on the one hand, older technologies such as FM radio are perceived to be more coherent with their values, while, on the other hand, refusal to make the transition to a later platform or technology comes at the price of not being able to communicate those values to a broader public (Dunbar-Hester, 2009). Besides technical products, hackers have furnished corporations with innovative and horizontal organisational practices, as well as with associated cultural values. Lilly Irani has studied local political practices that reconfigure new forms of exclusion and inclusion by incorporating practices such as hackatons (2015b). Through adaptation and integration of this form of collective innovation process into corporate structures, Indian firms exclude the slow time of democratic debate while fostering what Irani calls the 'managed urgency' that defines a new form of entrepreneurial citizenship.

By recognising that technological innovation is an arena of contestation rather than simply being a resource that can be mobilised, this approach places it through its whole life cycle. Thus instead of focusing on a single case study as it culminates in an innovation ripe for commercialisation, while setting to the side the community with its rivalling factions, a longer historical framework allows for a deeper understanding of the relationship between alternative technological innovation and the value-driven corporate sector. Alternative technologies are developed in cooperation with private companies, and as the market demand for these products grow, industries incorporate and transform the technology, thus giving birth to conflicts and ultimately to a new wave of technological innovation.

Second cycle: evolution of hacker cultures

A longer time frame in which hacker studies can be situated is that of the coevolution of, on the one side, the hacker culture, scene or movement taken as a whole, or some branch thereof, and, on the other side, the computer industry and/or relevant (state, military) institutions. While a case study following the life cycle of a single development project or community relates its internal dynamics to the immediate context, a study following one or another aspect of the development of hacker cultures relates this phenomenon to determinate, historical moments. For instance, Steven Levy's classic work *Hackers* identifies several phases in the history of hacking, spanning from the 1960s MIT hardware hackers to the emergence of free software in the 1980s, thus covering scenes and communities with very different ethos, cultural references and political goals (2010). Scholars in the field concur that

1970s US West Coast is a key historical and geographical juncture for making sense of later co-evolution of hackers and computer industry. By following the life trajectory of Stewart Brand, Fred Turner's book *From Counterculture to Cyberculture* shows how the former culture branched off into the latter, giving impetus to the nascent personal computer industry in the process (2006). Indeed, the idea of building a small computer to foster free communication practices and new modes of community formation sprang out of the communalist longings of the counterculture (Levy, 2010; Flichy, 2007).

This short background dispels any notion about a pristine hacker subculture that at one moment was corrupted by industry. Hacker countercultures, the industry and the military evolved in tandem from the very beginning. As this relation continues to evolve, the interdependency becomes an object of reflection in its own right, and for all parties, and this leads on to new strategies and counter-strategies. On the one side, an industry or a branch of a state puts in place methods and routines to render systematic its interactions with hackers, aiming to increase benefits and reduce uncertainties. On the other side, anxiety over incorporation feeds into the self-representations, community norms, and practices of hackers, accommodating or resisting to various extent incorporation processes. It is typically around this question that internal fraction lines emerge. This is manifest in ever recurrent debates on how to design free/open licenses (Berry, 2004). The license lays down the criteria under which for-profit interests are sanctioned by community norms to benefit from the collective innovation process. Although individuals and firms are *in principle* entitled to make as much money as they can from the free (as in free beer - i.e. unpaid) contributions of the community, the reciprocal obligation to share information puts a *de facto* limit on profit maximisation. With reference to Boltanski and Chiapello's terminology, we can say that in this setting the open license is the pre-eminent *test* against which firms are being held accountable, serving to both legitimise and constrain capital accumulation. Consequently, the design of a free/open license, and the vigilance by which it is enforced, gives an indication of the strength of the forces at play at a given time (O'Mahoney, 2003).

