Poaching in Southern Africa:
Identifying Leverage Points for Effective Intervention.

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Abstract

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Poaching and wildlife trafficking is an urgent ecological threat, with human causes and human victims. In response, emerging technologies have begun to enter this domain, with varying degrees of success. This compels those of us in technology design roles to consider how technology may be more appropriately applied to this context, with awareness of the systemic complexities that affect the relationships between individual actors, communities, organizations, and environmental conditions that make up the socio-political fabric of the design situation. In this, and other so-called "Wicked Problems" [Rittel & Webber, 1973, p.156], there is a need to employ creative thinkers, and engage a diversity of perspectives. The objective of this thesis is twofold: Firstly, to identify underlying causes and factors of poaching, and 'leverage points' by which design may affect positive change, and secondly, to examine the emerging role of the designer-researcher and the value of independent design fieldwork.

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POACHING IN SOUTHERN AFRICA:

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UNIVERSITY OF WASHINGTON, 2020

POACHING IN
SOUTHERN AFRICA

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"The most difficult animal to manage is a human being, let's learn to manage that animal."

-Nicholus Funda, Field Interview [81]

Abstract

Poaching and wildlife trafficking is an urgent ecological threat, with human causes and human victims. In response, emerging technologies have begun to enter this domain, with varying degrees of success. This compels those of us in technology design roles to consider how technology may be more appropriately applied to this context, with awareness of the systemic complexities that affect the relationships between individual actors, communities, organizations, and environmental conditions that make up the socio-political fabric of the design situation. In this, and other so-called "Wicked Problems" [1:156], there is a need to employ creative thinkers, and engage a diversity of perspectives. The objective of this thesis is twofold: Firstly, to identify underlying causes and factors of poaching, and 'leverage points' by which design may affect positive change, and secondly, to examine the emerging role of the designer-researcher and the value of independent design fieldwork.

POACHING IN
SOUTHERN AFRICA

INTRODUCTION

Introduction

This thesis documents research conducted over the course of three academic quarters at the University of Washington, School of Art + Art History + Design.

Wildlife poaching is getting worse across Africa [2]. In fact, on average, poaching results in the loss of an elephant every 15 minutes [3,4]. Existing anti-poaching strategies aren't sufficient [5,6], and so new, creative strategies are needed [7,8]. I will argue in this thesis, that in light of the complexity of this topic and the inadequacy of existing strategies, design is able to provide a complimentary perspective and contribution. Through a holistic analysis of wildlife poaching and trafficking, and field research in South Africa and Namibia, I propose a number of areas within this topic that I believe to be well suited to future design interventions. These areas are described as 'leverage points', as they present an opportunity for relatively small, focused interventions that have the potential for broad, systemic impact.

In the introduction section of this thesis, I explain my rationale for selecting this research topic, In the background section, I outline the urgency of poaching and wildlife trafficking, its causes, contributing challenges, and current strategies that attempt to resolve it. Following this outline, I examine the characteristics of 'wicked problems', the suitability of design in addressing these problems, and the necessary adaptations required to do so. In the methods section, I examine the role of secondary research in this project and present a chronology of my analytic and synthetic methods. This section concludes with an overview of my field research in South Africa and Namibia. The results of this field research are documented in the findings section, which is divided into findings pertaining to design research and findings pertaining to poaching and wildlife trafficking. I have included in this second findings section, secondary research insights which were confirmed, and novel insights that emerged from the field research. I conclude this findings sections with a number of leverage points identified by this thesis, centering on changing values and developing sustainable revenue models.

Definitions and Regional Scope

Poaching, insofar as this research is concerned, refers to the illegal capture or killing of wildlife on private and public land. As wildlife crime is transnational [9], and wildlife habitat can overlap multiple countries [10,11], this research focuses on the Southern African region, as opposed to a single nation. Whilst this region experiences poaching of many plant and animal species, this research centers on rhinoceros, elephant and pangolin poaching.

Poaching may be broadly categorized into either subsistence or commercial poaching [12]. Subsistence poachers illegally hunt wildlife for food and sometimes small-scale commercial trade, whereas commercial poachers do so for money, typically at the behest of someone else. The study of poaching must also include the trafficking of illegal wildlife products and the stakeholders involved, including those who profit from this enterprise and the consumers who drive demand for these illegal wildlife products.

Positionality on Poaching

Perhaps unsurprisingly, this research aims to develop insights and interventions that are in opposition to poaching. Yet, it bears recognizing that poaching is not universally condemned. It is a source of food and income for some families, and the proceeds can trickle down to positively affect others in their community [12]. In kind, poachers are afforded respect by these communities [12–14]. In some cases community economies are kept afloat and thereby made dependent upon poaching activities [15]. It is important, therefore, to recognize the impact of my perspective on the form this research takes. An extreme animal rights advocate, for instance, may have no qualms with incarcerating every poacher. However, this would likely intensify the poverty that causes some to poach in the first place. For this reason, it is important to consider the issue holistically, and sensibly. It isn't my intent to improve upon one issue, only to exacerbate another. With that said, poaching has objectively bad effects on ecosystems and humans, including the potential for species extinction, secondary ecological effects, detrimental effects to African tourism, and an intrinsic relationship with organized crime. Aspects of the issue which will later be expounded upon.

Personal Motivation and Background

This thesis should be considered in terms of the perspective through which the research is interpreted. My professional background is in industrial, human-centered and technology design, with most of my career spent designing consumer electronics products. I was originally born in South Africa, though I left at a very young age during the late apartheid era. Having visited game reserves throughout the years, I returned to South Africa in 2017 to complete my field guide training in Limpopo province. The African savannah occupies a special place in my heart, and so the topic of this thesis is, in a way, an experiment in how one might reconcile one's day job with one's passion.

My interest in the issue of poaching was piqued during a visit to a heavily fortified cycad sanctuary in South Africa. The ancient plants within this reserve were under 24/7-armed guard against poaching helicopters. More recently, I became aware of the adoption of drone (UAV) technologies to detect wildlife poaching in this same region. I had initially planned for this thesis to focus on emerging and advanced technologies within this domain, as this would bridge my professional expertise with my passion for the South African bush. As my research continued, however, I became more critical of the use of drones and other advanced technologies, and my thesis reflects this stance.

Acknowledgement

My undertaking of research on this topic was enabled by my personal connection to the region. Yet, I acknowledge that I was not invited to conduct this research, and I do not presume to suggest that the communities and conservation professionals discussed in this research are unable to address their respective challenges without design intervention [16]. My connection to the research context and its people is a privilege, and without it, I would have been unable to make the progress I have. Many of my primary sources were recommended by friends, professional contacts and family in South Africa and Namibia. In many cases, this network, as well as my heritage and experience in the region, was essential in gaining the trust of sources, in what is an innately dangerous topic.

Expanding Upon Topic Relevance

Poaching results in animal deaths and has broad ecological consequences, which is why I've found it to be commonly considered an issue of exclusive concern to humanitarians and conservationists. This is an environmental and humanitarian issue, however, the topic has broader, global implications, and should therefore be of concern to a broader audience: The effects of poaching and wildlife trafficking extend to many nations, including the United States, which is the second-largest market for illegal wildlife products, and a major shipping conduit of these illegal wildlife products to consumers in Asia [17]. In fact, recent laws have sought to combat the number of illegal wildlife products entering Washington state ports [18], not far from the University of Washington Seattle campus. That we find evidence of trafficking in our own back yard, illustrates the global nature of this insidious trade. Furthermore, the proceeds of this trade are funding terrorist and criminal organizations which are both deemed to be threats to the United States' national security [19]. Ultimately, poaching, wildlife trafficking, and the strategies used to counter these two things, results in human victims: Be it from economic subversion [2], hardships caused by incarceration [20] and extortion [14], the introduction of drugs [21], or global disease outbreaks [22,23].

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BACKGROUND

Background

This section aims to provide the reader with an overview of the complexities of this topic. This information was synthesized from a variety of primary and secondary sources, the process of which is discussed in detail in the Method Section of this thesis.

Urgency, Escalation and Technology

Paul Allen, the cofounder of Microsoft, announced in 2016 the results of his "Great Elephant Census". This large-scale aerial survey of 18 African nations, found that on average, we are losing one elephant every 15 minutes to poaching [3,4]. Poaching is an issue that demands our immediate attention. Throughout Africa it is worsening, and time is running out if we are to do anything about it. Poaching in Africa has doubled since 2007 [2] and between 2007–2013, rhino poaching has increased 7000% in South Africa, alone [24]. At the current annual rate of 8% population decline [4,12], we will lose the elephant in ten years and the rhino in ten [24] to 25 years (by more optimistic estimates) [25].

Many regulatory efforts to curb demand and tackle organized crime have failed [6], and international treaties such as the Convention on International Trade in Endangered Species (CITES), have lost their effectiveness [9,26], strong-armed into inaction by The Southern African Development Community (SADC) [9]. The UN general assembly has now declared wildlife trafficking a priority issue [6], and the United States government has instigated a variety of initiatives to curb poaching and trafficking [18,19], including an inter-agency task force [19] to address what President Obama once described as an "international crisis" [17].

The recent increase in poaching and demand for illegally trafficked wildlife product is being fueled by increased demand from Asia's burgeoning wealthy class [2], and it's "nouveau riche" [27]. With this class expansion comes increased disposable income and a thirst for luxuries previously enjoyed only by the privileged few. Increased demand and its resultant supply, is further stoked by the rise and accessibility of enabling-technologies, including the rise of e-commerce, social media [28], cryptocurrency [29,30], and the dark web [30]. The increasing speed with which new technologies are developed and adopted, is in this case both an opportunity, as well as a challenge. It bears reflecting on the potential for technologies to be coopted for nefarious purposes. The same group-chat apps that are encrypted so as to protect our right to privacy, are on the other hand, used to facilitate the sale of illegal wildlife products [30], and the operations of other illegal enterprises. There have been efforts, albeit reactive efforts, to mitigate the use of technology platforms for the illegal trade of wildlife products and animal cruelty. The Global Coalition to End Wildlife Trafficking Online, with members including Google, Facebook and Instagram, are implementing interventions to curb the use of their platforms for these purposes [31].

An Arms Race

There is a danger that anti-poaching strategies have the capacity to be counter-productive if they contribute to conflict escalation. It's necessary to ensure that this potential side effect be anticipated and mitigated. As new technologies and strategies are adopted, each side has to adapt their technologies and methods in response, in what is akin to an arms race.

Between 2006 and 2016, approximately 750 rangers were killed in action by commercial poachers and militias [32] -who were claiming their slice of the $19 billion industry that is poaching [33]. This industry is now the fourth most lucrative illegal enterprise [33], and anti-poaching units are increasingly finding themselves outgunned by poachers as the stakes increase [2]. Commercial poachers, some outfitted by criminal syndicates, are equipping themselves with rocket-propelled grenades, rocket launchers, M16 assault rifles, night vision goggles [2], helicopters, explosives, and encrypted communications [12]. In response, anti-poaching units are fighting back with grenade launchers [34], drones [35], paratroopers [36], radar [14,37] and helicopter gunships [6].

This escalation in weaponry and technology has a human cost. It is causing rangers to employ more aggressive tactics in situations where they're outgunned, resulting in greater risk to themselves and the poachers (Wildlife Poaching Threatens Economic, Security Priorities in Africa) [2]. Between 2010 and 2015, it's estimated that up to 200 suspected poachers were killed in Kruger national park alone [34] - or "neutralized, as SANPARKS prefers to call it [15]. in addition to the dangers that poachers and rangers face in this feud, this escalating violence brings with an increased risk of collateral casualties [2]. It will only take one tourist getting between a ranger and a poacher in a gunfight to decimate South Africa's wildlife tourism industry [14], the proceeds of which fund the conservation of at-risk species such as elephant and rhino.

"We will fight fire with fire."

-David Mabunda [34:46]

"There are some days we will have three contacts or firefights with poaching groups. The poaching groups are relentless. Day or night, it doesn't stop...We are concerned. This intensity, the number of firefights, poachers wounded, poachers killed, near misses are having a psychological impact on not only rangers but their families."

-Ken Maggs [15:np]

Behind the scenes, technologies are being developed for a colder war on poaching, but it remains to be seen if they will be effective, for how long, and if these technologies will also eventually be utilized by criminals as they become commodified over time. For instance, machine learning [21] and artificial intelligence [21,38] is being applied to automate visual analysis of images. And new types of incursion sensors, IoT [21], cloud computing [38] and forensics technologies [5,39] are also being rolled out to assist with detection and evidence gathering in the field. Intelligence-gathering software is being developed which will scan social media for illegal marketplaces, and can trace online financial transactions, although it is expected that their success will be short-lived and push these criminal operations deeper into the Dark web [30].

