The Social Life of Algorithmic Values: Examining the Impact of Value-Based Frameworks in Everyday Life

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***Abstract*— Value-based frameworks are widely used to guide the design of algorithms, yet their influence in mediating users' perception and use of algorithm-driven technologies is vastly understudied. Moreover, there is a need to move research beyond a focus on human-algorithm interaction to account for how the values these frameworks promote – algorithmic values – become socialised outside the boundaries of the (human-algorithm) interaction and how they influence everyday practices that are not algorithmically mediated. This paper traces the entanglement of algorithmic values and everyday life by mapping how residents of the Salvadorian town of El Zonte perceive the top-down transition of the town into "Bitcoin Beach" through value-driven transformations to diverse aspects of their material culture and built environment. This approach advances empirical research on the impact of algorithms by acknowledging the myriad ways in which those who won't or can't (afford to) interact with algorithm-driven technologies are impacted by the value-based outcomes of their programming and provides novel insights for critically examining the role of algorithm-driven technologies in shaping sustainable futures.**

I. INTRODUCTION

In recent years, a growing number of value-based frameworks–sets of guidelines and methods designed to enable and support the embedding of a desired set of human values in the design, research and development of new technologies [1,2]–have been developed to guide how algorithmic systems should behave in order for "AI" to be a constructive tool for achieving better societies. The potential of frameworks such as human-centred AI [3], ethical AI [4], and AI4SG [5] has become widely embraced across the HCI community [6,7], yet scant attention has been placed on how the values these frameworks promote–what we call algorithmic values–are influencing how people use and understand these technologies [8,9].

To address this gap, researchers interested in the cultural and social impact of algorithms are increasingly approaching human-algorithm interactions as sites of ethnographic relevance, stressing the need to "understand how notions of the algorithm move out into the world, how they are framed by the discourse and what they are said to be able to achieve" [10, p. 10]. Yet, despite a growing awareness across HCI scholarship that how we speak and think about algorithms influences social ordering processes that shape diverse aspects of everyday life [11,12], scant attention has been placed on how algorithmic values become socialised outside the boundaries of human-algorithm interactions, and with what impact to everyday practices that are not algorithmically mediated.

If value-based frameworks operate on the premise that lines of code and the artefacts that allow humans and algorithms to interact can become embedded with values such as fair, inclusive, transparent and trustful, ethnographies of algorithms, we contend, should then be conducted on the premise that these values can also become embedded in diverse objects, practices and sites that are not part of the interaction [13]. While the boundaries of the interaction are notoriously ill-defined [14,15], restricting the investigation to the relational, spatial and temporal boundaries of the interaction fails to account for the diverse ways in which those who won't or can't (afford to) interact with algorithm-driven technologies are impacted by the value-based outcomes of their programming. This raises a crucial question: Can we study the impact of algorithmic values outside the boundaries of the human-algorithm interactions that valuebased frameworks aim to mediate?

To answer this question, this paper builds on early findings from fieldwork conducted by the first author in the Salvadorian town of El Zonte [8], where the local community is experiencing the top-down transition of the town into Bitcoin Beach. Bitcoin Beach serves as an interesting case study for the topic of "AI for a better society" as the project is established as a "social project" that relies heavily on the use of algorithmic values to drive adoption of their services and their vision of a "better" El Zonte. The paper begins with a brief overview of related work in the area of ethnographies of algorithms and the social life of values, followed by a short introduction to the context of the study and previous work scaffolding this research. After the methods section, we present four examples of how algorithmic values can be used as research material to identify meaning-making practices emerging outside the boundaries of human-algorithm interactions and finish with a discussion of our findings.

II. RELATED WORK

As the reliance on value-based frameworks as a strategy to align the technical reasoning of algorithms with the moral expectations of their users increases steadily alongside the algorithmic retrofitting of daily life, the ethnographic research of human-algorithm interactions shifted attention from the technical to the social and cultural impact of algorithmic values [16]. This shift has been central for bringing to the fore concerning aspects related to the social power of algorithms [17], particularly relating the diverse ways in which "people vest algorithms with promises and

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possibilities that extend beyond what the maths, lines of code, steps or ingested sensors can do" [18, p. 9] and how these folk understandings and imaginaries of algorithms shape how users understand the intentions and transformative potential of algorithms [19,20]. As Ruckenstein [2023, p. 34] points out, ethnographies of algorithms are meant to help researchers find "unifying themes in algorithm talk by tracing what people do, or say they do, in relation to algorithms."