Another example of this cycle can be found in the political trajectory of one sub-branch of the hacker movement, centred on providing physical spaces for alternative technology production. What is nowadays referred to as the hacker- or makerspace movement has its roots in something once known as 'hacklabs' (Maxigas, 2014). Hacklabs flourished in the 1990s and the turn of the 2000s and were hosted in squatted buildings and social centers in many European cities. Among other things, they provided technical support for their hosts and in street protests that adjoined international events such as WTO and G8 summits. Starting in 2008, a second wave of hackerspaces emerged, this time with the epicenter in the United States. These places are rented and rely on a plethora of financing models, from membership

fees to partnerships with municipalities and local businesses, corresponding with a more accommodating political outlook. As Maxigas shows, the rupture was most striking in the Netherlands, where some hackerspaces rented 'antisquat' real estate, a scheme initially established by rentier companies to fend off squatters from the property. Another indication of the reversal in shared beliefs and values that has taken place is the widespread (though not unison) acceptance of US military funding by individual makerspaces and support of key intermediaries within the maker movement, such as *Make Magazine* (Mitch, 2012).

Seismic shifts in values over time like the ones mentioned above are not always manifest, not even to the practitioners themselves. The existence of hacklabs has largely faded from the collective representations of the makerspace movement. Ruptures and the forgetting that there ever was a rupture occur regularly in hacker movements, often in connection to the emergence of a new sphere of activity (for example from free software to open hardware or DIY biology), or due to geographical evolution (for example, the shift of the hackerspace movement from Europe to North America). Part of the explanation for this amnesia is the high turnover of participants and a culture oriented towards the New. Another reason might be anxiety among organisers not to scare-off external partners and funders. An indication hereof is debates about re-baptising 'hackerspaces' to 'makerspaces' as the word 'hacker' is deemed too controversial. The third reason, which we put stress on with our framework or recuperation, is the ever-ongoing struggle over collective memory and representations. A case in point is how *Wired*, *Make Magazine* and Maker Faires act as gatekeepers within the maker movement, promulgating storylines about innovation, customisation and entrepreneurship, while marginalising more confrontative stories about technology (Tocchetti, 2012).

Governmental institutions, and not only for-profit interests, are involved in processes of recuperation built upon such displacement. An example comes from biohacking, that evolved in close relationship with the institutions in which biology is performed, negotiated, and regulated. This link is rooted in the substantial segment of the global do-it-yourself community made of people who work in an academic or government lab. Another sign of this trend is the increasing inclusion of do-it-yourself biology practices in museums, education projects and outreach activities (Delfanti, 2017). Through direct engagement with institutional actors, do-it-yourself biology also actively contributes to State regulation and control. Shortly after its emergence, the DIYbio network of amateur biologists and biohackers was labeled as a 'biosecurity concern' in the US. DIYbio members quickly came to an agreement of being incorporated in the FBI Outreach Program for biosecurity. In a few years, the amateur network became a strategic partner of the FBI Bioterrorism Prevention Program.

(Aguiton and Tocchetti, 2015). This partnership, the authors suggest, was instrumental in constructing DIYbio as a legitimate framework for citizen science.

Third cycle: evolution of the spirit of capitalism

The third cycle in which we suggest that hacker practices can be studied is that of capitalism as an evolving whole. Inspiration comes from the reflection on the emergence of a *new spirit of capitalism* suggested by Luc Boltanski and Eve Chiapello (2005). Adopting a Weberian perspective, Boltanski and Chiapello reiterate that capitalism's sources of legitimacy are to be found outside capitalism itself. They coin the term 'connexionist logic' to describe the spirit of contemporary capitalism. This logic is based on an incorporation of 1968 critiques that helped to restructure and renew the ideological and organisational logics upon which capitalism works. Numerous other authors have canvassed a similar storyline where ideals of 1968, such as individual freedom and self-expression, were later appropriated and made into the motor of contemporary consumerist societies (for example Harvey, 2005). We single out Boltanski and Chiapello's book because they have developed this observation the furthest, by depicting the evolution of capitalism as strictly intertwined with the practices that oppose it. According to this schema, capitalism feeds on critical cultures: only the incorporation and adaptation of critiques give capitalism means to overcome its own, recurrent impasses. Yet whereas Boltanski and Chiapello's argument dwells on the evolution of organisational forms, the authors have said little about the role of technology in the processes they describe. One can speculate if they dodged this thorny issue to differentiate themselves from innumerable other magistral works about the transformation of capitalism where information technology has invariably been designated as a motor, most notably by Daniel Bell and Manuel Castells. It is in order to fill this gap without resorting to any innate trajectory of technology that we stress the relation between oppositional hacker practices and capitalism. The technical innovations coming out of this conflictual symbiosis, such as, for instance, modular software code, mesh computer networks, distributed retrieval systems (i.e. filesharing protocols), and private cryptography, have all been integrated in the material infrastructure of capitalism.