Causal Factors and Contributing Challenges

There are many causal factors that result in wildlife poaching and trafficking, and many more factors which impede its redress. I've found it helpful to categorize these into three significant groupings: Poverty and unemployment, judicial failure and international cooperation, political will, funding and corruption, and organized crime and terrorism.

Poverty and Unemployment

Poverty and poaching go hand-in-hand [40]. Poverty, along with unemployment was identified as the primary cause for poaching in a study of communities surrounding the Ruaha national park in Tanzania [20]. Poachers are recruited by transnational criminal enterprises that target desperate and indigent residents [41] from communities that border conservation areas [12,34,41]. Given the lack of economic opportunity, these poachers will brave high risks [20,34], and for their efforts can receive anything from a bag of cornmeal to 150,000 South African rand ($8000, at the time of writing), which is nearly the equivalent of five years' salary in South Africa [21].

In South Africa, where the unemployment rate is estimated at 28–38% [42], rural populations suffer from higher concentrations of poverty and face a greater struggle in seeking employment [43]. This "spatial inequality" [44] is a holdover from the apartheid regime [43–45], when non-whites were forced to move from cities to rural 'homelands' [43,44].

One might think that rural populations who live near to conservation parks are fortunate, and may benefit from the nearby businesses that operate within them, but to the contrary, rural communities that are adjacent to conservation areas tend not to benefit from the wealth that is generated inside [6,46,47]. Kruger national park, which is the size of the country of Israel [48] and has two million people live along its western boundary [34], employs only 2300 people [21]. Historically, the "economic penalties" for living next to a protected area has far outweighed any benefits [7:588], and the creation and expansion of these conservation areas has been to the detriment of these adjacent communities [20].

"Why should people care about the big game on their doorstep, when they can hardly afford to school their kids?"

-Helena Pozniak [21:np]

"Well why does it matter to me? I live in a tiny one bedroom, tin-roofed house in the middle of [a township]. I will never see a rhino."

-Anonymous Field Interview [59]

Whereas subsistence poachers poach because their primary needs are not met, there are indications that commercial poachers poach in order to supplement their incomes [20]. This is not to say that commercial poachers aren't impoverished, nor that poverty isn't a cause of commercial poaching, but that poverty is multidimensional and cannot always be measured monetarily [45], and therefore, money alone may not alleviate their poaching practices. Rather than absolute, the poverty com-

mercial poachers experience is moderate and relative, so the motivation to supplement their income may be driven not purely by need, but by social factors such as intracommunal wealth disparity [20], a desire for nonessential luxury goods [14,49], or even boredom [46]. In one survey, commercial poachers claimed that they would prefer to do something other than poaching to diversify their livelihoods but lack the wherewithal [20]. Yet, evidence suggests that providing monetary assistance to these poachers can backfire, resulting in poachers purchasing snares to improve their poaching efficacy [20], or even expanding their operations by employing other people [7]. Furthermore, providing funding to alleviate poverty in these locations may promote dependency on such aid, or even cause populations to migration into that area [7], potentially exceeding the capacity of the funding initiative.

In a cruel twist, wildlife tourism, which accounts for 80% of annual sales of trips to Africa [50], has significant potential to fuel economic growth on the continent [51,52], and subsequently to reduce poverty. Wildlife based tourism has the potential to exist in the very areas where rural Africans struggle to find employment, and it generates 40% more employment compared to the same investment in agriculture [51]. However, wildlife tourism depends upon the very wildlife populations [20,21] that are being decimated by impoverished poachers. They are unwittingly sabotaging their own people [2]. Poaching further undermines the potential for tourism to alleviate unemployment in Africa, reducing tourism revenue [2] in that tourists are attracted to stability and safety, which certainly isn't helped by the presence of poaching [51], corruption, and anti-poaching conflict in these areas.

Judicial Failure and International Cooperation

The number of countries involved in the supply, transit and consumption of illegal wildlife product makes it extremely difficult to enforce laws [19]. An even greater number of countries are likely involved in facilitating the financial transactions behind this trade and hosting those who profit from it. Because of the global nature of this issue, successful investigation and prosecution requires concerted inter-governmental co-operation [2]. However, this is hampered by corruption and complicity within governments and enforcement agencies

"In most cases, they are low-level 'foot-soldiers', drawn from the local communities that fringe the park: cannon-fodder for the poaching networks and transnational criminal networks that are dispensable and easily replaceable."

-Julian Rademeyer [34:53]

Stories of failed prosecutions and sentences not fully served, have become all-too-common [5,53]. In 2015, there were 1000 poaching arrests made in South Africa, yet this resulted in only 60 convictions [5]. Dawie Groenewald, an ex-policeman turned poaching kingpin, was first charged in South Africa in 2010 with 1872 criminal counts [5]. The United States has since requested his extradition, but this cannot occur until he is first tried in South Africa, and this isn't expected until 2021 [53]. The investigation into Groenewald has so far exposed links between his businesses and the Trump family, Pablo Escobar's cartel and the Irish

Mob [5]. "It's very likely he's going to get off the hook. That's an indictment of how sick our systems are." [Hofmeyr in 5].

The legal infrastructure in nations that supply illegal wildlife products are severely lacking [2,54], and it is clear that assistance and pressure from the international community is needed [2]. International pressure has, in the case of Namibia, been successful in providing the impetus to strengthen their laws and stand up to Chinese interests [55]. Likewise, it is thought that pressure from the United States, in the form of sanctions, may also assist in strengthening the enforcement of international trafficking laws [19]. However, opposing interests from somewhat surprising sources, may obstruct these efforts. For example, the National Rifle Association (NRA) opposes the United States strengthening laws against the ivory trade [9,19] and SADC member nations of the UN's CITES treaty, also obstruct further efforts to curtail this trade [9].

The efficacy of the legal and judicial systems within source nations would be improved by multilateral agreements on jurisdiction and penalties [2]. As it stands, poachers and poaching bosses simply flee across international borders [14,55,56], instead of remaining to face prosecution; Borders that are already weakened and undermined by government corruption [19]. In Namibia and South Africa, the poachers sometimes originate from across borders [5,34,41], and rangers, who have no international jurisdiction, can do nothing when they cross back during pursuit [14].

Current criminal penalties and financial deterrents are proving to be insufficient [2,54], in part, because wildlife crimes aren't taken seriously by the courts [8,39,54,56]. Poachers are frequently released, only to be re-arrested for poaching time and time again [57], or are bailed out by poaching syndicates [41,55] who provide them with a passport and the means to abscond [55]. In Tanzania, the perceived insignificance of the crime and the cost of incarceration is used to justify sentences of less than a month [20]. Although light sentences are argued to be a contributing cause of poaching, it should be noted that the threat of arrest and incarceration is less of a deterrent for those who are severely impoverished and desperate [20], and those who view prisons as a source of food, shelter and medical care - oftentimes those who suffer from HIV/AIDS [56].

Poaching weakens economic stability and is detrimental to growth and investment [2]. Initiatives to expound the severity of wildlife crime by reframing it as "economic sabotage" [2:4], are helping. In Namibia, prosecutors and magistrates are provided workshops where they are taught about wildlife crimes, and the extensive human and economic impact of poaching [56]. This has helped to increase successful prosecutions and promote harsher sentencing [56]. And the US department of Justice (DOJ) has found that overseas justice systems are more receptive to the advantages of asset seizure and restitution, rather than penalty reform [19].

"Investigative officers working on poaching cases have to weigh the benefits of collaborating with other officials, knowing that sensitive information has a way of getting back to the criminals."

-Extract from Field Notes

"The Chinese embassy was complicit, at least in terms of turning a blind eye to what was happening and not taking accountability."

-Dr. Chris Brown, Field Interview [55]

Politic Will, Funding and Corruption

Poaching can only be successfully addressed if there is a political will and the resources to do so. Unfortunately, conservation related issues aren't always prioritized, nor well-funded. Even the United States appears to have arrears of $1.3 million on the CITES ledger [58]. And South Africa allocated only 1% of their 2015/2016 national budget to the Department of Environmental Affairs [34]. In the same year, their Defense department received 8% [34].

Africa's 8400 protected areas amount to half the land mass of the USA [51]. An analysis in Zambia in 1988 estimated the cost of protecting a square kilometer against poachers to be $200 [7]. Accounting for inflation, that is $435, in today's dollars. Protected areas in Africa receive only one tenth of the funding they require, and so many are subsidized by private organizations and NGO's [51,56]. However, NGO's and non-profits are struggling to raise funds amidst widespread "donor fatigue" [59]. There are just too many causes and too many organizations diluting the pool of donor funds. In some cases, conservation programs receive assistance from philanthropists, tech companies [21], and international aid programs. Financial assistance from the CITES National Ivory Action Plan (NIAPS) program, provides participating nations with funding, that rather nonsensically corresponds to the country's improvements, as opposed to their needs [9]. This has the unfortunate effect of incentivizing nations to manipulate their statistics to continue to receive this assistance [9].

Unfortunately, few African nations have the resources to fund conservation to the extent that is necessary [7]. Many other priorities compete for the resources that they do have [7]. Many governments are rolling back conservation initiatives, and downsizing protected areas, in response to competing demands [7], including healthcare, education [51] and crime [14]. There is a correlation between affluence and conservation attitudes [7], so "Why should people care about the big game on their doorstep, when they can hardly afford to school their kids?" [21]. Politicians serve the interests of the majority, in theory at least, and the majority have more important concerns than conservation [14]. Until public sentiment changes, politicians are unlikely to champion conservation.

In regions that experience conflicts between humans and wildlife, public sentiment regarding wildlife conservation is further eroded [8], and poachers gain more sympathy [9]. In these places, including Botswana, Zimbabwe [8] and South Africa [14] animals are viewed as problems. They raid crops and kill livestock [14]. In the past five years, 200 humans have been killed by elephants in Zimbabwe [10], where the Parks and Wildlife Management Authority (Zimparks) has claimed that farmers have also lost more than 7,000 hectares to elephant damage [60]. The public sentiment is used by politicians to weaken conservation laws [9] and to rationalize the sale of ivory stockpiles [10].

"He explains to me how poachers receive a lot of their information from underpaid, unhappy anti-poaching rangers and other staff members... They will offer more than a week's salary just to provide some information. It's easy money."

-Extract from Field Notes

"We are badly badly, badly infiltrated. And it makes sense for the criminals to recruit our people to work from them."

-Anonymous Field Interview [14]

Corruption almost certainly feeds into political inaction. It is considered by the Unites States government, as a major enabling factor for poaching, according to a report by the Office of the Director of National Intelligence [2]. Three months before this report was released, David McNevin, a former US defense attaché was arrested in Nairobi airport for possession of illegal ivory [8]. This wasn't mentioned in the report. It's speculated that officials in Zambia, Malawi and Mozambique permit and profit from the illegal harvesting of products from national parks [55]. In South Africa, the police are suspected of poaching related corruption [Funda in 5,59], and in its largest national park, Kruger, rangers are extorted for inside information by syndicate loan sharks [14]. In private conservancies, I'm told that it's not uncommon for the anti-poaching rangers and park employees to be paid to supply information to the poachers [14,57,61]. In Namibia, it's assumed that certain state prosecutors are prone to leaking information [56]. And in Mozambique, administrative, judicial and tax department personnel were exposed as being complicit in syndicate poaching, in some cases selling weapons and equipment to the poachers, releasing detainees and destroying evidence [62].

Organized Crime and Terrorism

Illegal wildlife trafficking is now the fourth largest illegal industry, behind human, weapon, and drug trafficking [39]. It is estimated to generate $19 [33] to $23 billion [63]. This is credible when considering that raw elephant ivory commands $2000 per kilogram [33], and rhino horn commands $65,000 [33] to $100,000 per kilogram [64]. A single bull rhino can possess up to 22lbs of horn [5], which at the more conservative estimate of its market price, translates to $650,000 for a single animal's horn. This makes rhino horn more valuable by weight than gold [65], diamonds [19] and cocaine [33,66]. With this sort of profit margin, it's no wonder that organized crime syndicates and terrorist organizations are involved in poaching.

Al Shabaab, a branch of Al Qaeda, generates 40% of its income from ivory [19]. They are not alone: ISIS, Boko Haram [19], The Lord's Resistance Army, and the Janjaweed militia [8,19] also profit from poaching. This international security threat is one of the reasons that the United States [19] and UN general assembly [7] have prioritized this issue in recent years.

