Hacking Difference in Indonesia: The Ambivalences of Designing for Alternative Futures

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ABSTRACT
The paper offers an ethnographic account of racial and cultural difference as sites to contest dominant practices of computing and technology. Specifically, we focus on how a collective of Indonesian biohackers position the care labor of a generation of women (referred to as Nenek-nenek in Bahasa Indonesia) to retrace the origins and boundaries of their making, hacking, and citizen science practices. The paper's contribution is to bring the study of the political economy of hacking and making into conversation with themes of racial and cultural difference in postcolonial computing across HCI, STS, and design. More specifically, the paper examines how Indonesian biohackers position situated histories and expertise as properly technological. Further, we show how their articulation of Indonesian difference was in turn appropriated by foreign hackers and commentators to envision tech futures against the status quo.

Author Keywords
hacking; making; postcolonial computing; ethnography; Indonesia; gender

ACM Classification Keywords
• Human-centered computing~Empirical studies in HCI

INTRODUCTION
Over the last decade, the field of Human Computer Interaction (HCI) has expanded its repertoire to understand and study cultural processes of design. This includes projects that unsettle the centrality of Euro-American histories and sociologies of technology [5],[31],[72] as well as new analytical frames to account for how colonial vestiges are embedded in the design of technology including but not limited to postcolonial computing, multi-sited design, and humanistic and feminist HCI [5],[9],[31]. HCI and design researchers have turned their critical lens inwards, accounting for the ways in which interaction design and computing fields have historically assumed knowledge and innovation to emanate from the West [1],[3],[10],[60],[72]. This work has shown how binaries of here vs. there, us vs. them, developed vs. developing have historically informed design—from early ICTD to methods in design thinking, ubiquitous computing, and human-centered design [31],[39],[44].

More recently, a growing body of work in HCI has evidenced the reproduction of cultural difference in postcolonial regions themselves. Postcolonial conditions have bred yearnings and desires for national independence and sovereignty, in turn resulting in the articulation of cultural and regional difference (e.g. [19],[62]). This has become visible in tech entrepreneurship and design projects aimed at "rebrand[ing] cities, local regions and whole nations as emergent tech innovation hubs arising from the periphery" [5]:472]. It is likewise visible in the flurry of smart city and open data initiatives in cities as diverse as Detroit and Shanghai, which are competing on a global stage for investment in their regions' future capacity to innovate—be that for a future of self-driving vehicles, smart city planning, or connected living. Here, the articulation of regional difference enables the attraction of capital investment by rendering certain locales, regions, and even nations as uniquely promising for the purposes of future economic and technological development [5],[39]. In other words, arguments for cultural difference and their aims to decenter Western-centric knowledge claims have fueled the interests and processes of contemporary finance capitalism [30],[31].

Our aim in this paper is to bring into conversation themes from postcolonial and decolonial studies with specific concerns in HCI and design research. Specifically, we show that postcolonial desires to achieve sovereignty and cultural credibility in global tech production express themselves in the design of hackerspaces, hacker projects, and citizen science initiatives. To illustrate, we draw from three years of ethnographic research with the Indonesian citizen science and biohacking initiative "Lifepatch" and its tactics of deploying cultural difference to contest dominant genealogies and practices of computing and design. This paper focuses on how Lifepatch mobilized people, sites, and practices of care labor that are rarely associated with the image of contemporary making and hacking cultures. Specifically, we show how their international recognition partially arose out of their articulation of cultural difference

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which they attribute historically to the work of their mothers and grandmothers (referred to as Nenek-nenek in Bahasa Indonesia). While we have focused elsewhere specifically on the visions and practices of these Indonesian biohackers [24], this paper focuses on the domestic care work and unpaid labor that enabled these Indonesian biohackers to be regarded as legitimate producers of technology in transnational network of electronics art and tech innovation. To illustrate, this paper unpacks the care labor Nenek-nenek have performed in the context of state-run women organizations during and after Indonesia's New Order administration (1965–1998).

We show that it was exactly Nenek-nenek's labor in nation making and organizational work, bound up in Indonesia's state programs, that provided a narrative for a different history of DIY (do-it-yourself) hacking and making. The organizational and care labor of Nenek-nenek enabled Lifepatch to position their hacking practices as culturally and historically Indonesian or what we term as 'hacking difference', distinct from and more than a mere replica of acclaimed Western hacking practices. We further demonstrate how Indonesian practices of 'hacking difference' enabled their foreign (largely Western) counterparts and collaborators to promote Indonesia as a site of hopeful and more equitable technological futures.