Besides the product innovations stemming from hacker practices, the latter also contribute to reinventing the cultural infrastructure of capitalism. The inverse side of the critique against proprietary software and other forms of 'closed innovation' systems expressed in free software communities, is an investment in 'open' forms of capital accumulation. Thus the critique of hackers are turned into an 'ethical foundation for contemporary capitalism' (Barron, 2013, p. 19; Tkacz, 2012). This coalesces with a more general investment in the subcultural outsider position of the hacker, which has become a key asset in an authenticity-

stricken and consumer-driven market society (Liu, 2004; Fleming, 2009). It is the contribution of hacker practices and values to the systematic features of capitalism that is in focus here, which is to say, the reshaping of labor relations in the computer industry and beyond. For example, Fred Turner describes how in the mid-2000s the syncretism between technological countercultures and new age spirituality that characterised the Burning Man Festival in the Nevada desert has been incorporated in the recruitment strategies of Silicon Valley firms. In turn, this contributed to shaping the career strategies of prospecting employees. The cultures at play in the festival were based on horizontal team-building, task modularity and a commons of shared resources. They represent a non-profit and autonomous analog of the work organisation strategies adopted by Silicon Valley corporations, thus providing a 'cultural infrastructure' upon which the latter evolve (2009). Likewise, the project-based and community-centred model of free software development is increasingly drawn upon by firms for allocating work tasks (Auray and Kaminsky, 2007; Rolandsson, Bergquist and Ljungberg, 2011). The coercive side comes to the fore when this model is applied to the lowest tier of the social and global division of labour, as exemplified by the crowdsourcing platform Amazon Mechanical Turk, a just-in-time labour market for routinised and generic piece-work (Irani, 2015a). Also biohacking and DIY biology have been integral to the formation of the field of synthetic biology and its public perception. The radical stance on openness and distrust for bureaucracies expressed in open source biology research is a conductor for informatic ways of thinking about life and nature, as well as for the transposition of cultural elements from hackerdom onto an increasingly privatised and consumer-driven biotechnological industry (Delfanti, 2017).

A genealogy of the contemporary platform economy can provide another example. A well known story traces the birth of commercial interactive services back to Indymedia, the alternative and radical citizen journalism website that assumed a central role in alter-globalisation movements in the past decade. The values of horizontality, openness and collective gatekeeping that were firstly embodied in Indymedia thanks to its relation with politicised hacker movements in the 1990s have become a resource for social networking services such as Twitter or YouTube. Platforms for distributed production and sharing are thus appropriated by corporate actors for the purpose of reorganising labor and production circuits, whereby waged, contractual work relations can be undercut (Dyer-Witthford, 2015). Examples of the latter are corporations such as Uber for car rides or TaskRabbit for jobs. The very use of the word 'platform' in the self-descriptions provided by web corporations responds to commercial needs, as it can be part of discursive strategies aimed at representing internet services as open and politically neutral. With these rhetorics, corporations can address both advertisers and publics, as well as attempt at shaping regulatory policies (Gillespie, 2010).

The third cycle situates hacker movements in a *longue durée* perspective. An analytical focus on the co-evolution of, on the one hand, oppositional hacker practices, and, on the other, the incorporation strategies of computer firms, can deepen our understanding of capitalism. In fact, when hacking is approached from this time interval, the object of study has been reversed. Instead of explaining hacker practices by relating them to their historical situatedness, it is the spirit of the times that is being studied through the lens of hacker practices. Contemporary capitalism, we argue, absorbs repurposing and distributed production within its organisational practices, while coupling them with a distrust for incumbents - i.e. 'disruption', to use one of Silicon Valley's favourite keywords.