Militias and terrorist organizations create chaos and thrive amidst it. In Northern Mozambique, conflict between Christians and Muslims has enabled Al Shabaab to exploit resources including wildlife, while the government is preoccupied [14]. The chaos caused by the Coronavirus pandemic has created an ideal opportunity that poachers are taking full advantage of [67]. Virunga national park in the Democratic Republic of the Congo (Africa's first national park) has been plagued by violence since the Congo's civil war, paving the way to poaching and illegal log-

"Terrorist groups, such as Al Qaeda affiliate Al Shabaab, Boko Haram, the LRA, and others, are all involved in poaching."

-Hon. Ted Poe [19:3]

ging [68]. In 2020 it was closed due to the pandemic, and in April 2020, 12 of the park's rangers were killed by militia [68].

Transnational organized crime syndicates are also heavily involved in poaching and wildlife trafficking. The low risks and penalties, and high profits, attract them to this lucrative industry [19]. These are sophisticated and ruthless operations, with clear links to human, weapon, and drug trafficking [19]. Poachers arrested at the grassroots [14], and the organizations that commission the killing, are inexorably linked to these other crimes, often employing the very same supply chains [2,19]. These supply chains are intricate and transnational, and are able to adapt to increased risks posed by changing laws, or to depleted wildlife populations [9]. Therefore, efforts to crack down in one location or species, may displace the problem to another location or species, analogous to the 'balloon effect' experienced in policing drug production [8]. This displacement effect has been observed both within individual parks and across international borders [34]. Beyond simply an analogy, the balloon effect could quite literally apply in this situation: Considering the well evidenced relationship between poaching syndicates and drug trafficking supply chains, it is plausible that as one product is squeezed, another may 'pick up the slack', as it were. Similarly, putting pressure on one particular trafficking method, such as containerized shipping , will assuredly result in a quick adaptation [2].

The business savvy of these organized crime syndicates cannot be overstated. Far from simply responding to a latent market opportunity, they actively create product demand. These syndicates have historically spurred demand for ivory, and more recently have created an artificial demand for Pangolin products in East Asia by marketing healing properties that don't originate from cultural traditions [9]. They react to investigative techniques, in some cases intending to overburden the systems that investigate them [9] and constantly develop novel methods to conceal trafficked wildlife products [9,17,29]. These organizations function at a scale that means they can afford to lose million dollar shipments as a matter of probability [29], but at the same time will fiercely defend their operations, to the extent of murdering rangers [21,32], assassinating activists [69] and tampering with evidence [29,62].

Some argue that the close link between poaching and other crimes presents unique opportunities. At the University of Washington, Professor Samuel K. Wasser's work in DNA forensics for tracking Elephant tusks, turned out to be instrumental in tracking narcotics supply chains [9]. As a "sexy" [9], political issue, the agencies involved in investigating transnational drug crime are better resourced than their wildlife counterparts, and so if the investigation of wildlife crime can contribute to fighting other crimes, the benefit will be mutual. This is a sentiment echoed by Nicholas Funda, South Africa National Parks (SANPARKS) Chief Ranger, who believes that policing wildlife crime reduces other crimes in those locations, and advertising this fact is a surefire way to increase resourcing for wildlife crime investigation and enforcement [14].

"The Somali militant Islamist group and al Qaeda affiliate al Shabaab…generates up to 40 percent of its funding from illegal ivory."

-Editor [33:np]

Strategies to Counter Poaching and Wildlife Trafficking

As with the causes and impediments outlined above, it's pragmatic to attempt a categorization of the strategies that have emerged in response to poaching and wildlife trafficking. It would be logical that each causal category I outlined in the preceding sub-section, would correspond to a matching strategy category: A strategy to address poverty, or corruption, etc. These are admirable (and necessary) objectives, but it is more constructive for a thesis of this type to change the scale of magnification when investigating anti-poaching strategies. For this reason, the following three strategy categories have been selected as they are significant, but also specific and tangible: Enforcement and its consequences, legalization and market-manipulation, and demand reduction. As is befitting of a 'wicked problem', each of these strategies is accompanied by challenges and contraindications.

Enforcement and Its Consequences

Law enforcement is perhaps the most visible strategy in what is often described as a 'war' on poaching [5,34]. "Securocrat" [6] politicians tend to fixate on militarization in response to the issue, garnering the attention of the media [6], who are happy to feature "sexy" [Allan in 8] photographs of drones and armed soldiers. Policing is an immediate, tangible response to the gut-wrenching photos of slaughtered animals that serve as an introduction to this topic for many of us. 'Boots on the ground' and technology in the field is attractive to donors [8] and NGO's, as its effects are easily measured, and within a compatible timeframe [14].

National parks, private reserves and communal lands across Africa suffer from incursions by poachers. In South Africa's Kruger National Park, they had 7500 in 2015 alone, and this number is increasing year on year [34]. In that same year, 1000 arrests were made for poaching across the country. "We will fight fire with fire", says South Africa's National Parks (SANPARKS) former CEO, David Mabunda [34]. SANPARK's current chief ranger tells me that the situation forces a reactionary response [14]. Conservation lands across the continent are guarded day and night by a small army consisting of government rangers and military personnel, private security firms and anti-poaching units (APUs), and community guards [55,59] and volunteers [57]. Rangers, who's jobs used to focus on conservation management, now spend 80% of their time on enforcement activities [15]. SANPARKS won't say how many poachers are killed in the park , but we know that on any given day there are between 5-15 groups of poachers in the park [34] and that on some days, there are multiple firefights [15] Some sources speculated that between 2010 and 2015, 200 suspected poachers were killed in the park [34].

"How many poor people can you arrest?- There are thousands out there that the syndicates are going to recruit."

- Anonymous Field Interview [14]

"I'm a breadwinner. There's no one else to support the family. Once I die, it's over."

-Thomas Shitlhabani [15:np]

The casualties extend to the other side as well. It is estimated that approximately 750 rangers were murdered by poachers and militias between 2006 and 2016 [32]. If rangers are 'lucky', then this warfare inflicts only psychological wounds on them [32,49] and their families [Ken Maggs in 15] Rangers, who sometimes hail from the very same communities as the poachers they battle, face being ostracized by their communities [15], who consider poachers to be modern-day "rob-in-hoods" [57]. Some rangers are now choosing to arm themselves with illegal handguns; not to use against poachers, but to defend themselves at home [14].

Enforcement activities aren't exclusively reactionary. In some cases, they are preemptive. Intelligence units "clean the park from outside" [14], and community informants enable arrests to be made before poaching occurs [56,59]. Detection technologies such as seismic cables, ground radar, gunshot detectors and drones are also being adopted, though with mixed results [14]. Conservation areas are vast in size [38]. The largest communal conservancies in Namibia can reach 1 million hectares [55], and Kruger is twice that, or about the size of the nation of Israel [34]. Monitoring such vast areas is extremely challenging [70]. The size, remoteness, variability and condition of conservation areas make them hostile to humans and technology alike [14,49]. Drones, while offering a deterrent effect [21,35], are no match for the scale of the geography [21] and haven't performed well in trials in South Africa [14,71]. Sensor technologies have likewise been thwarted by the extreme condition. Ground radar [14] and thermal vision technologies [56,57] have been effective, but only in targeted, close-range applications. Technology is perceived by some in the field, as detracting from more necessary tasks, being overly complex [49], or requiring dedicated staffing resources that would be more effectively allocated to traditional field work [71].

The question remains, that even with the best technologies and many more boots on the ground, is arresting and incarcerating poachers going to have a lasting effect? -And is this effect a positive one? There are 2 million people living along the Western boundary of the Kruger national park [34], and there's thought to be 1000 poaching syndicates around the park's borders [21]. Poachers are known to live in neighboring villages [5,41,49], and to be assisted by their friends and families [34]. Their local knowledge of tracking and animal behavior is what makes them so formidable [14,41,55]. And so these neighboring communities are viewed with suspicion, commonly perceived as the source of the problem [55]. As a result, anti-poaching enforcement activities commonly include roadblocks, searching tribal lands [72], and of course, arresting [5] and killing poachers [5] from these communities. Anti-poaching units commonly re-arrest the same poachers time and time again [57], and so recognize the futility of their arrests [57,71] And if these poachers are successfully prosecuted and incarcerated, then there is a virtually limitless population of willing recruits to take their place [14]. Compounding the issue, is that the poor and desperate, who poach out of economic necessity, will not be deterred by the risk of arrest [20,34]. Furthermore, incarcerating the 'breadwinner' of a family,

"What is wrong with you?… Our children are dying. You are killing our people."

-Song lyrics addressing rangers, Mozambique [32:np]

"Holding his up [his] son's identity card and death certificate. "Why was an animal's life worth more than my son's?"

-Albert Valoi [34:51]

or imposing a financial penalty on them, may cause that family to slide into absolute poverty, or force another family member into taking their place [20].

Reactionary policing is made possible by "fortress conservation" [20:29], whereby conservation land is fortified against the outside world. In erecting fences and treating neighboring communities with suspicion, it literally and figuratively excludes people, perpetuating historic divides. The Colonial legacy of conservation areas, which have typically excluded indigenous communities [7] and exclusively benefited the elite [6], had already marginalized local communities [73]. As the communities were forcibly displaced [14], they were prevented access to cultural sites [6], burial sites and land resources [74]. Coupled with this legacy, anti-poaching enforcement activities will likely compound this existing antagonism and have the potential to create long-lasting divisions [34]. "Wild animals are for white people" [Collet Ngobeni in 75] is the sentiment shared by many who perceive the conservation community as valuing wild animals over their lives and their livelihoods [6].

Enforcement strategies are hugely expensive and violent [8], yet many argue that they are needed in order to buy time for other strategies to take effect [57]. Whereas, others argue that there will never be enough boots on the ground [14] and that "it's a [game of] whack-a-mole" [Peter Knights in 8] As with the balloon effect, isolated enforcement may well succeed in one location, or protect one species, but is unlikely to resolve the issue of poaching holistically, or at scale. The alternative may be to refocus on community engagement, however there are concerns that pivoting to a less militarized strategy will be too slow [46] and nearly impossible to measure its impact [14].

Legalization and Market Manipulation

Zimbabwe, Angola and Botswana are some of the handful of African nations calling for a suspension to the CITES ban on trading ivory [60]. Zimbabwe is sitting on a stockpile of ivory worth $600 million [60], and Botswana has $300 million worth [10]. South African rhino farmers, who periodically trim their rhino's horns and store them in bank vaults, are also banking on a relaxation of trade laws [5],. The general argument put forth, is that the proceeds of legal sales could help to fund conservation efforts [76] and be used to benefit their citizens [5], however, there's no evidence that this will, in fact, happen [76]. It is also argued that legalizing trade, especially of rhino horn, will incentivize the breeding of these animals and pay for their protection [55].

In 2007 CITES temporarily authorized a legal sale for ivory in an effort to flood the Asian market and drive prices down [5]. Shortly thereafter, the winning bidders, Japan and China, released their legally purchased products to the general market at more than ten times the price [9]. This

"They are not interested in sustainability in other peoples' countries...it's just ultimate exploitation, that's the model, and then move onto the next area, the next area."

-Dr. Chris Brown, Field Interview [55]

actually stimulated the market and catalyzed an unprecedented wave of poaching [5]. Moreover, whenever CITES has talked about easing restriction, ivory and rhino horn prices have increased [5].

Related strategies to devaluing the market prices of illegal horn and ivory includes flooding the market with synthetic, lab-grown versions of these materials [27], or perhaps 3D-printed versions [27]. In this case, it may be useful to consider the example of lab-grown diamonds and their result on the market. They too are a luxury product that convey status and affluence. The presence of synthetic diamonds on the market hasn't affected demand for the authentic, original version [27], and there's little reason to suggest that the same wouldn't be true of synthetic ivory, for instance. Of additional concern, is that synthetic versions of ivory and rhino horn will diminish the stigma of owning the authentic version [26], and potentially improve the material's aesthetic popularity, resulting in it being used in more products, and increasing demand for both the synthetic and original versions [27].

At a practical level, the introduction of a parallel market for legal or synthetic versions of wildlife products will likely act as a smokescreen for the original illicit versions [26], There are doubts that even South Africa, a more developed African nation, would be able to regulate and enforce such a parallel market, as they have failed to do so in the past with marine species [76]. It is presumed that the presence of a parallel legal market and the responsibility to monitor it, would add pressure to law enforcement agencies that are already failing to effectively tackle poaching and trafficking [5].