In doing so, ethnographies of algorithms have contributed novel findings that show how algorithmic values influence how participants understand the transformative potential of algorithms. Some recent examples include algorithmic folk theories [22] as a method to collect lay understandings of algorithms emerging as a result of (negative) experiences with algorithmic platforms, stories about algorithms [23] as a tool to document shared ideas of algorithms by users of the same platform and algorithms as popular discourse to contextualise the cultural conditions in which notions of algorithms emerge [24]. Yet, despite a growing recognition that algorithms are not only mathematical constructs but "also cultural constructs, informed by the values, politics, and biases of their creators and the societies in which they are developed and used" [25, p.2], the meaning-making practices scaffolding the contributions of ethnographic research are primarily elicited during human-algorithm interactions, perpetuating the notion that the interaction is the only site where humans become aware of the transformative potential of algorithms.

In contrast, the ethnographic turn in HCI has given little attention to how algorithmic values become shared and adopted alongside everyday practices that transcend the limits of the interaction, their role in transforming diverse aspects of material culture and the built environment as they become part of public discourse, and the value-based notions of algorithms that emerge as a result of people interacting with the values of algorithms rather than with the artefacts and interfaces that allow humans and algorithms to interact. The entanglement of algorithmic values and everyday life matters because if algorithmic values can be socialised through and alongside algorithm-driven technologies, they can also become embedded in diverse aspects of material culture and the built environment that emerge alongside or in response to the widespread adoption of algorithm-driven technologies [13,26,27]. When material culture and the built environment become imbued with values, Appadurai posits [13, p.107], they serve as conduits for expressing and reinforcing cultural norms, traditions, and social hierarchies, becoming potent agents capable of sustaining or transforming power dynamics and engendering novel cultural practices and identities. Therefore, the impact of algorithmic values also needs to be examined in relation to everyday life.

Lastly, it is relevant to highlight that although the theory and methods for empirically researching algorithms are becoming a growing area of interest in HCI, most studies remain rooted mainly in European and North American contexts. While these settings have undoubtedly benefited from critical ethnographies scrutinising the extent to which algorithmic values address challenges of algorithmic bias, discrimination and oppression [29,30,31] and amplify existing social inequalities, particularly concerning race, gender, and class [32,33], they reflect the lived experiences of people in cities that are already highly digitised and datafied, where the everyday impact of emerging technologies, such as algorithms, can be harder to recognise and easier to dismiss [34]. In contrast, the experiences of people with technology in countries within the so-called “global south” have received significantly less attention. These contexts matter for ethnographically studying algorithms as in many places, the impact of their deployment is still unfolding, creating tensions between hegemonic narratives and local interests and transforming everyday life at a pace and scale that presents new opportunities and challenges for the ethnographic researcher [8,35,36].

III. CONTEXT OF STUDY

This paper builds on early findings from fieldwork conducted for two months in late 2022 in the Salvadorian town of El Zonte [8], where the local community is experiencing the top-down transition of the town into Bitcoin Beach. El Zonte is a small coastal town in the country of El Salvador–just a few unpaved roads wide on both sides of a small stream–about one hour away from the capital city. For many decades, people in El Zonte–like many other rural towns in El Salvador–lived in relative isolation from foreign interests due to the country’s political, economic and social insecurities. However, in the early 2000s, before El Salvador began to reform its image and invest in attracting foreign tourism and investment, El Zonte had already started to make a name for itself thanks to the surfing conditions that can be found around the town [37]. By 2010, Salvadorian investors were already building hospitality infrastructure to accommodate foreign tourists. Yet, until 2019, El Zonte had a precarious physical and digital infrastructure and was far from having a thriving tourism industry.

Things rapidly began to change for the people of El Zonte when, in 2019, President Bukele was elected, and Bitcoin Beach was established in El Zonte [38]. Bitcoin Beach was the first of a growing number of initiatives worldwide aimed at transforming small communities, mostly in developing countries, into circular economies built on Bitcoin–a blockchain-supported cryptocurrency. The project was started by North American entrepreneur Mike Peterson, who first began visiting El Salvador in 2005 to support missionary groups and small development projects through his Evangelical church. El Zonte was chosen as the context to explore the adoption of Bitcoin because it offered a local community with a lack of economic, technological and educational opportunities yet a growing interest from foreigners to visit and invest in the town due to its surfing and tourism potential. These days, the people of El Zonte–particularly the 18-30-year-old population–interact daily with foreigners and, while with different degrees of fluency, most of the town speaks English and works hospitality jobs provided by an increasingly foreign-owned service industry.