We argue for the importance of examining how cultural and racial differences are articulated and enacted through design. This includes close attention to how the articulation of difference has become an asset for finance speculation in national and international capital tech investment. The paper as such builds on an expanding body of HCI work that argues for a deepening engagement with the political economy of tech use and production [6]. We demonstrate that the articulation and enactment of techno-cultural uniqueness deepens extant inequality and dependence both within and between social groups and classes. At the same time, it provides conditions for "new forms of self-realization, sentiment, entitlement, enrichment" in postcolonial regions [18]:139]. In other words, we argue that hacking difference can be both redemptive and emptying, inclusive and othering; hacking difference thus is an expression of the contradictions that mark contemporary political economy and postcolonial computing in particular. We expand design theory and critical computing scholarship by demonstrating how postcolonial desires to achieve sovereignty and cultural credibility are embedded and articulated in the practice and design of hackerspaces and innovation economies.

RELATED WORK

The ideas and literature that inform our paper sit at the nexus of two bodies of work. First is the interdisciplinary fields of critical computing and design, STS, and HCI scholarship that draw from postcolonial and decolonial theory to reveal the power asymmetries, colonial legacies, and systemic injustice embedded in design and technology histories and sociologies. For instance, HCI work in postcolonial computing has offered an analytic orientation, rooted in the conditions and experiences of postcoloniality, that begins by examining the hegemonic structures of design in the postcolonial context [31],[10]. HCI scholar Syed Mustafa Ali proposes decolonial computing to consider systemic racial structures of inequality and exploitation [3]. Emerging from Charles W. Mill's work on the racial contract and Walter Mignolo's decolonial theories of the global south, decolonial computing is an attempt to theorize computing from the peripheries of the "modern world system" [3]. Together, these works connect debates in postcolonial theory, STS, and HCI to unsettle the universality of technoscience discourse and diversify design methodologies—from those oriented toward dismantling white supremacy to critiques of development projects in the global south.

Recent work in postcolonial studies, critical computing, and STS emphasizes how techno-nationalist projects reify cultural difference and indigeneity to market products and expertise as unique to a specific locale [31],[39]. The investment in entrepreneurial hubs, tech innovation, and design programs in various postcolonial regions frame ethnic, cultural, regional, and national differences as promising for future investment and capital markets [6],[35],[41]. Building on anthropologists John L. Comaroff and Jean Comaroff [18], Irani and Philip, for instance, argue that non-Western difference is a resource for indigenous state and corporate leaders to articulate "forms that can live well with capital" [31]:11]. Building on this work, we aim to contribute to the repertoire of critical computing scholarship by showing how difference is produced and legitimized by postcolonial desires for credibility in computing and tech innovation industries. Specifically, we examine how the care labor of a generation of women (Nenek-nenek) was made to be central for securing the legitimacy and sovereignty of Indonesian hacking and technological practice, both nationally and internationally.

A second, related body of work in HCI that frames our work is the critical study of DIY making and hacking. Making and hacking is often implicitly understood as a countercultural approach to technology design and production that disrupts old patterns and approaches. Although many have critiqued the overly enthusiastic claims that making would democratize technology production [1,[33],[44],[63],[73],[74], an underlying assumption remains that making and hacking intervenes in established notions of who gets to design and innovate. For instance, making is promoted as a movement of geeks and countercultural renegades who resist passive consumption and top-down approaches to education and employment by promoting a hands-on, active, and DIY approach to computing [6],[10],[16],[44],[73],[74]. We build on this work by demonstrating how the image of making and hacking as inherently countercultural and as disrupting the status-quo required labor—making and hacking in Indonesia

(as much as elsewhere) is not inherently countercultural, but had to be made for it to be seen that way. Specifically, we examine the ways in which making was articulated and performed as extending from prior political systems, social, and material infrastructures and forms of labor unique to Indonesia. This paper then contributes by unpacking "hacking difference" as a sociomaterial practice in postcolonial computing that rearticulates old regimes of care labor as key to the production of a technological imaginary of countercultural resistance against the status-quo.

METHODS & ETHNOGRAPHIC SITES

In what follows, we bring into focus the dependencies, relationships, and conflicts between two generations – Nenek-nenek (English: grandmother or elderly women) and their sons and grandsons, founders and members of the citizen initiative Lifepatch, established in Yogyakarta, Indonesia in 2012. Lifepatch members produce devices, machines, and installations that measure, illuminate, or critique the environmental conditions that affect the lives and livelihoods of citizens in Indonesia (see more details on the productions and daily activities as well as the members and founders of Lifepatch in our prior publications [24]). Our ethnographic research with Lifepatch began in 2013 and spanned 3 years. For the purpose of this paper, we focus on a subset of our findings: our engagements with the mothers of Lifepatch founders and members. The relationships between mothers and sons we document here were contingent on the economic and political developments that preceded it, which we briefly outline in what follows.

The late 1990s and 2000s, and particularly the years prior to the establishment of Lifepatch, had seen an uptick in citizen protest and political intervention. Following the currency crisis that swept across Southeast Asia in 1997/98, many began to openly critique the "foreign-investment friendly policies" of the Suharto regime [71]. The call for economic growth and development had benefitted a small elite, and not the still fledgling urban middle class. The resignation of Suharto in 1998 was followed with a relaxation of censorship and a rise in public dissent. Lifepatch emerged out of this longer history of political struggle and citizen activism. It translated these very values and experiences into a project of technology production. This approach has garnered Lifepatch significant international attention, especially by European tech art and activist networks and institutions [24].