It has been suggested that we take another cue from the war on drugs in our attempt to manipulate the market. Market demand for the recreation drug, ecstasy, was unintentionally eroded due to its widespread adulteration by drug dealers [8]. It is hypothesized that adulterating horn with a mild stomach irritant may result in a similar contraction of the market, as consumers begin to distrust its safety [27]. This suggestion brings up some obvious ethics concerns. Some Rhino farmers have begun to inject their living rhino's horns with Insecticide and dye to decrease its value to poachers and make it visible to x-ray machines [8].

Another means to manipulate the market is to replace demand for ivory and rhino horn with suitable, non-imitation materials that possess appropriate qualities and may be able to convey similar values. One example is to promote Jade as one such material, as it is already present and popular in the Asian nations that drive demand for ivory and rhino horn [47]. Therefore, it's theorized that promoting this material to be used in the manufacturing of high-value ornaments would accordingly decrease the popularity of ornaments constructed of illegal wildlife-derived materials [47]. The issue with this hypothesis is that it doesn't address demand for ingestible traditional medicines. It also assumes that belief structures, such as the deeply ingrained cultural value of ivory [77], could be manipulated, and done so within a reasonable period of time.

"'Where there is persistent demand for an illegal substance, there will be supply... Creative interventions in the market' designed to create distrust among Asian buyers about the quality or value of rhino horn and ivory might lower demand."

-Ethan Nadelmann, Adam Welz [8:np]

Furthermore, there are may be unintended consequences to promoting this or other materials. In the case of jade, we may be decreasing poaching in Africa, but at the expense of promoting an industry that is notorious for its human rights abuses in Asia [47].

Demand Reduction

Reducing market demand for illegal wildlife products is widely agreed to be necessary [8,19,29], but certainly not easy [47], nor quick [19]. In 2015, 56% of Chinese who were surveyed by national geographic stated that they wish to purchase ivory products, and less than a third were aware that elephants are extremely endangered [3]. In another poll conducted in 2013 and across 22 nations found that "Public concern about the environment is at a 20 year low" [78]. This include concern about species loss. There is clearly an opportunity to address this apathy, and in doing so, to affect a reduction in demand for trafficked wildlife product.

The main markets for elephant ivory and rhino horn and are China and Vietnam. Vietnam is currently leading with 45 tons per year of ivory imported yearly [29]. Rhino horn is predominately used as a traditional medicine that is purported (but not clinically proven) to treat all manner of maladies, from cancer to hangovers [5]. It is composed primarily of keratin, the same substance as human hair and nails is made of [27]. Ivory is used in all manners of ornamental objects and embellishments [9,28]. It is valued for social, cultural and economic reasons [77]. These values are deeply ingrained, and behavioral scientists warn that, even when presented with facts, laws or educated about the cruelty involved in poaching, these consumers should not be expected to react rationally [47]. Their "desire to conform" exceeds the influence of an attempted intervention [47:67].

In the past, public awareness campaigns have tended to take a western perspective [79] and focus on values familiar to the conservation community, rather than the values of the consumers of illegal wildlife products [47]. Whilst they may increase awareness, these campaigns struggle to affect behavioral change [47]. Moreover, campaigns that successfully reach consumers of illegal wildlife products can backfire, sometimes causing the target audience to do the opposite of what they are told to and cements their opposition to the message [47]. This is known as Brehm's reaction-theory [47]. Likewise, messaging that is perceived as individually critical can backfire [80]. It's imperative that future initiatives to curb demand are extremely narrowly targeted to specific audiences, situations and locations [47,80]. In order to be effective, the messaging cannot be broad, but rather needs to demonstrate an acute familiarity with the specific motivations of the particular target audience [80] and the nuances of the location [47].

"Asians cannot be given carte blanche to wipe out African wildlife…enough is enough, this is our heritage."

-Anonymous field interview [14]

We know that the United States is a significant consumer and conduit of wildlife product to Asia [17], and so building advocacy in the US is also necessary. Campaigns that attempt to elicit a response from a pro-conservation audience, can also fall flat for similar reasons. Our behavioral tendency to "emotionally regulate" [Gross in 47:69] causes us to turn away from confronting images, or to believe that the message is intended for another, less virtuous audience [Gross in 47]. Alternatively, campaign messaging can overwhelm us into feeling helplessness [78], which isn't productive either.

Changing cultural values and consumer behaviors won't be quick [19] and some believe that the scale of the challenge makes it unrealistic [29], potentially requiring many generations and enormous resources [25]. Populations of poached species such as elephant and rhino, are declining at such a rate that it is unlikely large-scale behavioral interventions can be made in time [25]. "You cannot change culture in 5 years." Says Nicholus Funda, South Africa's National Parks Chief Ranger [81]. If a strategy for large-scale demand reduction were to be successful, it will need to account for the surge of poaching that will likely occur as suppliers rush to exploit the market before its collapse [9]. Long term demand reduction strategies will also need to factor in the agility of the poaching syndicates, and the likelihood that they will pivot to supplying alternate products and cater to alternate markets; to which targeted demand-reduction campaigns are unlikely to be able to adapt. We must concede that, while demand reduction through consumer education (and any other avenue) is necessary, it is a strategy that does little to resolve the short-term and immediate concern of species extinction [27]. If demand reduction strategies are too slow or inertial, then they will either be left reducing demand for a non-existent product or struggling to stay ahead of the curve for different, equally unsustainable products.

"The very nature of our challenge is, sometimes we are forced to be reactionary… we can't close our arms and say 'lets wait for the behavior to change'".

- Nicholus Funda, Field Interview [81]

"Unless that [demand] changes, all we can do on the ground is keep fighting the fight and hope that eventually rhino births override the deaths."

-Anonymous field interview [59]

POACHING IN
SOUTHERN AFRICA

WICKED PROBLEMS

Wicked problems and the necessary adaptation of design

Wicked Problems

As I have thus far outlined in the Background section, the topic of poaching is fraught with complexity and competing perspectives. It is a multifactorial issue that cannot be resolved with current approaches [5], and therefore demands new, creative strategies [7,8]. Furthermore, there is a call for designers to evolve beyond their historic association with consumerist industry [82] and to instead apply themselves to meaningful humanitarian [16], political and social issues [83]. Herein lies an invitation to apply creative design thinking to the highly complex issue of poaching and wildlife trafficking.

Many of the complex issues that designers are being called upon to address, including poaching, are what Horst Rittel and Melvin Webber famously described as "Wicked Problems" [1:156]. Wicked problems are unique, complex constellations of interconnected causal relationships [Rittel in 84]. Such topics cannot, and should not, be isolated into discrete problems. They are symptoms of systemic failure, for which there cannot be a singular solution [1]. In other words, they aren't well suited to the linear analytic and synthetic forms of inquiry [Rittel in 84] commonly employed in the product design process. And yet, such topics still need to be researched, and by designers, who Jon Kolko [85] argues are well suited to making sense of the chaos that constitutes such topics; they are masters of abductive logic [85], and excel at discovery possibilities that others cannot conceive of [86] and problems that have thus far gone unrecognized [82].

Wicked problems are of a scale and opacity that make them unlikely to be pursued by consumer-oriented design agendas in industry, which perhaps makes them ideal candidates for critical design inquiry in a research context. One might even argue that it is incumbent upon the design research community to pursue what commercial design cannot or will not. Design is both a profession, and the subject of research that forms a design discourse, sometimes in collaboration with industry and sometimes critical towards industrial practice. However, design research of this nature is poorly served by the first generation reductivist and universal design methods [87, 89] or rapid 'design thinking' industry methods commonly emulated within in vocational design curricula [16, 102]. Fundamentally, it is counterproductive to apply a solutionist or consumer-oriented design lens to wicked problems, and so we cannot borrow from the methods that are rooted in these mandates. We must instead, reevaluate the practice of design and design research in regard to such problems and consider the systemic and contextual nature of design situations that are ill-structured, wicked problem spaces.

Solutionist design in search of a 'solution' to a problem, presumes that the problem is ideally defined. This is problematic, in that the one can only be as good as the other. A poorly defined problem (or question), yields a poor solution (or answer), artificially constrained from the outset by the positionality encoded in its definition [82, Donald Schön in 85]. In the case of wicked problems, there cannot be a well formulated question. Wicked problems, by their very nature, defy formulation, for to define the formulation of the problem, you would therein define the solution [Rittel in 84]. Accordingly, as the problem and solution are "concomitant to each other" [Rittel in 1:161], one cannot start at either extreme, but must instead begin to research the topic from the middle, in what Cross describes as an "appositional" [88:91] flux. Cross elaborates that this approach to design inquiry requires an intentional oscillation between problem and solution identification, "rather than a propositional argument from problem to solution" [88:91]. I have approached this research project from the position that I do not presume to know the fundamental problem, nor do I hypothesize on the solution, and that this does not preclude me, as a designer, from researching it.

The Legacy of Design

It can be difficult, even illogical at face-value, for designers to engage in researching a topic such as this. In primary research interviews, it made little sense to my participants why I, a designer, would be interested in the topic of poaching. I found similar apprehension within my own design department: For example, when presenting an update on my research, a few professors commented on its closer resemblance to an anthropology thesis than to a design thesis. What they meant, presumably, was that my research needed to conclude with a designed artifact; either a proposed artifact to solve a problem, or a materialized form of research. This is hardly a surprise. It has largely been the tradition of design schools to teach that, "problems necessitate a materialised solution" [16:5]. This is problematic, in that designers are increasingly being asked to apply themselves to increasingly complex social problems [16], yet their potential contribution is too narrowly defined by their traditional output. Concerningly, we are beginning to see the consequences of this 'solutionist' perspective. As designers increasingly take on wicked problems, their insistence on solving the problem has resulted in the reductionist practice of forcing an ill-structured problem to conform to their particular world-view [Kazi-Tani in 16]; an industrial designer, for example, may address American obesity with a smart-fork, and not an advertising campaign. It is, as Klaus Krippendorff observes, that in order "to meet contemporary challenges, design cannot possibly limit itself to industrial era conception of products" [86:12] .

"The concept of 'co-evolution' of both the problem and its solution...The designer's attention oscillates between the two, forming partial structurings..."

-Nigel Cross [88:91]

We have witnessed, over the last century or so, the evolution of design "from a trade activity to a segmented profession" [84:5]. And in this time, as a result of its contribution to industrialization, it has garnered a destructive [82] and even evil reputation [Sotsass 16:4], in some circles. Amidst this changing landscape, it is now suffering from what might be described as an "identity crisis" [16:4]. Ezio Manzini [83] Herbert Simon [89] and Viktor Papanek [82] have for years argued that design is, in one form or another, an activity carried-out by everyone. Manzini and Papanek refer to design in its broader sense, as the practice of improvement, amongst other things. Perhaps this is why designers might differentiate their 'professional' activities through their mastery over tools, and in the creation of the material artifacts that have become their hallmark. In its fight for legitimacy and credibility, the defensive nature of the design professions has long been observed [Mergy in 16]. They have conspired, like many other professions, to assert authority over their activities [1]. If materialization is the hallmark expression of design, then it follows that designers are called upon for this very contribution. The danger in presuming material artifact-creation to be the expected output of design, is that it potentially prevents designers from conceiving of alternate contributions, and suggests that material artifact-creation does not, or should not happen elsewhere. In its extreme form, the practice of conflating design with materialization is an expression of the monopolization of innovation that has been occurring due to over-professionalization and industrialization, according to Ivan Illich [90]. Designers addressing the complex problems of our time need not perpetuate this symptom of industrialization. The truth is, as Herbert Simon states, that many professions engage in design [Simon in 86], and indeed, that designers do not always 'design' in material forms [86], but are concerned with finding re-representations of existing representations. The new representations can take the form of materialized artifacts, or they can be concepts that offer new ideas on existing forms of understanding.

Adapting to Meet the Challenge

The idea that to design is to make something new, is inherited not only from the industrial history of design [16,82], but from an ideology of growth that permeates modern existence [90]. It is difficult for us to conceptualize what 'progress' entails, if not the constant growth and change we have become addicted to [90]. The "tame" problems of the late nineteenth and of the twentieth centuries have largely been solved [1:155], and we are now confronted with problems of increasing complexity which demand new approaches [16,82]. In light of this, theorists argue that design should depart from its historically capitalist ideology and adopt a humanist one [16]. In other words, it should turn to the redesign of society [83]. Similarly, Richard Buchanan [84] believes that the natural progression of design is its evolution into a new liberal art.