Conclusions

In order to analyse the evolution of hacking and its relation with the unfolding of history, we have suggested three cycles in which hacker practices can be studied as being hacked, or repurposed to serve institutional goals. Each cycle is understood to be folded into the other. Short term dynamics of action and change occur within longer historical waves of technological and societal transformation. The evolution of single technologies is part of the transformation of hacker scenes over time. In turn, these two cycles unfold within more general transformations of capitalism, which they simultaneously contribute in shaping. Within these cycles, we propose that hacking is continuously hacked by powerful institutional actors, thus diluting its subversive potential. Yet the cyclical nature of our analysis is meant to stress how hacking is also continuously reimagining how to use technological subversion toward its own political goals. Therefore it should come as no surprise that contradictory phenomena unfold at the same time. The very term 'hacker' seems to be losing any meaning when IKEA uses it to commercialise its furniture or when Facebook's address is 1 Hacker Way, Menlo Park, CA. And yet hacking witnesses cyclical waves of re-politicisation, as hackers resist co-optation and continuously explore new techno-political territories: think of the legions of hacktivists who joined entities such as Anonymous (Coleman 2017), or the renewed role of hacking as a techno-feminist form of political intervention (SSL Nagbot 2016). Finally, we have also argued that repurposing, the fundamental hacker way of dealing with technologies, is being adopted by corporate and institutional actors as a novel organisational practice within contemporary capitalism. At the commercial level, modular and hackable products are increasingly common in several sectors of today's Western economies.

By highlighting the role of repurposing in processes of recuperation, we have used hacker justifications and values to reflexively analyse the political contestations and tensions within hackerdom. The hackability of organisational practices is a new feature of contemporary

capitalism, and hackers are at one and the same time shaped by and contribute to shaping this larger whole. Hacking contributes to the evolution of the work cultures, business models, and ideological infrastructure of capitalism (Coleman and Golub 2008, Himanen 2001), while acting exactly within the constraints imposed by such renewed capitalism. The last claim is likely to be controversial. The risks with adopting such an overarching vantagepoint are readily acknowledged by Boltanski and Chiapello:

Stressing historical structures, laws and forces tends to minimize the role of intentional action. Things are what they are. Yet the critical approach becomes meaningless if one does not believe that it can serve to inflect human beings' action, and that this action can itself help to change the course of things in the direction of further 'liberation' (2005, p. x).

Given the limited scope and purpose of this work, we cannot aspire to resolve this grand question here. Instead, we offer an analogy with hackers. They perceive their power to act in the world as derived from a voluntary submission to engineering constraints that, over time, is rewarded with skill and affordance. This resonates with the famous statement of Francis Bacon: command over nature's laws presupposes obedience to the same. Drawing on the principle of symmetry, we propose that this paradox applies with equal force to the 'laws' of history. If so, the antinomy between agency and structure needs to be qualified. This antinomy trades on the concern that putting stress on 'historical structures, laws and forces' could be demoralising. Concurrently, however, it is through such historical reflection that one can become aware of the constraints to their own capacity to act, which in turn is a precondition for acting *effectively* in the world. The same holds true for 'recuperation'. This term foregrounds the succession of past struggles and defeats, from the Arts and Crafts to many other movements, and finally to the present-day hacker, thereby suggesting that the hacker figure is partially recuperated from the start. Rather than being simply demoralising, this historical insight is instrumental if hackers are to counteract future recuperation attempts and assert their autonomy within a symbiotic relation with more powerful actors.

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notes

[1] Interview collected by Söderberg.

[2] <http://www.ikeahackers.net/about>, accessed October 2017.

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Preprint version, October 2017

Forthcoming in *Ephemera. Theory and Politics in Organization*, 2018

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