While Bitcoin Beach is framed as a social project that aims to empower the community of El Zonte through Bitcoin, the project is inherently top-down when it comes to the changes and "improvements" that need to take place to accomplish what Bitcoin Beach supporters envision as a better version of El Zonte. According to representatives of the project, many of these changes have to do with strengthening the physical and digital infrastructure needed to interact with the Bitcoin ecosystem, such as improving the electric grid and increasing 4g and WIFI access or investing in digital literacy and subsidising access to smartphones and tablets. On the other hand, there are transformations to the built environment and material culture of El Zonte that are deemed necessary to support the vision of Bitcoin Beach, such as paving the town's main roads, improving the trash-collecting infrastructure, and investing in hospitality infrastructure.

Given the top-down nature of the Bitcoin Beach project, the transformations that are cementing the transition of El Zonte into Bitcoin Beach haven't been discussed with the community yet have received ample support from the Salvadoran government. In response, some members of the community are becoming suspicious of the intentions of the project, particularly among the 40-plus-year-old residents who have a complicated and troubled relationship with the government of El Salvador. On the other hand, the younger generations of El Zonte are increasingly trusting of foreigners and the government since the election of President Bukele in 2019, and have become eager to see El Zonte evolve into Bitcoin Beach. As a result, the community of El Zonte is becoming divided, with the younger generations helping Bitcoin Beach shape the future of El Zonte, while the older generations increasingly struggle to visualise the opportunities and potential harms that a foreign and government-backed technology can bring to their lives.

A. EARLY FINDINGS

To promote adoption of their products and services, address concerns about the vision of Bitcoin Beach amongst the older generations, and guide the narrative concerning the transformations redefining the material culture and built environment of El Zonte, Bitcoin Beach relies on a specific set of human values that are meant to represent the transformative potential of Bitcoin: efficiency, trust, inclusivity and modernity. Although these values are part of a more extensive set that makes up the value-based framework behind the ideology of Bitcoin Beach and the development of its services and products, they were chosen by Bitcoin Beach leadership for their likeliness to be embraced by the younger generations of El Zonte. As a key member of Bitcoin Beach explains: *"You can't expect all people to understand blockchain in order to see the potential of Bitcoin, so instead, we capitalise on how algorithms are portrayed in mainstream media, like smart, cool, efficient, modern and so on, and use those values to make the technology attractive to the younger generations but also more approachable for the older ones" (Bitcoin Beach leadership, 45 y/o).*

To associate the algorithmic values of Bitcoin Beach with the products, services and transformations scaffolding the transition of El Zonte, the project has invested in offering free education and training to everyone in the community, yet making a focused effort in recruiting those in the 18 to 30 y/o bracket as this segment is largely invested in the success of the project. Once training is completed, participants in this age bracket become "promoters" and are tasked with *orange pilling* the community. Orange pilling, as a promoter explains, is a concept used by Bitcoin supporters to describe acts that are conducive to people "understanding what Bitcoin is and truly stands for." The practice of orange pilling the community is widely seen as part of the social contract of being a Bitcoin (Beach) supporter, and promoters are trained in how to persuade members of the community–particularly, promoters are encouraged to orange pill those amongst the older generations who are more reluctant to accept the town's transformation.

Orange pilling relies heavily on the algorithmic values of Bitcoin Beach. As a member of the Bitcoin Beach project explains: "adopting our values is often more important than adopting the services that Bitcoin Beach offers because, if the community adopts our values first, they will not question adopting our technology later" (Mateo, Bitcoin Beach employee, 30 y/o.) Consequently, algorithmic values become part of conversations that seek to control how the community perceives the transformations, rather than services, sprawling from Bitcoin Beach. In this paper, we build on these findings to explore how the values of efficiency, trust, inclusivity and modernity become associated with diverse aspects of the material culture and built environment of El Zonte and how the entanglement of algorithmic values and everyday life is shaping how the older generations of El Zonte perceive the transformative potential of Bitcoin Beach.