"Design as a discipline planned to tackle these multidimensional issues in the same way it has considered social problems for the past century.... by using, one may say, outdated methods on totally new problems.... designers continue to use the same capitalistic methodology on phenomena that are totally new and unprecedented."

-Elizabeth Hale [16:7]

In the university setting, however, the design disciplines aren't afforded the same respect as other academic disciplines [86], due in part to prevailing academic norms [89], but also because designers themselves underestimate the contribution of their discourse [86]. The realization of Buchanan's evolution cannot occur when designers define themselves exclusively by their materialized output. As designers begin to tackle unprecedented challenges, they continue to apply outdated capitalist methodologies [16]. It seems that we designers are addicted to growth and novelty. And as with any addiction, each fix results in "declining satisfaction", and "escalating marginal disutility" [90:52], until we finally reach obsolescence [82]. When, and how then, are we to adapt our methodology to better fit challenges that aren't resolved by simply "devising artifacts to attain goals" [86:26]?

The answer may be found in examining why it is that research and discourse is considered an end goal for some academic disciplines, but not necessarily so in the design fields, where the outcomes of designing are productions that provide alternatives to traditional knowledge dissemination. It would be easy to assume that extrinsic factors are at play, but even within design literature, outcomes, such as productions and their impact, are commonly favored over the research processes that underpin them [91]. Design research is similarly downplayed in commercial practice, especially in comparison to the gravity conferred upon the final design artifact [16,85]. If we once again consider the close relationship between design in industry and design as a research field, then we can assume that the visibility of research in industry likely informs a debate about the relationship between design outcomes and design knowledge in the design research community. There is a missed opportunity, in that design research can function – and does function - not merely as a "means to an end, but as the end product itself" [16:11]. There are calls for design to discontinue its imitative research practices, and to develop new approaches to research [87], which embrace the subjective and particular reflexivity of the design researcher [91].

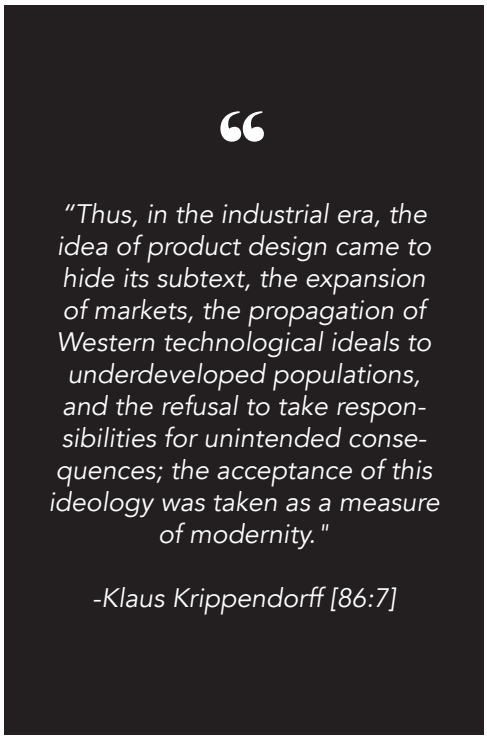
"The number of problems, as well as their complexity, have increased to such an extent that new and better solutions are needed…However, most problems requiring immediate and radical new solutions lie in areas that are quite new."

-Victor Papanek [82:151-156]

In summation, in the Introduction and Background sections of this thesis, I have laid out the complexities of the topic and limitations inherent in current anti-poaching strategies. It becomes increasingly clear, that "…doing the same thing every day isn't working," [Edna Molewa in 5], and that conservationists are struggling to come with new strategies [7]. In the Wicked Problems section, I describe the argument for design to turn its attention to complex global issues, such as poaching and wildlife trafficking. Herein lies a 'call-to-action' that I have attempted to answer with this thesis: To apply an open-ended form of creative inquiry to a topic that demands urgent, systemic change.

"Conservationists in Africa are struggling to develop new approaches to protect the continent's spectacular natural heritage."

-Newmark & Hough [7:585]



"Thus, in the industrial era, the idea of product design came to hide its subtext, the expansion of markets, the propagation of Western technological ideals to underdeveloped populations, and the refusal to take responsibilities for unintended consequences; the acceptance of this ideology was taken as a measure of modernity."

-Klaus Krippendorff [86:7]

POACHING IN
SOUTHERN AFRICA

METHOD

Method

Overview

The scope and structure of this thesis was defined by a time constraint as well as some unexpected external factors. Traditionally, theses in the Master of Design program at the University of Washington, are completed in three ten-week quarters. Initially this thesis project was intended to follow a typical process: The first quarter would be spent on secondary research, followed by a 'discovery' phase field research trip. The second quarter would consist of concept ideation and prototyping followed by an 'evaluative' field research trip. And the final quarter would be spent on documentation and designing an exhibit for installation at the Henry art gallery in Seattle, as is customary for the program. A number of factors emerged that would disrupt this plan. Firstly, my initial secondary research on this topic revealed information that prompted a more critical reflection of technology within this domain and suggested that focusing early and singularly on a product-based hypothesis would be naive. Also, in this first quarter I was involved in a bicycle accident which badly broke my ankle and left me unable to walk, let alone travel for a few months. Furthermore, it became clear, that even with existing relationships, finding sources and planning travel logistics was a much larger undertaking than could be achieved in one quarter. And finally, the Covid-19 pandemic devastated the world, almost stranding me in the field in Namibia, and curtailing any plans of physically 'making' or collaborating, or of exhibiting at the Henry art gallery. Consequently, this thesis process reflected these learnings and difficulties: The first quarter was spent acquiring broad domain-familiarity via secondary research. The latter half of the first quarter, and the second quarter was spent mapping and synthesizing this information and planning for fieldwork. Fieldwork occurred at the end of the second quarter, and the third quarter was spent in reflection, synthesis and documentation of the entire process.

Secondary Research

Open-ended Research

I began my secondary research with a literature review, guided by a research question. However, it quickly became evident that my iterations of research questions were consistently attempting to frame the topic within my professional expertise. Each question artificially constrained the research, and presumptively implied that a solution existed within an industrial design or advanced technology intervention. In hindsight,

this was a reaction to what felt like overwhelming complexity. Naturally, I responded by trying to isolate and focus on one particular aspect of the issue. However, I soon realized that this was counterproductive to forming a holistic understanding of the topic. I found it to be more successful to adopt an organic form of probing, and reframing, in what might be described as an oscillation between breadth and depth [88]. Instead of seeking to prove or refute a hypothesis, the secondary research was non-linear and exploratory, aiming to situate the issue within a greater context. This is how much of the information outlined in the Background section came to light. I had, for example, never expected to research drug cartels and anti-drug strategies, but both continued to appear as tangents in the literature, and so I followed those threads.

The amount of time and focus spent on secondary research may have been driven by circumstances but became instrumental to the fieldwork I will later describe. It identified individuals and organizations that I contacted and, in some cases, later interviewed. It also became evident after an interview with an expert in Seattle, that I would need to build a significant level of my own domain-expertise in order to conduct fruitful interviews. At many times during my fieldwork, this was proven to be true. An awareness of causal and geo-political factors, strategies, technologies and contentions proved invaluable in demonstrating respect to people I interviewed in the field, and commitment to the topic.

Framing and Sensemaking

To diverge too far, or dive too deep, would be impractical considering the constraints of the project. For example, it is necessary to understand the cultural factors which create consumer demand for illegal wildlife products, but perhaps not necessary to research Chinese traditional medicine (TCM) in depth, until it becomes the focus of an intervention. The process of prioritizing information and of establishing what Donald Schön describes as a "frame" [85:22] through which to address a problem, is facilitated by various 'mapping' techniques. Of greater import, in my opinion, are the sometimes unexpected, abductive inferences that emerge from this mapping process [85].

Throughout the secondary research process, I maintained a large foam core board of sticky notes [fig. 1]. As discrete information fragments emerged from secondary sources, such as actors, motivations, or technologies, they would be arranged on this "synthesis wall" [85:19]. This process of giving information a physical form, is one that Jon Kolko argues is fundamental in supporting the inferential and abductive leaps that designers are good at making [85]. As this eventually grew to become unwieldy, it was transitioned to a digital tool [fig. 2], which continued to facilitate the free manipulation and association of data points.

"Sensemaking is a motivated, continuous effort to understand connections (which can be among people, places, and events) in order to anticipate their trajectories and act effectively."

-Klein, Moon & Hoffman [103:71]

As underlying relationships and patterns materialized, these were documented using 'systems practice' ('systems theory') tools. Systems

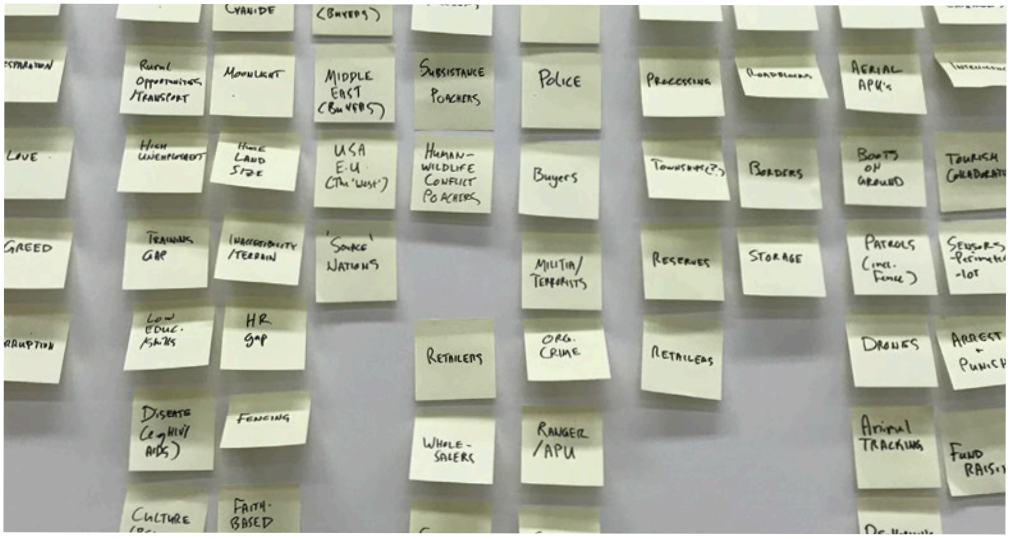
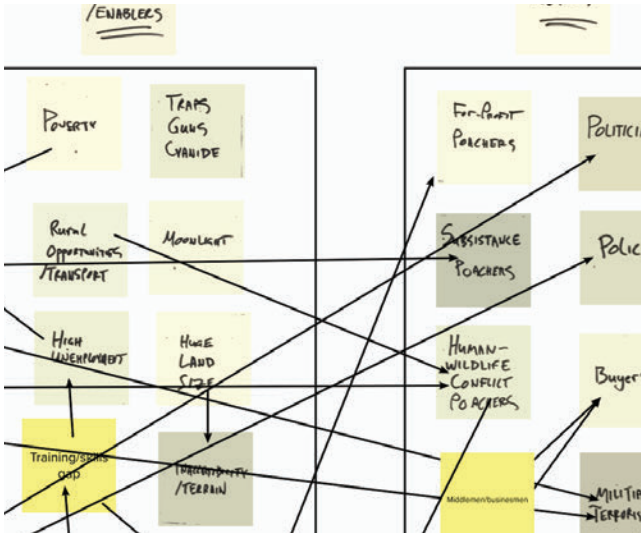


Fig. 1: Secondary Research Wall



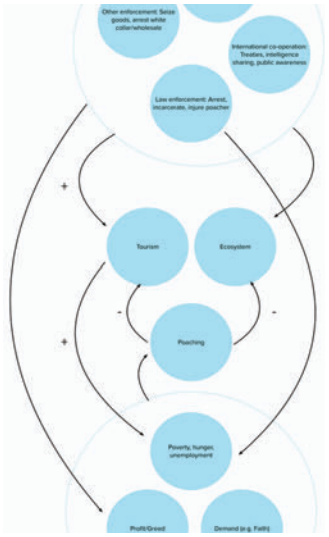


Fig. 2: Digital Relationship Building, Causal Loops

practice tools, as described by the Omidyar Group, are an "approach to grappling with adaptive problems in complex environments with the aim of making enduring social change at scale" [92:7]. Systems consist of elements and interconnections, and are oftentimes nested within each other [93]. Causal loops [fig. 2] and interconnected circle tools diagrams were helpful in identifying relationships between system-nodes, positioning a subsystem within a continuum of systems, and identifying relationships that are vulnerable to collapse or could be leveraged for positive effect [93]. Mapping of this type can also reveal ripple-effects between nodes and between systems [92], which Horst Rittel and Melvin Webber argues are better forecasted by designers, rather than the systematic approaches of engineers [1]. The indeterminacy of wicked problems, as described by Rittel and Webber, and their unascribable root-causes [1], make these mapping tools particularly useful in making sense of such problems. Furthermore, I found them to be useful for delineating the boundaries of research and in enabling an oscillation between micro and macro scales of information.