The founders and members of Lifepatch identify as a collective with shared ownership over tools, machines, and tech production. We hence refer to their collective articulations and practices of hacking and making as the activities of Lifepatch, while quoting individual members or founders (given pseudonyms) if we draw from interview data or specific observations. Lifepatch has produced, amongst other things, open source hardware devices, with the goal to make science available to populations who have little to no access to scientific tools and knowledge. Their work has not only been presented in regional Biennale exhibitions such as the Jakarta and Yogyakarta Biennale (2013; 2015), but has also garnered visibility in international DIYbio networks such as 'Hackteria' and won honorary mentions and awards at international digital media arts festival such as Prix Ars Electronica (2014), one of the most prestigious digital art awards.

Our initial focus in our ethnographic research was on the material and social practices of Lifepatch. About seven months into our work with Lifepatch, we became increasingly aware of the central role of the work of Nenek-nenek and began including them in our interviews and observations. We wanted to better understand how the two generations informed one another. We used standard ethnographic methods such as formal and informal interviews and in-depth participant observations at the homes and neighbourhoods of Nenek-nenek (given pseudonyms) and at Lifepatch's DIY laboratory. As common to ethnographic research, we prepared open sets of interview questions, which we modified as themes emerged. We followed Nenek-nenek in their weekly meet-ups as women-only groups and participated in their discussions and hands-on activities. As women almost half of the ages of most of our interlocutors, we were often treated as Nenek-nenek's daughters, building an intimate yet tenuous relationship with these mothers and grandmothers at times. We also engaged in material production with our interlocutors to uncover how specific material practices became sites of inter-generational negotiations and knowledge production. We collaborated with one Lifepatch member, a video artist, in the production of a documentary film featuring our interviews and meetings with the women. The documentary, we had hoped, would be a mobile cultural and artistic artefact, to be shown outside of Indonesia, raising awareness about their work. Entitled the "Nenek Project," the film project was exhibited in two cultural and artistic venues in Indonesia and Switzerland in 2015. For the purposes of this paper, we draw from the interviews, conversation, and observational materials we conducted with both Lifepatch and Nenek-nenek during and outside of film production.

In total, across our ethnographic engagements and documentary film production, we have collected hundreds of hours of video and audio material of interviews, home visits, presentations, hands-on workshops and discussion sessions. We conducted over twenty formal and forty informal interviews with relevant stakeholders including Nenek-nenek, artists, makers, scientists, and policy makers. Throughout these various engagements, we paid particular attention to how Nenek-nenek perform organizational work, engaged in familial, economic, and social responsibilities, and produce and distribute knowledge.

FINDINGS

The Difference in Indonesian "Hacking"

In 2015, Indonesian biohacker and citizen science group Lifepatch received the Digital Communities Honorary Mention at Prix Ars Electronica, which has been referred to

as the "Oscar of digital art" [25]. Media artists and technologists in Europe and elsewhere began to celebrate Lifepatch's technological experimentations as an alternative to the predominantly white, male maker—a figure that practitioners and scholars have begun to view as a depoliticized mode of hacking [37],[46],[65],[67]. People began differentiating between hacking as a countercultural practice and making as a corporate-driven pursuit [27],[65],[46],[7],[73]. For instance, open source tech projects that turned commercial such as the 3D printing company Makerbot and the legal copyright battle at Arduino came to demonstrate the failed promises of DIY making [39]. It was in this very moment that Asia was celebrated as producing an "alternative" hacking culture from Chinese shanzhai [39] to Indian jugaad [31] and Indonesian biohacking, all seeming to promise to recuperate making's failed promises [39]. Indonesian biohackers began asserting a unique culture of hacking by tracing the origins of their technological tinkering to Indonesia's state planning programs.

In an interview with co-founder of Lifepatch Amos in January 2015, he elaborated that Indonesian hackers learned values and practices of collectivism, open sharing, and tinkering from Nenek-nenek, rather than from a genealogy of Western-centric internet counterculture. Amos continued to explain that his mother Maria was a volunteer cadre in state-run women organizations since the 1980s. This he argued had made her "a do it yourself (DIY) genius." When we talked with the 67-year-old Maria, she clarified that she did not understand what "DIY" meant, but that she knows how to "buat sendiri" (make it yourself). "Buat sendiri does not start with yourself, but making things independent of help," she explained, "it is about learning how to make your own resources".