IV. METHODS

To unpack the entanglement of algorithmic values and everyday life, the first author recruited sixteen participants between the ages of 40 and 70, of which twelve were female, and four were men. El Zonte, being a small community where people know each other, allowed for participants to be recruited through word of mouth with the help of two participants who had been previously involved with earlier stages of the fieldwork (described in the section *Early findings*) with the condition that participants should not be involved with the Bitcoin Beach project nor be users of their services.

Through a design anthropological (DA) approach, which provides the critical and analytical tools and concepts to approach emergent cultural phenomena taking place as a result of specific transformations to everyday life [39], we engaged participants through directed storytelling [40] and mapping exercises as a form of graphic elicitation [41] aimed at revealing the human scale where the impact of Bitcoin as a technology and Bitcoin Beach as a vision becomes relevant for the daily lives of our participants. Using algorithmic values as a research material to explore the transformative potential of Bitcoin, the values of efficiency, trust, inclusivity

and modernity were mapped onto diverse sites, practices and behaviours whose ongoing transformation is being used by our research participants to develop an understanding and position towards Bitcoin Beach. By actively involving research participants in co-creating knowledge [42,43], this research approach allowed us to flesh out contesting values hidden under hegemonic narratives of Bitcoin Beach and use these values to further scrutinise the transformations that are redefining life in El Zonte.

The research presented in this paper took place during one week of the broader 2-month study conducted in 2022. Interviews were both conducted in Spanish and translated to English by the first author. The data obtained from the interviews and mapping exercises was in the form of field notes [44] and transcripts. The data obtained from this research was interpreted using a narrative analysis method [45] to focus on the lived experiences of the participants and their subjective experience of change [46] and how these experiences shape and become part of everyday life [47,48].

The interviews, mapping and debriefing were conducted in groups of eight and had the following structure. First, research participants were asked to form pairs at their discretion. Once paired, participants were asked to use one of the algorithmic values of Bitcoin Beach as the needle of a compass to identify changes and ongoing transformations to material culture and the built environment that would trigger reflection about the transition of El Zonte into Bitcoin Beach. This method builds on multi-sited theory, which posits that social phenomena, such as notions of algorithms, have an "initial, baseline conceptual identity that turns out to be contingent and malleable as one traces it" [49, p.90] and suggests that "when the thing traced is within the realm of discourse and modes of thought, then the circulation of signs, symbols, and metaphors guides the design of ethnography" [50, p.108] as these provide a "rich source of connections, associations, and suggested relationships for shaping multi-sited objects of research" [ibid, p.95]. As Hine (2007) puts it, multi-sited theory "centres attention on the construction of the ethnographic object" [p.655], which in this case are the transformations associated with the algorithmic values of Bitcoin Beach.

This mapping exercise lasted between 30 and 45 minutes, and participants were not given any instructions or restrictions on where to walk. Before the participants began walking, the first author engaged the group through directed storytelling [52] to elicit memories and anecdotes that relate to the ongoing transition of the town into Bitcoin Beach. The goal of this 1-hour warm-up exercise was to have a baseline indicator of their individual and shared perceptions of change and to set the tone for the walking exercise by bringing to the fore aspects of material culture and the built environment that are relevant to the participants. Once couples returned from their walks, a 1-hour debriefing took place where participants shared transformations to sites, practices and behaviours that they identified with the algorithmic value of choice and the reflections that were prompted by these sites.

V. FINDINGS

By relying on algorithmic values, our research participants identified diverse transformations to material culture and the built environment of El Zonte that had already taken place, were currently underway, or felt impending. These trigger sites were diverse, but had in common that none fell within the boundaries where residents of El Zonte interact with the products and services of Bitcoin Beach, making them by-products of the Bitcoin Beach transition. Some of these sites play a crucial role in scaffolding El Zonte for its transition, such as the imminent paving of roads and the top-down removal of cultural practices, such as cooking with fire. Others are seen to promote the adoption of Bitcoin Beach services and lifestyle, such as the widespread adoption of Bitcoin stickers by the local youth and the motif of the town's Bitcoin Beach mural.

Regardless of their purpose or how they emerge, what matters the most for our research participants is the impact that these transformations will have on their daily practices and cultural heritage. As a research participant explains: *"Bitcoin people can't possibly see the implications of these transformations because they are not from here; they just think because it comes from them, it is progress, but for us is the end of how we've lived for decades." (Female participant, 65 y/o).* In the following subsections, we introduce these four trigger sites, the values our participants associate with them, and the reflections that emerge as a result.