Arthur Koestler [82] theorized that creative insights are borne from collisions, and that this is made possible by, "perceiving of a situation or idea in two self-consistent but mutually incompatible frames of reference or associative contexts." [Arthur Koestler in 82:153]. I endeavored to do just this, by employing a qualitative coding tool [fig. 3]. By 'tagging' many of the sentences and paragraphs within the body of secondary research I had amassed, I could then generate reports based on seemingly disparate themes. For example, I might select keywords such as 'terrorism', 'pangolins' and 'social media'. I could then, on a single page and in no particular order, read from a number of sources that mentions one or all of these topics. This process enabled me to begin to make sense of what was an overwhelming amount of information, and to draw connections "between apparently unrelated elements" [85:17]. As these connections continued to emerge, I plotted them on an interactive web-based chord diagram, which was dynamically connected to an excel database [Fig. 4]. The result of this process is the information presented in the Background section.

Forms of Understanding

Kolko believes that to map a particular challenge, is to create "a picture of understanding…a formal representation of a mental model" [85:24]. His proposed methodology refers to a taxonomic or diagrammatic means of mapping, though I believe the same critical reflection that Kolko argues for, can also be achieved through other forms of generative, embodied synthesis. Embodied synthesis shouldn't be confused with solution-seeking. The artifacts I describe herein are to design, what an email is to a book publisher. Their value is as much derived from the process of creating them, as from using them as a discursive tool to further design research– not to punctuate it.

"The creative act consists in combining previously unrelated structures so that you get more out of the emergent whole than you put in."

-Arthur Koestler [82:153]

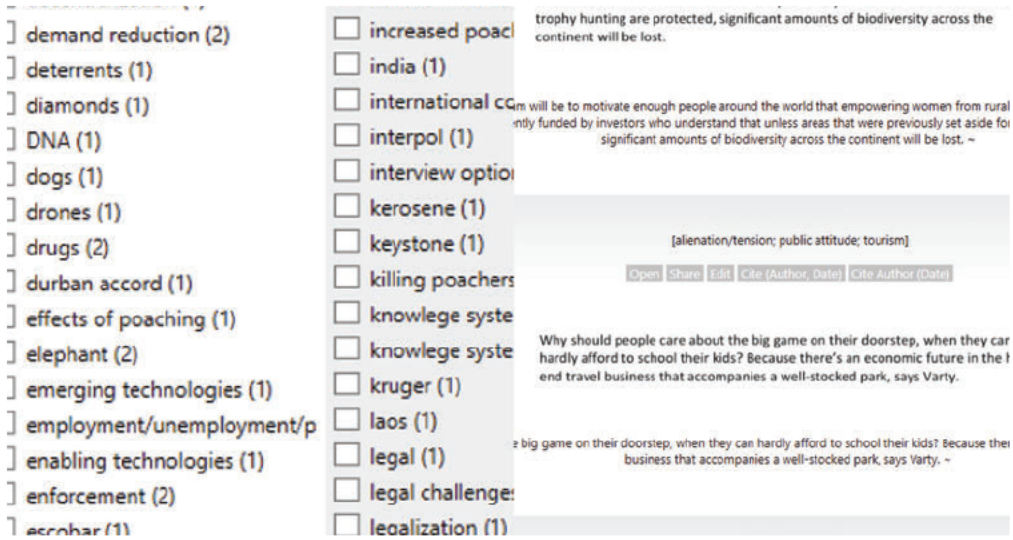


Fig. 3: Qualitative Coding Process

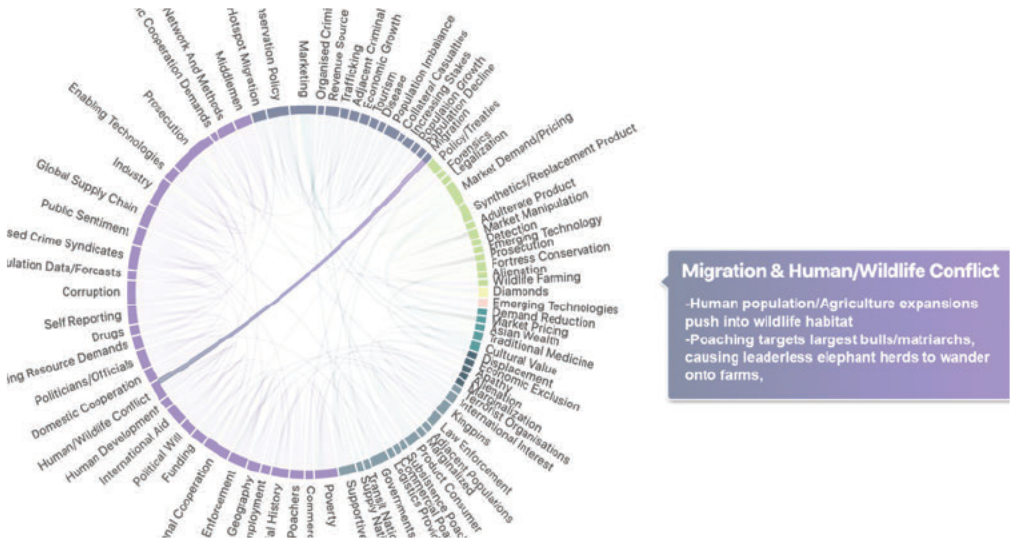


Fig. 4: Database-driven Interactive Chord Diagram

Fig. 5 depicts an interactive poster that was installed at the Jacob Lawrence Gallery. Every 15 minutes an elephant is lost to poaching [3], and so every 15 minutes a ticker-tape of printed elephants would progress across the surface of this poster, to then be overprinted with a target symbol and a statistical data point. Visitors could tear this off as a keepsake and were invited to read from a number of short essays that surrounded the poster. Visitors could also press a button on the poster, which would then print out a 'random' quote and a prompt, that the visitor could handwrite their answer on and paste up next to others' responses. The poster served not only as an interactive, experiential means of information dissemination, but as a process of synthesis in and of itself. The content as well as the interaction and media type, began to elucidate (as though through happy coincidence, or subconscious expression) common threads across the system. For example, the greed and transactional nature of the issue: From the cost of supermarket staples in Africa, to the consumer wildlife markets in Asia. The use of banking technologies and the resulting forensic paper-trail. The falsified shipping manifests and the financial illiteracy that allows organizations to extract resources. It was an embodiment of the insights that were gradually emerging.

Concepts as a Tool for Inquiry

In the same vein as the interactive poster, I experimented with concept development as a form of ongoing synthesis and understanding. For reasons previously outlined, it became clear that this thesis wouldn't culminate with a final product proposal, but that concepts could nonetheless be valuable if generated in parallel with the research process. In this way, concept development became a tool of inquiry, rather than a solution or endpoint. By articulating my understanding of the issue in the form of a tangible product, I could reveal gaps in my understanding that would inform the direction of the research going forward. I developed three concepts which were roughly anchored to areas that I felt could benefit from a variety of creative design interventions: Public awareness in the US, poaching detection and unemployment in Southern Africa, and public sentiment in Southern Africa. Each concept addresses a finite goal yet speaks to much larger systemic issues identified in this research. By encapsulating many aspects of the research within a tangible form, the concepts became useful as a discursive tool, or a conversational crutch with which to discuss my research with peers, professors and research participants. From these concepts, I received feedback, such as 'that would cause X issue', 'that's interesting, you should look into Y', etc.

"All mathematics exhibits in its conclusions only what is already implicit in its premises…Hence all mathematical derivation can be viewed simply as change in representation, making evident what was previously true but obscure. This view can be extended to all of problem solving... Solving a problem simply means representing it so as to make the solution transparent."

-Herbert Simon [89:132]

Fig. 5: Interactive Electronic Poster Installation, Jacob Lawrence Gallery, Seattle, 2020.

The first concept is a symbolic DNA kit [fig. 6]. Each kit would fund the DNA sampling of one illegally trafficked elephant tusk. The kits resemble the human DNA sampling kits that have become incredibly popular, but instead of being returned for processing, they would be retained as a symbol of the recipient's financial contribution. The kit would periodically come alive with information as this financial contribution is put to work and yields results. Information may include when a seizure is made and where, which country the ivory originated from, and if the DNA was used to prosecute a legal case. The intent of this concept is to: 1. Fund the continued DNA sampling of seized ivory by professor Sam Wasser and associated US government investigative agencies, 2. Increase public awareness in the US in a form that continues to engage over a long period of time, 3. Increase the success of investigations and prosecutions of wildlife and drug traffickers.

The second concept is a photo-royalty platform [fig. 7]. Safari tourists would optionally participate, so that when they photograph a particular animal, a predetermined dividend would be paid to a nearby community who hold the symbolic ownership rights to that animal. Although it's possible to automate this process using geo-tags and computer-vision, it would make more sense to employ people to identify the particular animal captured in each photograph. Tourists could upload these images onto social media platforms and encourage their peers to donate to match the photo royalty or continue to receive updates about that particular animal. This concept intends to provide a sustainable funding source for local communities, who otherwise wouldn't benefit from high-end tourism in nearby conservation areas. As these animals are worth more to communities alive, than dead, it provides motivation for a community to no longer tolerate commercial poaching operations within their region.

The third concept is micro-franchised poaching detection business for people who live relatively close to conservation areas that suffer from poaching [fig. 8]. Participants would be given a trained pigeon and some rudimentary electronics for it to wear. The pigeon would fly between two participants' homes, or between one home and one dovecote within a park, generating income for the participant with each flight. Every time the pigeon spots a human in the park, it will land, triggering an SMS message containing its location to be sent to the relevant authority within the park. A precedent for this training exists, and many local pigeon varieties exist in this region. This concept addresses the range, cost and optical limitations of current drone technology. It aims to create an invisible, ubiquitous, surveillance system over large tracts of land, that otherwise wouldn't be possible with today's technologies. It simultaneously improves detection capabilities for anti-poaching units, while generating employment opportunities for nearby people that otherwise don't benefit from conservation areas.

"Design must become an innovative, highly creative, cross-disciplinary tool responsive to the true needs of men. It must be more research oriented, and we must stop defiling the earth itself with poorly designed objects and structures."

-Victor Papanek (82:x)