Maria's "buat sendiri" must be understood against the mass mobilization of women directed by the Indonesian state since 1973 to deliver healthcare, education, and financial services across all kampung or village neighborhoods in Indonesian, even till today. Under the Old Order Regime (1966-1998), women were organized by President Suharto to deliver public services on a volunteer basis throughout the archipelago. Women like Maria primarily participated in two state-run women organizations: *Pembinaan Kesejahateraan Keluarga* (PKK, the National Housewives Association) and *Dharma Wanita* (DW, the Wives of Civil Servants). These organizations prioritized duties that fulfilled certain services that the state did not directly attend to. Most of these duties center on the monitoring and promoting of health, literacy, cooking, and microbusinesses within the kampung—a rural village can easily comprise of more than 500 people. Women were organized according to their location in different neighborhoods, nested according to what matched the current civil administration, which continues to be largely male-dominated [69],[70]. In many ways similar to the care labor women have been called upon to perform in the home, PKK and DW members were tasked to improve the standards of living of families and the village community while upholding the values of a nuclear family and female domesticity [52],[54].

Many Nenek-nenek were either civil servants or were married to a civil servant. This affiliation granted them positions in PKK and DW and the ability to manage resources and expertise within the kampung. Being a civil servant in Indonesia constituted an opportunity to push for social reform, all the while performing what was expected of women socially. Nenek-nenek as such have mediated between the ideologies and goals of government campaigns and the people living in their kampung community. Their work often entailed knowledge production and dissemination as the state depended on organizations such as PKK to generate and maintain social and economic welfare and infrastructures such as birth control education, family planning programmes, and microcredit systems [54].

It might seem counterintuitive at first that Lifepatch articulated the origins and practice of DIY hacking as rooted in the practices and commitments of women associated with organizations like PKK that were not only partially state-driven, but also naturalized women's role in society through feminized care labor. The articulation of Nenek-nenek's care labor as belonging to a history of Indonesian DIY culture has to be understood as emerging from a postcolonial desire to redraw the racialized hierarchies of Euro-American-centric tech innovation discourse [62]. The notion of "buat sendiri," for instance, was re-articulated through a language of autonomy and women's empowerment.

Kampung Lifeworlds: Educating other Citizens

Key to the practice of hacking difference we observed was the location of Lifepatch itself. Lifepatch is located in a so-called kampung, i.e. the smallest infrastructural entity of the district government in Indonesian cities [54], [69]. Kampung is the very urban economic infrastructure built and maintained by the generation of women who served in PKK and DW. They are close-knit neighborhoods , managed by state-run organizations and official structures that allowed people to shape neighbourhood life through their daily social and economic engagements. It was these informal economic and social structures that enabled Lifepatch to sustain the precarious creative work that hacking and making in many ways demanded [50].

Because of their location in the kampung, Lifepatch paid no rent for their DIY laboratory. They turned their own homes and that of their families into their workspaces. Crucially, working within the kampung provided a safety net; it offered not only free space, but also access to a clientele Lifepatch wanted to work with. Neighbors, especially women and children, patronized Lifepatch's in-house workshops and exhibitions and viewed their work as services to the kampung. In exchange, they reciprocated by supporting Lifepatch with security and housekeeping services when its members were out of town for artist residency and events.

The kampung, and the women who had built and sustained it, also provided a crucial infrastructure for Lifepatch to articulate and practice what was uniquely Indonesian about their work. Lifepatch's work as such extended from and aligned with the kampung's social and economic make-up, with state-run women organizations as its central enabler. Take, for instance, Nenek-nenek Eka whose son specialized in street art and wine fermentation. She worked as an educator in the neighborhood, and as a formally appointed high school teacher and active PKK cadre. In her role as cadre, she had been educating neighbours and friends on birth control methods for several years. Family planning activities, under the auspices of a national birth control campaign, were part of Eka's organizational duties as a member of Dharma Wanita and were distributed by the state to women. Eka, like other Nenek-nenek, also participated in the annual *hari kesehatan* (English: Health Day), specifically targeted at improving nutrition, welfare, and quality of life in the kampung. Eka often competed in these festivals, attempting to whip up balanced meals according to what was deemed 'healthy' for Indonesians. Eka has played an important role in supporting the social and economic structures in her kampung. She transformed the front of her home into an economic hub, focused on makeup and fashion advice. Many other women followed her lead by starting beauty salons and digital photography studios.

The kind of support network that women like Eka had built over the years created an environment of trust and provided kampung families access to diverse social and economic resources. It was likewise their work that granted Lifepatch to tinker with alternative career paths outside the formal labor economy. Today, only three out of eleven Lifepatch members engage in formally paid work. Two Lifepatch members—Bagus and Darma—opened a restaurant that was selling DIY fermented drinks and food in Bagus' house just next to their mothers' convenience stores. They leveraged their mothers' existing customer base and were able to avoid being tied to contracts for start-up capital or to patronage from the state. It was the work of Nenek-nenek, often spanning several centuries, that provided the necessary social and economic infrastructures that enabled the flexible and creative work of their children.

Practical Pursuits

Most Nenek-nenek described their educational work as a duty rather than following aspirational pursuits. A mother, counsellor, and teacher, Eka, for instance, has provided educational services to her kampung for more than 14 years, hosting more than 50 informal workshops that ranged from topics such as mathematics to the arts and crafts such as jewellery-making and traditional Javanese theatre masks. Not all Nenek-nenek reached tertiary level education, placing them on a different status from their University-educated sons. These workshops, Eka reiterated, served as an important substitute for Nenek-nenek to upgrade their own skillset.