A. Dirt Roads

As previously introduced, Bitcoin Beach aims to improve several aspects of El Zonte in order to transition the town into Bitcoin Beach, which includes the paving of at least the two main roads that connect El Zonte with the highway. Our research participants have been told by promoters that paved roads will be more efficient during the dry season because they generate less airborne dust, which has become an inconvenience for tourists, expats and developers seeking to invest in tourism infrastructure. In addition, promoters argue that paved roads will provide better access to the town during the rainy season when dirt roads often become undrivable and make it hard for expats and tourists to drive in and out of El Zonte.

Yet, our participants say that these *"improvements"* to the built environment of El Zonte are irrelevant to them, starting with the fact that none of our research participants owns a car, nor do most of their friends and relatives. Regardless, what dirt roads afford and restrict is still important for the older generations, yet not for the same reasons as Bitcoin Beach. For our participants, dirt roads are part of the identity and lifestyle of its residents. For some, it is about the pace of life; for others, it is about children being able to walk barefoot because the dirt doesn't get as hot as pavement; and for others, it is about keeping the *"town feeling"* alive. Consequently, the prospect of the town getting paved to accommodate the vision of Bitcoin Beach triggers concerns and animosity amongst the participants. The following is a selection of quotes from participants as they reflect on the

paving of roads in relation to the algorithmic value they associate with this transformation.

Algorithmic Value: Efficient

Reflection: *"I don't care about efficiency, I care about safety. And I'm concerned that with paved roads it will become too dangerous for our children to play in the streets. They [Bitcoin Beach] probably don't care because their technology has them sitting in front of a screen all day, but I want my kids to be outside, to play ball in the streets with their friends, but this obsession with efficiency and looking modern has changed the things that they enjoy." (Female participant, 43 y/o)*

Contesting value: Unsafe

Algorithmic Value: Trustful

Reflection: *"They talk a lot about trust, but they haven't asked us what we think about having our roads paved, they just assume we all want the same thing, so how can I trust them or the technologies they want us to use? They clearly have a vision of Bitcoin Beach that is for the benefit of foreigners rather than ourselves." (Male participant, 54 y/o)*

Contesting value: Deceptive

Algorithmic Value: Modern

Reflection: *"They think dirt roads make the town look poor, which I tell you, at first it was a selling point. You know that foreigners love to take pictures of our shacks and barefoot dirt-covered kids. It's cool for them to show they were 'here.' But now that the project is underway and has become internationally recognised, they want to make it look modern to attract a bigger number of expats and investors at the expense of our lifestyle. Paved roads will increase traffic, pollution and crime, it will make it impossible for kids to play in the bigger streets, and it will remove the quiet from every last corner of the town." (Male participant, 48 y/o)*

Contesting value: Colonial

B. Open fire

Open-fire cooking is still a common practice in the community of El Zonte, particularly amongst the older generations that grew up cooking this way. Yet, the smoke, smell and practicality of open-fire cooking are not aligned with the vision of modernity that Bitcoin Beach aims to instil in the community. Consequently, promoters are encouraged to convince the older generations to transition to cooking with gas stoves, stressing to them the benefits of gas over fire in terms of efficiency, safety, and environmental impact. However, the prevalence of open-fire cooking amongst the older generations when gas cylinders and stoves are readily available is not about rejecting efficiency but contesting the loss of tradition. For many of the women amongst our research participants, cooking with fire is considered a heritage that encompasses many practices that are passed from mother to daughter over generations, such as knowing where and when to collect wood, how to keep the wood dry, how to make a fire and how to cook with fire. They stress that, for most in town, cooking with an open fire is a choice, not a necessity. Therefore, while a sensitive case can be made for reducing the environmental and health risks of cooking with an open fire, what is relevant for this research is the role that algorithmic values play in removing these practices and how, in turn, this removal shapes perceptions of Bitcoin Beach, as three participants explain in the following quotes.