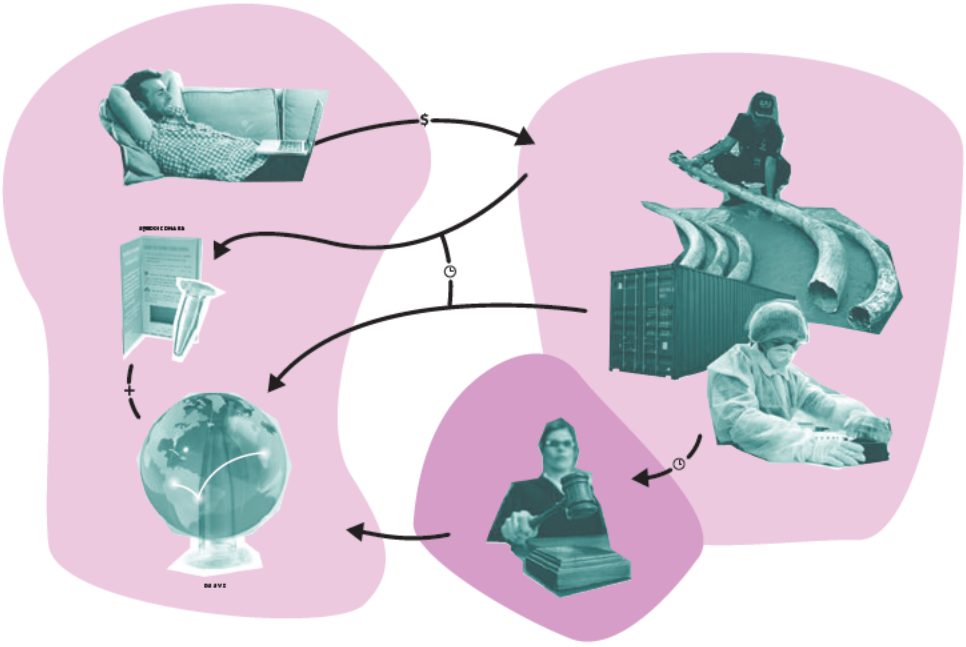


Fig. 6: Concept 1: Ivory DNA Investigation Fundraising Product

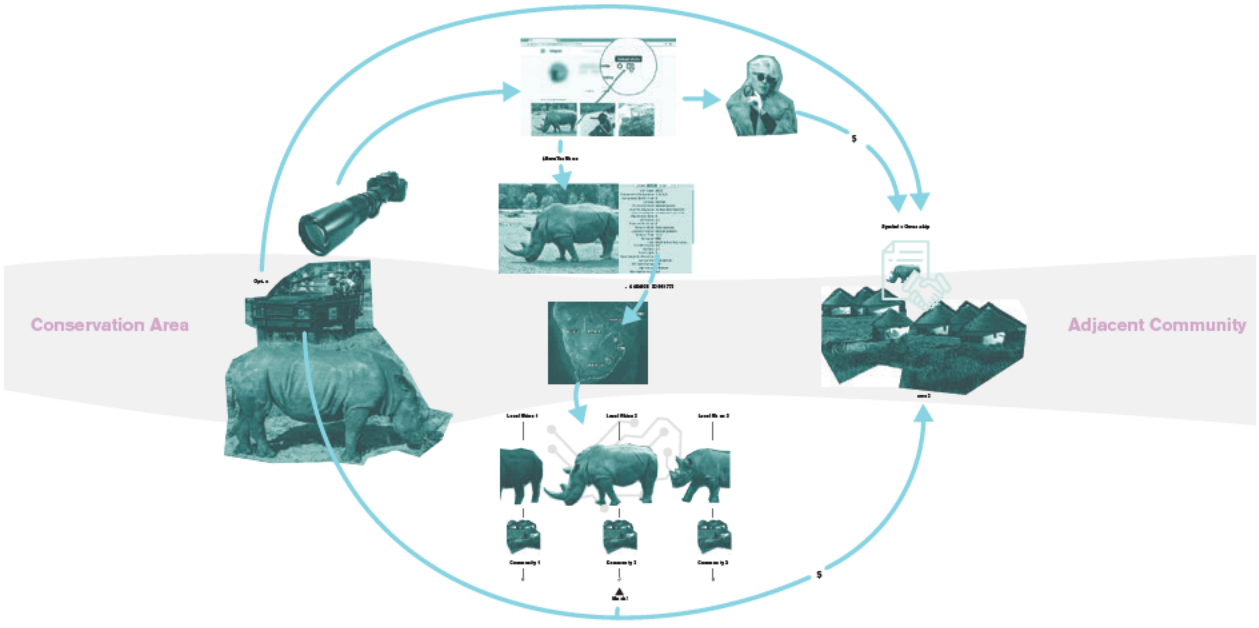


Fig. 7: Concept 2: Photo-royalty Platform to Distribute Tourism Revenue to Local Communities

To give an example of the sorts of insights and open questions that emerged from these concepts: This last one brought to light the fact that I was making sweeping generalizations regarding infrastructure and motives across vast geographies and could create unintended consequences, such as animal population imbalance and zoonotic disease risks. This concept, in hypothetically improving detection of poaching incursions, implicitly endorses the strategy of arrest and incarceration. These were assumptions and discoveries that require further research. The questions that arose contributed to an improved understanding of the problem-space, even if the concept never advances.

Field Work

From the earliest stage of this research, I knew that travel for primary research would be necessary. Given my relationship with one of the regions that experiences wildlife poaching, it would be odd not to capitalize on that connection. Originally, I had intended to travel to South Africa twice: first for explorative research, and then to evaluate a proposed intervention. As the research project adapted to my changing perspective and to external disruptions, the structure and purpose of travel had to change also. Moreover, during the process of planning travel, it became clear that I had underestimated the time and bandwidth it takes to organize this sort of travel. In the end, I was able to spend three weeks traveling in the Gauteng, Mpumalanga and Limpopo Provinces of South Africa, and in then in the Windhoek and Otjiwarongo regions of Namibia [fig. 9]. To protect particular sources, I have chosen not to be more specific about locations. Driving approximately 3000km through predominately rural areas of these two countries, I conducted formal and informal interviews with civil servants, anti-poaching rangers and specialists, national park managers, non-profits, lodge staff, intelligence services, general citizens and children.

"There's no generalizing black cultures in South Africa, and as such, there's no silver bullet. There are selfish, greedy people out there, who will sell their heritage for short term personal gains."

- Anonymous Field Interview [49]

"This team of rangers start every day with a morning meeting and a prayer to protect them against snakes, big five animals, and any poachers they may encounter."

- Extract from Field Notes

The value of designers conducting research in the field cannot be overstated. On many occasions in professional design practice, I've encountered 'push-back' against involving designers in field research. Oftentimes the argument is that field research is a specialized discipline, which I do not dispute. However, when designers participate in fieldwork, they gain a sense of empathy [87] and "firsthand knowledge" [Singleton et al in 91:2], that is invaluable. Immersion within the design context forms an understanding of a situation that cannot be synthesized from second-hand research insights. Their participation in field research can reveal to the designer defects in their original perspective, and immediately influence the 'lens' with which they view the situation [91]. In my experience, specialist researchers are often happy to relay questions from non-attending designers to research subjects, but this doesn't account for the observational strengths of designers. Observa-

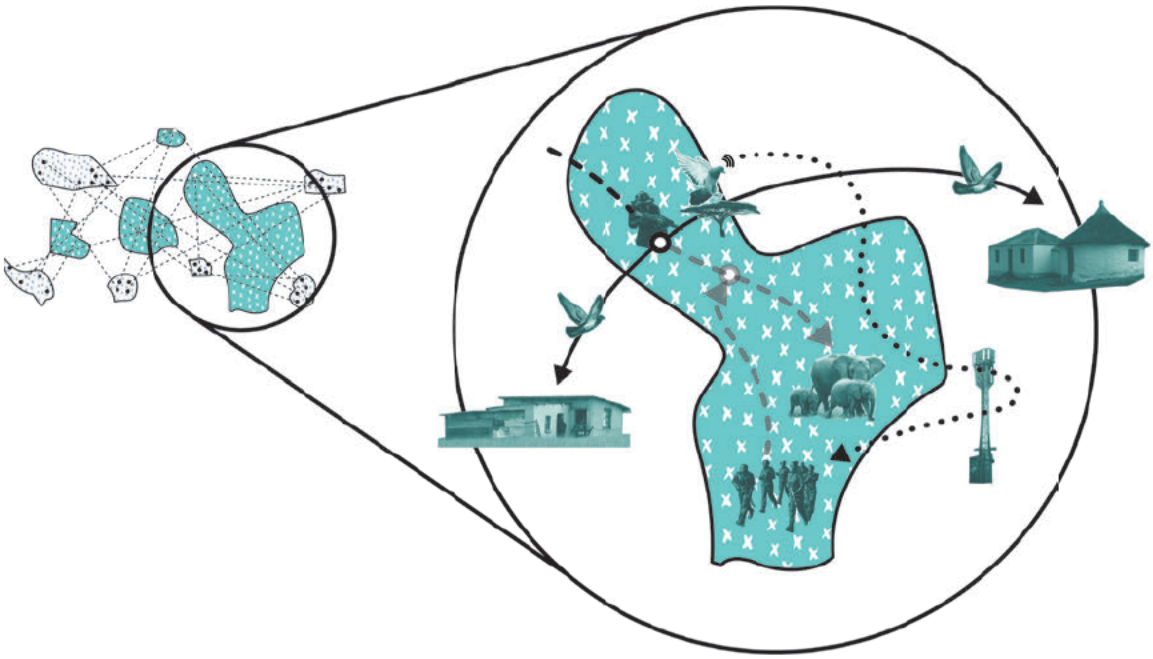


Fig. 8: Concept 3: Micro-franchised Pigeons for Long-range Poaching Detection

tional skills certainly aren't unique to design, but designers have observational sensitivities that may differ to specialist researchers. A designer cannot possibly predict and preformulate questions that relate to particular curiosities that might have emerged from their in-situ observations. Furthermore, such observations of situational nuances may provide conversational stimuli that reveal novel insights and propel research into unanticipated trajectories.

The purpose of my field research was to provide a 'reality-check' of sorts. Before traveling, I had been writing interview questions and planning participatory activities for research participants. Looking back at this planning work, I'm struck by how detached it is from the realities of the research-context. Despite previous exposure to some of the regions in question, I had managed to create a research protocol that might make sense to my peers but was alien to the people I wished to speak with. For example, conducting a card sort exercise with an armed, macho ranger, might not end well. Likewise, conducting participatory design exercise, or inviting the critique of my design concepts, is futile when linguistic or educations impediments, or cultural stigmas and hierarchies exist. This alone, illustrates the need to recalibrate by immersing oneself in the context you hope to learn from and potentially affect.

Secondary research was instrumental in facilitating field research. A number of primary sources were discovered via articles and papers that had featured them, or their organizations. There were occasions when individuals that were featured in secondary sources weren't directly contacted, but either came up in discussion, or were copied on email threads. A comprehensive general knowledge surrounding the topic area was extremely important in facilitating discussion. Politely introducing competing arguments and speculations, promoted more meaningful discussion and some candid comparisons.

"There's a lot of things that I want to tell you, because people are not aware of what is being done…we've done a whole bunch of stuff, some of which are not in the public domain."

-Dr. Chris Brown, Field Interview [55]

The value of conducting primary research is also to expose arguments and voices that aren't easily accessed remotely. In some interviews, I was told not to trust the information that is commonly published, which demonstrates the difficulty we face in deriving insights from secondary research. In addition to interviewing people with public roles and visibility, I endeavored to speak with people whose voices aren't well documented, or who aren't usually asked questions that pertain not to their specific role, but to their personal and general perspective. I would like to think that, even when interviewing people who have been interviewed before, that my particular perspective and presence resulted in unique discussions which exemplify the contribution of designer-researchers.

"The majority of the facts and figures you're being fed should be taken with a pinch of salt."

-Anonymous Field Interview [59]

Over the course of my research, I had been gathering examples of aspirational precedent projects, which became extremely useful in communicating my perspective on design and providing tangible examples of sensible 'technology'-driven interventions to interview participants

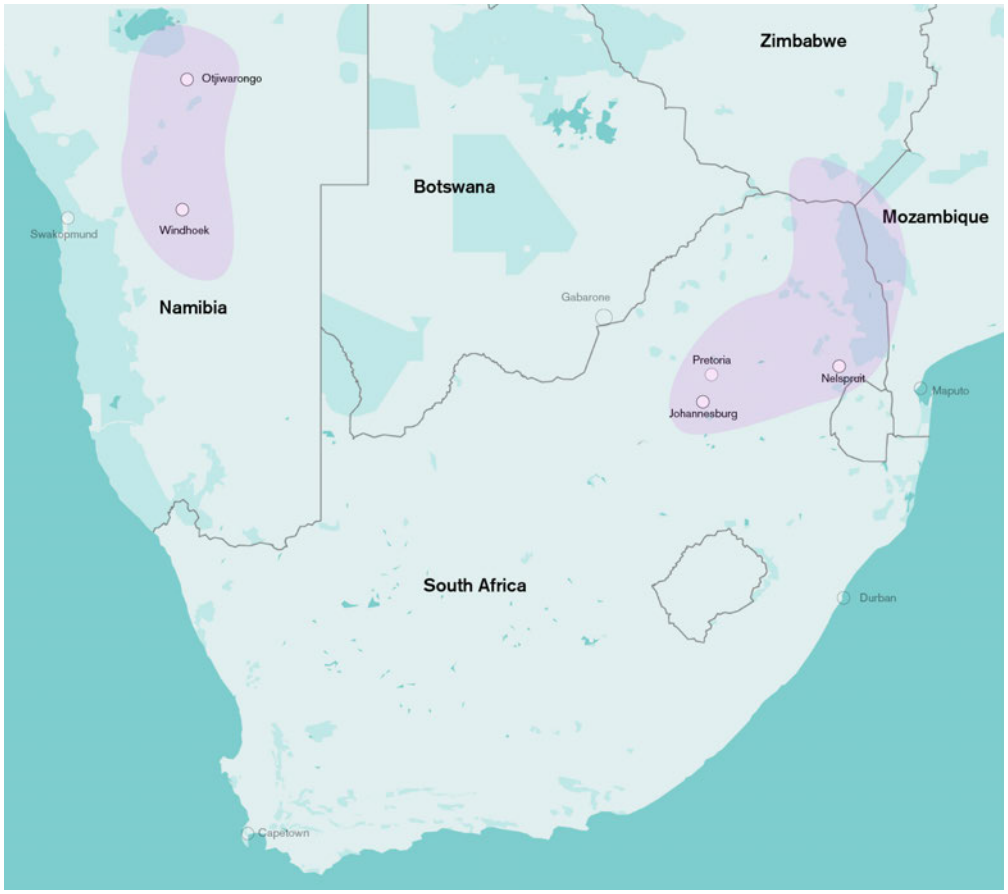


Fig. 9: Field Research Regions. Specific Locations Are Anonymized For Safety.