Lifepatch referred to their mothers' work for the community to highlight what was uniquely Indonesian about their own entrepreneurial and educational work. In 2015, Lifepatch expressed its pedagogical commitments in an exhibition focused on cultivating alternative educational structures at the Yogyakarta Biennale XIII. They presented tools for collaborative and interdisciplinary learning, exercised open classroom structures, and conducted hands-on workshops from audio-visual programming to fermentation. Nenek-nenek, however, felt ambivalent about such public displays; many had experienced how politically precarious it can be to organize and coordinate resources for social reforms during New Order Indonesia. Nenek-nenek Maria, for instance, recounted to us the trauma she experienced during her coming of age—the chaos and brutality of the President Suharto-led G30 operations (1965-1966). Maria's father, then a member of a school department administering societal welfare, was suspected to be one of the approximately 500,000 communists and leftists who were killed and/or brutally tortured under CIA-sponsored military attacks, an experience that shaped Maria and most Indonesians' engagement with the state until today. As working with the state was a politically ambivalent terrain for Nenek-nenek, much of their work was oriented towards enabling others to work "against," while at the same time granting protection from the political order. Their commitment, we learned, was towards their fellow citizens, in part challenging and in part reproducing the norms of the state.

Lifepatch rearticulated such political and educational structures and efforts as countercultural, in both national and international contexts. They saw it as their task to educate fellow citizens and deliver where the state failed to provide financial support for creative work. Their aspiration to educate Indonesians is also visible in their insistence on being recognized as a citizen initiative or "citizen lab" rather than a maker- or hackerspace. Drawing from Nenek-nenek's decade long work allowed Lifepatch to differentiate their approach vis-a-vis Western maker and art communities and assert their practices as belonging to a unique counterculture that emerged from Indonesia's history of carefully calibrated social organizing and resistance from within.

Sustaining Creativity through Reproductive Labor

These articulations of a uniquely Indonesian maker and hacker culture included rendering different the financial structures that sustained them. Lifepatch cited as a source of inspiration their mothers' tactics to create financial stability for the kampung. Nenek-nenek participatied in *arisan*—a rotary association that gathers participants to contribute money to form a kitty before redistributing the money around again [45]. During our research, we followed Nenek-nenek Sinta to a meeting that allowed us to see the rotary in action. Each kampung holds regular rotary meetings, typically comprised of women aged 45 and above. In this particular arisan meeting, Sinta discussed how important it was for her to receive redistributed arisan money: "This month was quiet for my store (Sinta owned a convenience store to upkeep her

household's income), therefore I have to borrow some money to get by". The arisan was framed around a narrative of female-oriented participation and self-sufficiency. It enabled the redistribution and coordination of arisan resources, which in turn sustained the entrepreneurial activities and structures in the kampung writ large, crucial for times when individuals faced financial hardship. The kampung, in this way, provided an important alternative to formal financial infrastructures such as banks and loans, which are difficult to obtain for the 66% of unbanked Indonesians [56].

Many of the Lifepatch members mentioned to us how proud they were of these informal practices around arisan finance and social welfare. They saw it as constituting a distinctly Indonesian practice, allowing them to distinguish their own work from the exploitative structures of finance capitalism and venture labor [50]. The work of Nenek-nenek seemed, here, well aligned with the values of open sharing and making-do. Amos, one of Lifepatch's co-founders, made arisan practice a key point in a public lecture he gave at Indonesia's first National Hardware Hackathon; arisan was, he made clear, Indonesia's "own form of open source culture", independent from the more familiar Western genealogies of open source [47]. Co-founder Bagus, similarly, positioned arisan in informal conversations as Indonesia's version of crowdfunding that allowed them to sustain the daily operations of Lifepatch.

It is important to note that the kind of labor Nenek-nenek performed has not received the same national or international recognition as the work of Lifepatch. Practices concerned with organizing and sustaining informal economic and social structures, especially when gendered and coded as work that women do, were—also here—less valuable. Since the 1970s, Indonesian women managed the most intimate aspects of everyday living, ranging from family planning to community building within neighborhoods [12]. They started new businesses, only in part supported by the state, to develop socioeconomic infrastructures across the communities they were tasked to manage. As anthropologist Jan Newberry notes, much of the "work of women in communities, underwritten by the ideology, policies and programs of PKK, also supported under-employed and unemployed youth and males in lower-class communities" [51],[53]. Moreover, PKK's programs in its early onset had ensured that women work in the informal sector for *tambahan suami* (i.e. income to supplement the husband's wages). Women were called upon to perform this labor in small scale, informal, house-based enterprises for which the government has offered courses and small funds. This care labor, framed as an obligation for nation building, was assigned to women and were naturalized as the responsibilities of the good wife and mother that has long kept households in Java afloat. Their informal enterprises and care labor in the kampung, in other words, have constituted the "engine" of economic development. The need for women's cheap and precarious labor largely persisted not because of its adaptability, but as anthropologist Jan Newberry asserts "capital's need for reproduction" [52].