Algorithmic Value: Inclusive

Reflection: *"I often cook dinner with my daughter. We use this time to catch up, and I teach her how to keep the fire and cook with it. But now my daughter doesn't want to be around the kitchen anymore if I'm cooking with fire because she doesn't want to smell like smoke when she hangs out with her Bitcoin friends. She is embarrassed by the smell. So I get to spend less time with my daughter because open fire is not good enough for Bitcoin Beach?" (Female participant, 41 y/o)*

Contesting value: Racist

Algorithmic Value: Efficient

Reflection: *"Promoters don't understand that I choose to cook this way for many different reasons that have nothing to do with efficiency. For example, I enjoy going for walks to collect wood. And yes, it is getting harder as I age, but it brings back many fond memories of going on walks with my mother, and I often go on these walks with friends because it is our private time to gossip without our kids and husbands snooping in. And yet all those memories and experiences will be gone the minute I switch to a gas stove." (Female participant, 63 y/o)*

Contesting value: Colonial

Algorithmic Value: Modern

Reflection: *"I don't believe they care about the health and environmental impact of fire; they love a good bonfire! I think they just consider that cooking with fire makes the town look impoverished. But I don't plan on stopping because it's not just about cooking; it's a ritual for me. It keeps me connected with nature and my heritage. But Bitcoin Beach people don't want to understand this, which makes me think that they don't really care about us. That all these things they want to change is just so that they can feel more comfortable as they take over the town" (Female participant, 54 y/o)*

Contesting value: Deceptive

C. Bitcoin stickers

The Bitcoin community has a well-defined aesthetic manifested in diverse forms of material culture, from memes and catchphrases to laser-eyes profile pictures and Bitcon-themed stickers. The latter, in particular, have become widely popular amongst promoters and the extended local youth, who indiscriminately stick them in fences, walls, light posts, street signs, trash cans and everything in between, redefining the aesthetic of El Zonte seemingly overnight. Our participants explain that there is a general

feeling of unrest amongst the older generations in response to seeing the town covered in stickers. In part, they explain, this is because stickers extend the presence of Bitcoin outside the physical places where people are meant to interact with the products of Bitcoin Beach, stressing that while they can choose not to participate in the transition and avoid interactions with Bitcoin supporters or services to preserve the illusion that things are not changing, the prevalence of stickers has become an inescapable reminder of the impending transition into Bitcoin Beach. On top of this, the content of the stickers has become a topic of contention between the younger and older generations. Bitcoin stickers–from diverse coins, developers, wallets, and services–are usually value-laden, promoting ideals that often stand in opposition to those of the older generations. Consequently, our participants explained that there is a shared concern amongst the elders that Bitcoin Beach is using stickers to "brainwash" the youth (what Bitcoin supporters call orange pilling). The following are quotes of participants as they reflect on what the practice of stickering, and the values promoted alongside it, say about the transformative potential of Bitcoin Beach.

Algorithmic Value: Trust

Reflection: *"A lot of what is happening is still behind curtains, so it's hard to make sense of it, but kids tell me stickers give you a glimpse into the future of El Zonte: modern, sleek, sophisticated, and so on. So our kids are supporting a technology that they don't even understand just because they [Bitcoin Beach] made pretty images to manipulate them. So why should I trust them [Bitcoin Beach] if they are ok with manipulating our kids to convince us to embrace this transition instead of explaining to us [adults] what is really at stake here?" (Male participant, 57 y/o)*

Contesting value: Deceptive

Algorithmic Value: Modern

Reflection: *"We have been hearing about the values of this project since day one because it's how they sell their products, like a slogan, you know, but instead of something like 'it makes you a happy man', it's 'it makes you a modern man.' And the stickers trend started at the same time, so it's impossible not to think about the values they are selling when you are surrounded with Bitcoin stickers. And I see the impact that this is having on my kids in the way they talk and how they think about the future. It's like they've been brainwashed because Bitcoin Beach needs their support to change our town. But we [older generations] don't matter to them because they don't care about our traditions and way of life." (Male participant, 66 y/o)*

Contesting value: Oppressive

Algorithmic Value: Inclusive

Reflection: *"None of us know what Bitcoin is and how it will continue to change our customs and what is important for the younger generations. But we can also look at these stickers and get a good sense of where things are heading, and the things that these stickers promote make it pretty clear that their vision of Bitcoin Beach does not align with our vision of what El Zonte should look like ten years from now." (Female participant, 61 y/o)*

Contesting value: Colonial

D. Bitcoin mural

On a wall next to Hope House, the headquarters of Bitcoin Beach in El Zonte, there is a mural that aims to portray the merging of the Bitcoin and El Zonte cultures. The mural depicts an astronaut with an astronaut dog surfing a wave in a tropical setting under a Bitcoin-branded sun. At its most basic, the mural is a marketing tool and is often photographed by Bitcoin supporters, tourists and the press. However, as with stickers, the theme of the mural is of concern amongst our participants. This is largely due to its location, as Hope House is where the local youth go to be trained as promoters, many of whom are related to our research participants. The belief amongst participants is that the mural is not representative of the local culture, and like stickers, its purpose is to orange pill the youth.

Consequently, the mural has become subject to substantial scrutiny by the community, which has led to diverse beliefs and interpretations of its purpose and message. The presence of the mural has become so disturbing for some participants that some now avoid walking next to it, explaining that the sight of the mural is enough to ruin their day. Others refer to the mural as their first glimpse into the value-proposition and vision of change behind the transition into Bitcoin Beach. Below, we share some of these experiences.

Algorithmic Value: Modern

Reflection: *"It feels like they are intentionally deceiving the younger people who think this vision of modernity is cool and are still too young and naive to realise that they will be the ones working to sustain that vision so that foreigners can enjoy it." (Female participant, 55) y/o)*

Contesting value: Oppressive

Algorithmic Value: Trust

Reflection: *"The message is loud and clear: we are here for your waves, your land and your weather, but we don't really care about you. It's hard to trust them when they'd rather have a dog than one of us in their mural." (Male participant, 41 y/o)*

Contesting value: Deceptive

Algorithmic Value: Inclusive

Reflection: *"They say Bitcoin is inclusive, for everyone, but I look at that mural and I don't feel represented. They could have at least painted someone that looks like us surfing that wave since the project is supposed to be first for the benefit of our community, not the tourists, right? (Female participant, 40 y/o)*

Contesting value: Racist

Algorithmic Value: Inclusive

Reflection: *"They want our kids to be ok with our ocean being their [Bitcoin Beach] future and to think that El Zonte has "potential" to be better. Better for who? The kids don't get it; it's not for us. How can it be if we are never part of their picture? (Male participant, 52 y/o)*

Contesting value: Colonial

The quotes and experiences that emerged from the four trigger sites described in our findings show that as algorithmic values become entangled with everyday life through transformations to the material culture and built environment of El Zonte, they become boundary objects–entities that enhance the capacity of an idea, theory or practice to translate across culturally defined boundaries [53, p. 71]–which allow participants to reflect on the intentions and transformative potential of Bitcoin Beach. As boundary objects, algorithmic values provide a medium for participants to contextualise the transformative potential of Bitcoin Beach in practices, customs and behaviours that are meaningful for them yet seemingly ignored by the vision of Bitcoin Beach. As participants shared the trigger sites they identified and exchanged concerns and speculations about their impact on everyday life, patterns began to emerge concerning the top-down character of the Bitcoin Beach transition. In response, new values emerged in opposition to the ones used by Bitcoin Beach: efficient, trustful, inclusive and modern were contested with colonial, oppressive, deceptive, unsafe and racist. These bottom-up values, in turn, help participants ground the abstract vision of Bitcoin Beach in emotions and experiences that are familiar to them.

VI. DISCUSSION

The embedding of algorithm-driven technologies in social systems is continually being reimagined, and so needs to be the methods and places where the impact of these technologies is studied. The use of algorithmic values as a research material allowed us to overcome the challenge of accessing the materiality of algorithms while doing ethnographic research [54,55] and provided our research participants with the "cognitive and material 'grabbing' abilities" [56, p.606] to scrutinise the transformative potential of Bitcoin Beach. Yet, operationalising algorithmic values also comes with a challenge, as it can contribute to perpetuating the malpractice set forward by developers and marketers of explaining and justifying algorithmic behaviour through subjective values that appeal to morals rather than through down-to-earth explanations that appeal to reason.

To leverage algorithmic values as a research material without risking further support for their use as a design material, it is essential that they are not used to understand or justify the workings of algorithm-driven technologies. Instead, they should be used to a) expand how these technologies are ethnographically understood and approached outside the interaction, b) make visible the transformations that scaffold the deployment of new technologies, and c) transcend worn-out narratives where the interaction is the only way in which people become aware, make sense, and contest algorithms. In the following discussion, we expand on the opportunities for leveraging algorithmic values as a research material.