Negotiating Naturalized Care Labor

The relationship between Nenek-nenek and their sons was not without politics and inter-generational tensions. When we met 68-year-old Nenek-nenek Sinta, she showed us the convenience store she has managed the last three decades. Mostly stocked with pre-packaged foods, soda drinks, and detergent sachets, Sinta's business earns close to 300 USD monthly. Located in one of the refurbished front rooms of her house on a busy street in the kampung, Sinta serves customers driving by from 8am to 9pm. Throughout the day, Sinta prepares meals for the family of three, washes the laundry, takes care of her sick husband, and serves incoming customers. Working to supplement the household income from home meant that her day was consumed with all these different tasks, often at once. reflecting on the labor she was expected to perform as a woman, she told us,

> "As a woman, I have to learn how to be pintar anak-anak (clever at taking care of children), pintar memasak (clever at cooking), pintar cuci (clever at washing). I receive very little help in my shop and for supporting the shop's logistical and administrative matters... my daughter Lia can assist me as she is aware of the prices of my goods. Otherwise, I run and manage the shop myself. My husband and sons know nothing about the shop."

Sinta makes clear here how she has become worn from her reproductive labor and responsibilities, notwithstanding the fact her work was often taken for granted or rendered invisible.

The postcolonial conditions left little room for Lifepatch to intervene in such forms of labor exploitation. In their international work in particular, they felt pressure to justify the relevance of their practice against dominant Euro-American-centric genealogies of design and making. They turned towards images of the countercultural to celebrate Indonesian history and the labor of their mothers as uniquely innovative in their own right. However, to read the lives and work of Nenek-nenek as a story of how state power and international circuits of expertise operated against the subaltern woman masks the contradictory and ambivalent positionality both Nenek-nenek and their sons hold. As Newberry observes how women negotiate their roles in state-run organizations, members in PKK "only comply with governnment directives on domesticity and proper homes" insofar as it serves their own ends and the needs of the community they are in charge of [54]. Nenek-nenek, as made evident in the examples of arisan and educational workshops, navigated the mandates and gender ideologies that underpin work in PKK and DW in order to support their families, and communities, and not to impose what a woman should do.

Rewriting Futures from Indonesia's Difference

Lifepatch's articulations of a uniquely Indonesian culture of hacking was taken up by foreign hackers and institutions that sought alternatives to Western approaches to technology.

Lifepatch's own articulations of difference provided an imaginary of technological intervention that departed from typical approaches to hacking as "disrupting and going against the system" [43]:5].

In January 2012, MAKE Magazine accepted $10 Million in funding from the US Military Agency DARPA (Defense Advanced Research Projects Agency) to disseminate and produce maker curriculum, tools, and pedagogy across 10,000 high schools globally [57]. When the news came out, a long-term collaborator (given pseudonym) of Lifepatch from Switzerland, Marcus, openly criticized the move on social media, public presentations, and hacker mailing lists, arguing that such funding will compromise critical and inclusive views to tech education. Amos, one of the co-founders of Lifepatch, publicly backed Marcus' critique, arguing that the origins of MAKE Magazine had little to do with the development of innovation and technological expertise in Indonesia. He added, "openness [or open-source culture] has been overused and overrated."

To show his disapproval of MAKE magazine's defense funding, Marcus designed T-shirts printed with a Maker Faire logo holding both a gun and a missile stating, "I am not a Maker" (Figure 1). In his writings and talks that accompanied it, Marcus contrasted the economization of making in the West from Nenek-nenek's financial mechanisms, highlighting that rotaries like arisan enabled Indonesian citizens to share their resources within communities they have built and be self-sufficient. It was not the archetypical figure of techno-counterculture hero and open source financial systems such as Bitcoin, he proclaimed, but arisan that would sustain the promise of maker and hacker pursuits to provide alternative approachesto the status-quo. Marcus' endorsements provided further legitimacy for Lifepatch's own project of hacking difference.

Figure 1. Marcus' use of missiles and guns to comment on MAKE Magazine's recent acceptance of U.S. Defense funding