Leveraging algorithmic values to guide the design of the ethnographic research, as Marcus suggests [1988], allowed us to find transformations to material culture and the built environment that participants associate with algorithmic values. While algorithms have been extensively studied for their impact on various systems, including physical, cultural, and environmental, less attention has been given to how the context of their use adapts to the limits and potentials of algorithms and the imaginaries that are built around them, and how these adaptations reinforce dominant narratives of algorithmic life. Floridi [57] calls this phenomenon "enveloping," which refers to how the environment adapts, either through social, cultural or technological pressures, to the capacities and limitations of emerging technologies in order to allow for their functioning. Relying on algorithmic values to identify trigger sites contributes not only in providing ethnographic context to scrutinise the transformative potential of emerging technologies, in this case, Bitcoin and Bitcoin Beach, but in extending our understanding of how the values that developers rely on to guide the design of algorithms permeate everyday life and the feedback loops that come into being as a result.

Algorithmic values, as we have shown, helped to make visible the transformations to material culture and built environment needed to envelop El Zonte so that it can be transitioned into Bitcoin Beach. These transformations, as McLuhan [28] and Adorno [34] point out, are the patterns that the ethnographic turn in HCI needs to pay attention to in order to account for the different scales and dimensions of everyday life that algorithms are enveloping. As Adorno reflects on the dawn of modern life in his short essay, "Do not knock," technology has a way of flattening the human experience by patterning what interactions with technology look like. Therefore, as Adorno posits, "the new human type cannot be properly understood without awareness of what he is continuously exposed to from the world of things about him, even in his most secret innervations" [33, p.19]. This approach can be applied to other algorithm-driven technologies, including those that are classified, rightly or not, as AI technologies, as what matters is not the technology in itself, but the algorithmic values that are socialised alongside their deployment and the transformation to everyday life that take place as a result.

Making visible the entanglement of algorithmic values and everyday life reveals the human scale where the impact of Bitcoin as a technology and Bitcoin Beach as a vision becomes relevant for the daily lives of our participants. Therefore, conducting ethnographic research of algorithms across scales is relevant not only for contextualising the impact of these technologies in everyday life but also to provide participants with a concrete context bounded by human time scales where the transformative potential of new technologies can be reflected upon. This is relevant as it allows participants to assess the impact of Bitcoin in their

community by relying on memories of pre-Bitcoin times, present-time concerns, and desires about the future based on the things that are important to them rather than on the outcomes of interactions with Bitcoin products. In doing so, participants began using algorithmic values as boundary objects to make sense of the intentions behind a technology they, as most people out there, don't fully understand.

As boundary objects, algorithmic values do two things. On the one hand, they vastly extend the ethnographic context in which critical researchers can approach participants with the aim of fleshing out bottom-up understandings of algorithms and their impact on everyday life. This extended mode of inquiry aligns with the challenges currently facing the ethnographic turn, allowing researchers to decouple notions of algorithms from the artefacts and interfaces that mediate them and focus attention on the by-products of human-algorithm interactions and how these shape people's perception, adoption and contestation of algorithm-driven technologies. Furthermore, as boundary objects, algorithmic values prompt participants to critically examine the extent to which the values associated with algorithms are mirrored in the transformations that occur alongside them, whether as by-products or through top-down enveloping. When these transformations are not aligned with the expectations of participants, value tensions arise [58,59]. These value tensions, in turn, allowed for bottom-up values to surface and be negotiated with algorithmic ones, which helped participants to express their concerns, fears, and desires in response to the entanglement of algorithmic values and everyday life.

Lastly, it is relevant to highlight that the potential and limitations of relying on human values to design and develop AI technologies must be scrutinised not only in the context of their deployment and adoption, but also in the context of their embedding. In particular, we suggest more research needs to be done in three stages of the development pipeline: **Ideation,** where a narrow group of people will decide which social values better represent the constraints and potential that a specific algorithm-driven technology should respond to [59]; **Development processes,** where a larger number of stakeholders will have the agency to add and remove values to address concerns or reinforce interests related to varied, and often conflicting, aspects of design, ethics and performance [60]; **Marketing strategies**, where algorithmic values will be leveraged to replace knowledge of a technology with a social positioning towards that technology to exploit people's reliance on social values to trust and understand new technologies [61,62].

ACKNOWLEDGMENT

This work is part of the DCODE project. The project has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 955990.

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