The valorization of Nenek-nenek's care labor as enabling a unique Indonesian hacker culture, in other words, was appropriated by foreign hackers and cultural institutions to recuperate their ideal that open source, if done right, would produce more equitable tech futures. In 2016, the British Council listed Lifepatch's 'Nenek Project' as an exemplar of increasing gender diversity in the tech and art sphere [[55]]. It sponsored a multi-year collaboration between British hackers and media artists and Lifepatch to develop projects that increase women participation in Indonesia's creative industries. In a British Council blogpost published on 10 April 2017, Birmingham Open Media's (BOM) Director Karen Newman described how Lifepatch operated on "Indonesian time", physically opening its DIY laboratory and facilities to residents throughout the day in the kampung, especially women and children who mostly stayed at home [55]. She contrasted the "radical openness" and diversity in Lifepatch's lab to the impersonal relations she observed at galleries and art studios in UK. "Lifepatch creates," she argued, "the kind of engagement that most arts organizations and hackspaces *dream of*… women become unassuming biohackers in Lifepatch's kitchen, learning to make fermented tea and yoghurt". These celebrations of Indonesia as delivering on the promise of creative freedom and radical inclusivity, here, are portrayed as emergent from an "unassuming", seemingly naturalized cultural essence of Indonesian creativity. The care and reproductive labor of Indonesian women, that crucially enabled these very practices, is ironically silenced. The complex histories, social hierarchies, and gender norms that underpin the maintenance of kampung infrastructures and relations are turned into a resource and asset for the promise of cultivating a truly open and authentic hacker practice.

An incident during Transmediale, a prestigious new media arts award of a similar caliber to Ars Electronica, crystallized the challenges in maintaining the boundaries of "Indonesian" difference. During the media arts award ceremony and judging, Bagus, one of Lifepatch's cofounder described how Lifepatch members were identified as "golden boys". "People found us attractive because of our tanned skin and identify us and our skin as 'golden'," Bagus laughingly commented on his physical appearance with tragic humor. As anthropologist Ann Stoler notes, "Racisms depend on indexes to mark differences *made to matter*, an anomalous being-in-the-world, a different humankind. Even in their formative moments, one finds a feverish search for tangible indices of those intangibles that can't be seen or measured." [68]:498] The index of Lifepatch's difference here works not through their stories and relationship with Nenek-nenek, but through their physical distance from whiteness—their tanned skin—a mobile marker of being Indonesian and of being rendered other. Race in this circumstance was wielded as an invaluable mapping tool, a means by which the origins and boundaries of Lifepatch are constructed and "through which the visible traces of the body are tied to allegedly innate invisible characteristics" [17].

Lifepatch worried that their difference, despite the celebrations of Indonesian uniqueness and authenticity, was only a temporary avenue for success. When they received the Transmediale award in 2011, they explained to us that "[we won] largely because we had an Asian critic and artist in the panel that judged us. This happened rarely. Otherwise, we

would not have won." Lifepatch, it seemed, was well aware that their own articulations of cultural difference had become a temporary asset in an international market of electronics art and future making.

DISCUSSION: ARRESTED AUTONOMY IN COMPUTING

When governments sponsor educational programs that teach making as a novel approach to STEM and corporations set up in-house makerspaces to update their workforces with the latest innovation technologies, making is often portrayed as a rupture. It is portrayed by elites and practitioners as new and breaking from what came before [44]. While the ad campaigns of Maker Faires and MAKE magazine envisioned a return to an era where DIY making was what drove the American economy, this return is promised to arrive not from the past, but with technologies from the future, in a refurbished and digitally-enhanced fashion: making, so the story goes, isn't about a return to the factory floor, but about opening up industrial production, while remaining in the safe confines of homes, schools, and DIY maker labs. Fundamentally, making has been articulated through a story of intervention and future making, promising a sense of regaining control in times understood as increasingly unstable and precarious [42],[47].

In this paper, we have provided a glimpse into the work of those who enabled such visions of hopeful intervention to be dreamed up and enacted. We have shown how the work of a generation of Indonesian women was crucial for recuperating the hopeful promise of citizen engagement and open sharing. Their labor of care, institutional building, and brokering relations to the state were productively leveraged by their sons and grandsons, enabling them to live entrepreneurially, perform flexible and creative work without a regular paycheck, health insurance, or guaranteed pension. The care work and feminized labor of Nenek-nenek, in other words, enabled their sons and grandsons to live the kind of precarious life that global tech and creative industries demand [47],[50]. It is in how Lifepatch distinguished themselves from Western genealogies of hacking that Nenek-nenek's labor was valorized and exemplary for foreign collaborators envisioning alternative modes of intervention into the world of making.

We have also shown that these practices of rearticulating difference become a productive asset in an international market of future making and hopeful intervention. The assertion that Indonesian women had enabled contemporary practices of hacking difference simultaneously fueled and subverted the figure of the countercultural rebel; while it provided the grounds to challenge Western-centric discourses of design and innovation, it did so by replacing them with an Indonesian counterpart, as such recuperating and retaining the celebratory endorsements of hacking. Assertions of cultural difference, while a legitimizing force for Lifepatch's expertise in a global media art and tech network, aggravated the processes and motivations of finance capital that values life when rendered attractive to future investment, be that the investment in the potential of art or other modes of existence [31]. Postcolonial conditions engender desires and yearnings for national independence and sovereignty, in turn fueling a market of future making that HCI scholars are implicated in [31].

The engagement with cultural difference has become a central feature of HCI and DIS, from visions of ICTD to localize universal design principles in specific contexts to the celebratory endorsements of what makes Indonesia hacking uniquely interesting. Alex Taylor shows how HCI design by reaching beyond the interface has positioned itself as designing for a population 'out there' [72]. As a consequence, he argues, difference has become an important tool to position design as reaching to those previously "neglected significant segments of society and sometimes overlooked sizeable yet marginalized members of the world's population" [72]. Such attempts to look "out there," Taylor reminds, operate by imagining the world as divided into different social groups, reifying the distinctiveness between what's believed to be here and there.

Building on these insights, this paper attends to how cultural difference is mobilized to achieve autonomy from Western-centric notions of design, technology, and computing, in part fueled by long-held postcolonial desires to overcome the status of being somehow lagging behind the West [1],[16]. In this paper, we have shown the ambivalence that emerges from this promise to assert difference and the appropriation of such articulations by an international tech art market. Hacking difference, here, resembles what anthropologist Juno Salazar Parreñas calls "arrested autonomy" – "the frustration of having the means intended to foster independence instead work toward continued dependence" [59]. Arrested autonomy in computing is visible in how Lifepatch's desires to assert difference ironically works to further diminish the possibility of autonomy from Western design histories and genealogies.

Arrested autonomy, however, might not be the kind of conundrum we should attempt to resolve. Instead, we argue to view it as a mode of "experimentation with other responses and other senses of responsibility" [59]:9]. Decolonization, as Parreñas argues, involves recognizing "relations of interdependence and to empathetically live with differences, distinctions, and potential risks" [59]:154]. Such dependencies and attachments are crucially visible in Lifepatch's relations to their mothers as well as with foreign hackers and institutions, art funding and recognition. Likewise, foreign hackers came to rely on Lifepatch's organization and histories to recuperate ideals around hacking.

An effort to decolonize design in HCI then might begin from "embrac[ing] the vulnerability of sharing lives together" and "abandon an impression of safety that depends on cruelty" [59]:3], and an active acknowledgement that decolonization is "an ongoing process that simultaneously experiences an ongoing colonialism" [59]:6]. It is in this processual and

relational understanding of decolonialization that this ethnography of Indonesian biohackers shows how asserting cultural distinctiveness simultaneously confines and enable sovereignty, autonomy, and legitimacy.

Ambivalence and Anxiety in Western Thought

Throughout the paper, we show how Lifepatch articulated their practices as politically relevant to citizens by invoking "older" forms of organizational work that Nenek-nenek performed, rendering it as intrinsically Indonesian and crucial for motivating their own work today. While Lifepatch aspires toward working with citizens, Nenek-nenek have created exactly such citizen initiatives for many decades. Involved in political organizations since the New Order, their devices to control population growth, informal educational services, and financing mechanisms performed what the state couldn't directly deliver. We demonstrate how the interdependency between these two generations and the relations and infrastructures that result enable Indonesian biohackers to claim cultural credibility and legitimacy in their work. We also show the deep anxiety and ambivalence that underpin Western thought and practice in making, as evidenced by foreign institutions and hackers' search for new designs of hackerspaces outside of the West to counter what they view as the status-quo.

Here, we turn to recent scholarship in postcolonial STS that argues against reducing the postcolonial as a mode of analysis that emphasizes continuous yearnings for alternative modernities [62]. It is the "flows, transmissions, travels, and circuits of scientists, knowledges, machines and techniques" [1], that a multitude of yearnings, from postcolonial desires for parity to Western fears over failed promises of modern progress, come together in contradictory ways. Throughout our paper, we show how such desires for alternatives are enacted through the interdependency held between different social groups. They resist any notion of "unidirectional diffusion models of science and modernity, where science, rationality, progress, and enlightenment always rest in Europe or the West, to subsequently diffuse to non-Western nations" [61]:953]. In this way, our paper focuses on what postcolonial STS scholar Warwick Anderson calls "the ambivalence, anxiety and instability deep within Western thought and practice" [4]:645] as well as the contradictory tendencies of postcolonial computing to both be a route to what African American Studies scholar Ruha Benjamin notes as ''national scientific and commercial autonomy and dependence on global knowledge networks and foreign capital'' [12]:341]. When we account for the ambivalences that are masked behind the celebratory story of hacking difference we can begin to shed light on the political economy of promise and future making that feeds off these very desires and hopes for legitimacy. The celebratory endorsements of cultural difference, often driven by well-meaning commitments to diversity and inclusion, are of course not unique to the genre of hacking and making. The very theme of this conference—DIS 2019 "Contesting Borders and Intersections"—likewise signals a commitment to rethink the boundaries that have long plagued interactive design research. At the heart of this attempt is an examination of the divisions and exclusions that have governed design. Our paper provides a cautionary tale of replacing one story of success and uniqueness with another. We hope that a key take-away from our paper is a turn towards the ambivalences and contradictions that emerge through old and new regimes of distinction and exclusion in the very moment as cultural difference is celebrated and turned into a resource for hope and investment alike.

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