Fig. 10: "Nuru" Product [93]

in the field. The first of the three project examples is "Nuru" [94] [fig. 10]. It consists of a pedal-powered charging station, battery-powered LED lights, and a micro-franchise business model. A franchisee is able to generate income by charging and renting out lights to other people in their village. Rather surprisingly, the primary objective of this project wasn't to create employment, but to improve health. It achieved this by reducing villagers' reliance on dirty cooking stoves to generate light in their homes. It is an almost surreptitious form of social intervention, and one that is self-sustaining. The second project is "Rain Forest Connection" [95] [fig. 11]. It's founder, Topher White, repurposes discarded cellphones to detect illegal deforestation. By augmenting these cellphones with a small solar panel, they can be positioned in the rainforest to 'listen' for the sound of chainsaws, reporting these occurrences to local law enforcement. Not only does this project tackle the issues of illegal deforestation and e-waste, but it increases the efficacy of an existing strategy and resource (the local police force). The third project is entitled "Bee fence" [96] [fig. 12]. This is a project that aims to prevent conflict caused by roaming elephants. Instead of erecting prohibitively expensive elephant-proof fences, this project erects strings of beehives to protect people and crops alike. It makes use of ancient knowledge (that elephants fear bees), and is sustainable, in that locals maintain the hives in order to harvest honey. What's really interesting, is how the project simultaneously created a diversified community revenue stream and improved crop yields, preventing the habitat destruction and agricultural expansion that caused the problem in the first place.

In one interview, the participant had already heard of the bee-fence project, and discussing it gave more context for why a designer would be researching this topic. Intriguingly, these projects became a kind of 'lingua-franca' in explaining the potential role of design in this domain to my peers in Seattle as well as people in South Africa and Namibia. The projects helped to provide tangible example that reframe design as a more inter-disciplinary, sensible, and less technology-centered activity. Humility also played a part in improving interview dynamics. In one case, I noticed that a participant had a printer in their office that I had helped to design. Commiserating with the participant on the shortfalls of this product (and of technology and design in general), helped to promote the message that I was there to listen and not to impose outside 'expertise'.

"We shouldn't be changing the way these people live, we should be giving them tools for their current way of life…. Don't give them computers, give them tampons and farming implements"

-Anonymous Field Interview [71]

"Many current western-conceived solutions to conserve wilderness areas struggle to gain traction across the African continent."

-Akashinga [74:np]

Getting access to relevant sources in South Africa and Namibia proved extremely difficult. In most cases, cold contacts weren't successful, but finding intermediaries was. Receiving and introduction from someone, or referencing a shared contact, yielded better response rates. Sharing my personal connection to the region and topic was also helpful. Introductions came from (sometimes unlikely) family, friends and professional contacts. Oftentimes, all I was given was a first name and a WhatsApp number. Even with an introduction, sources were often apprehensive to discuss their specific role or give details such as their full name and location. This made it challenging to understand if they would, in fact, be a relevant source, and how I could logistically connect with them. Tracking these communications on a spreadsheet helped, as sometimes weeks

Fig.11: "Rain Forest Connection" Project [10]

Fig.12: "Bee Fence" Project [95]

would pass between sending a message and receiving a reply. It was a game of probability and faith. Gaining access to government personnel was particularly challenging. In one case, an extremely thorough research protocol had to be submitted to a public relations executive and was approved only two days before the interview took place. In another case, I managed to receive a response from one government executive by turning up to his office. Only eight field interviews took place, although seven more were agreed to, but couldn't occur due to scheduling challenges. Unplanned visits to police stations and magistrates' courts weren't successful. In the course of field interviews, other people and organizations were recommended. A longer period of time spent in each location, or a second trip, would have enabled many of these interviews to take place, although this would present its own security challenges.

Risk Mitigation

From secondary research into the topic, and from my prior experiences in the region, it was clear that I had to exercise caution in conducting primary research in these places. We have discussed in the 'background' section, the corruption, criminal elements and violence surrounding this issue. Decisions had to be made to prevent or mitigate risk to myself and others. Choosing to conduct primary research on a topic such as this, is choosing to accept a degree of risk. In some cases, this would mean making decisions that were best for safety and not potential research results. Decisions were, of course, affected by my resources. I did not have access to a travel companion, security detail, translator or driver, for instance. The sources I contacted, the information I gave to them, and the regions and countries I visited were decisions based on my degree of comfort and knowledge. Of course, the safest choice would have been to stay home, but I choose not to. Decisions couldn't occur completely prior to travelling to the field but had to be adjusted whilst there. My comfort level improved with each interview, but I had to be careful not to be like 'Icarus' and fly too high. I choose not to make contact with poachers themselves, nor their defense attorneys. In an attempt to 'fly under the radar', as it were, I ensured that riskier contacts were made without prior warning and on days that I would be departing that particular location. Driving routes were modified according to daily safety information from public resources and from personal connections. A number of safety protocols were followed to protect data, documents and valuables, which I am happy to share in more detail with researchers, upon request.

"The media, he tells me, isn't telling the whole story when it comes to poaching. he says that, unfortunately, he can't tell me the real story. In fact, he's protecting me by not telling me."

-Anonymous Field Interview [49]

In many cases, security precautions were taken by my sources. Often, they would only meet in public locations, divulging the location at the last minute. On two occasions, they 'scoped' me out by driving by me, and on one occasion they first met me in a bank before proceeding to the interview location. I was often viewed with skepticism and hostil-

"Some of the rangers worry about going home, because they may be accused of being a sellout."

-Ken Maggs [15:np]

ity until things warmed-up during the interview. Some sources were open and explicit about why they viewed me with distrust. One source implied that I was working for an enemy entity, and another suggested that the information I was asking for would put me in danger.

Improvisation and Adaptation

Design research is sometimes intuitive, unpredictable and even "messy" [91:2]. In the case of this topic, it deals with an ill-defined, security conscious problem and a diverse range of people. Improvisation is imperative, and to a degree, it can be planned. Flexibility can be programmed into one's schedule and research tasks can be priorities so that one may supersede another, as required. I experienced interview participants who wouldn't schedule an interview until I was in their country, and others who gave me less than 24 hours' notice, requiring many miles to be driven at unfortunate hours. One interview was organized hours before it occurred. Positioning myself in locations that I believed to be relatively close to possible interviews helped in allowing me to respond to last minute invitations. Two of the three 'embedded' experiences that I had, were organized on-the-fly. One in a rural village, and another in an anti-poaching camp.

Traveling alone in rural Africa and having a cursory understanding of certain cultures within these regions, I was often forced to adapt to particular situations. It wasn't my intention to be disingenuous, but I had to omit certain personal information or characteristics in order to protect my personal safety, to not offend people, and to make interviews more fruitful. In some cases, this meant making small changes and adaptations of my personality in response to the personalities of the people I interviewed. For instance, taking a more deferential stance to older, more extroverted or macho people. In other cases, I made deliberate choices to not wear my wedding ring, as it would invite questions that would inevitably reveal my sexuality. I also chose to cut off my colored hair and wear clothing that would allow me to blend in, rather than looking like a wealthy tourist, for instance, or a liability that would require protecting and pampering.

Recording Impressions

"Field rangers are being threatened and there's an increase in them buying private firearms to protect themselves with they're on communal lands [against poachers]....Their lives are threatened."

-Anonymous Field Interview [14]

Another aspect of improvisation is knowing when to record, and with what medium. I had expected to audio record every interview I conducted, if consent was given, of course. As I gained interview experience, I developed an awareness of the impact that the recording device had on the dynamic of the interview. It was therefore necessary to balance the benefit of having a verbatim record of the interview, with that of the candor and conversational fluidity that seemed to transpire when

Fig. 13: B-roll Footage

the audio recorder wasn't present. In some cases, even the presence of a notebook wasn't conducive to promoting this candor. It is up to the designer to intuit when to turn off the recorder and when to close the notebook [91]. I began to experiment with not using either, but rather jotting down a couple of keywords between conversations. Occasionally, I would flesh these out later in the field, but mostly they were sufficient in spurring my memory just in their short form. Undoubtedly, there were things that weren't captured and that slipped my memory, but one has to wonder if that matters. The most impactful experiences and fragments of conversation were recorded in my memory according to a logic that I can't claim to fully understand, although I'm sure it's a field of study in its own right. Lawrence Taylor et al [91] argue that the design researcher's "overall impressions" [91:4] are undervalued, and that they actually "constitute a form of data in themselves" [91:5]. In retrospect, my motivation to audio record interviews was driven less by the value the recording would offer me later in my design process, and more by an insecurity that no one would believe my insights if I didn't have evidence exactly where they came from. I'm not alone, it would seem. Bruce Hanington [87] describes how design research has had a tendency to imitate the 'rigor' of other research disciplines, in order to seek credibility. If this need not be the case, then design researchers might consider alternatives media that are better suited to the capture of their impressions. While travelling, I collected a variety of media outside of interviews, including 'b-roll' video footage [fig. 13], still images, ambient audio recordings [fig. 14], found objects [fig. 15a/b], and cyanotypes [fig. 16]. I didn't collect these things with a clear intent for how they would be used, so their purpose is still being discovered.

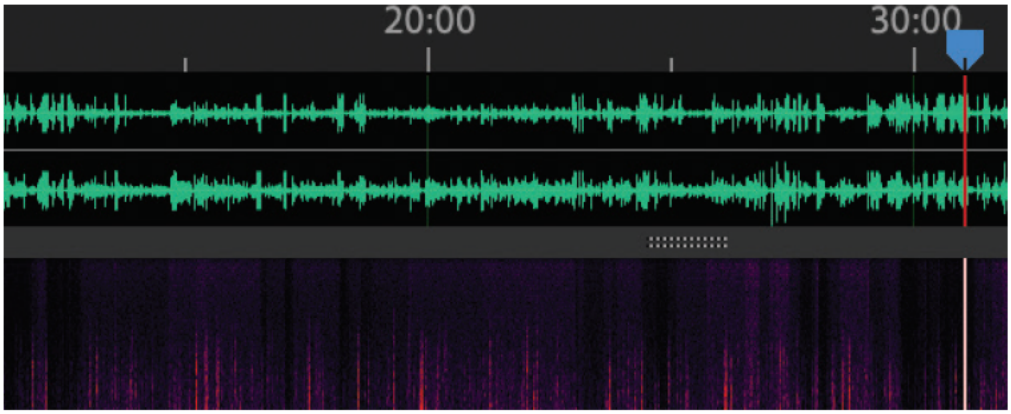


Fig. 14: Ambient Audio Recordings

Fig. 15a: Poacher's Snare

Fig. 15b: Poacher's Snare

DIY Cyanotype Exposure Frame

The cyanotypes were a medium and process that had some immediately evident value. Cyanotypes are a form simple photography, whereby a photo-sensitive chemical is used to expose objects, art or negatives onto all manner of surface materials. It was originally used to make copies of architectural plans, where its distinctive 'Prussian-blue' color gave the plans the name 'blueprints'. I traveled with some pre-impregnated cyanotype fabric swatches, and a homemade plastic and wood frame that I used to flatten found objects onto the swatches. Under the bright African sunlight, the silhouette of an object was exposed onto a swatch in a matter of minutes. In fig. 16, you can see some of these cyanotypes of plants, millipedes, snakes, feathers, dung and poachers' snares. These swatches functioned as a memory cue, or bookmark for the many locations I stayed at. People within the communities I stayed were intrigued by the process and outcome and were sometimes surprised by my interest in capturing what they considered to be mundane objects. In one location, I visited a class that was currently studying local grass varieties. I collected a number of these grasses and created a cyanotype of them to gift to the teacher. This process of capturing impressions of a location was successful on multiple levels. There's very little 'down-time' when one is in the field, and this was a cathartic, enjoyable process for me. For those who saw me collecting specimens and exposing the cyanotypes, it shared a dimension of my personality that is perhaps more tangible and human, when compared to how they may otherwise perceive Western academic researchers.

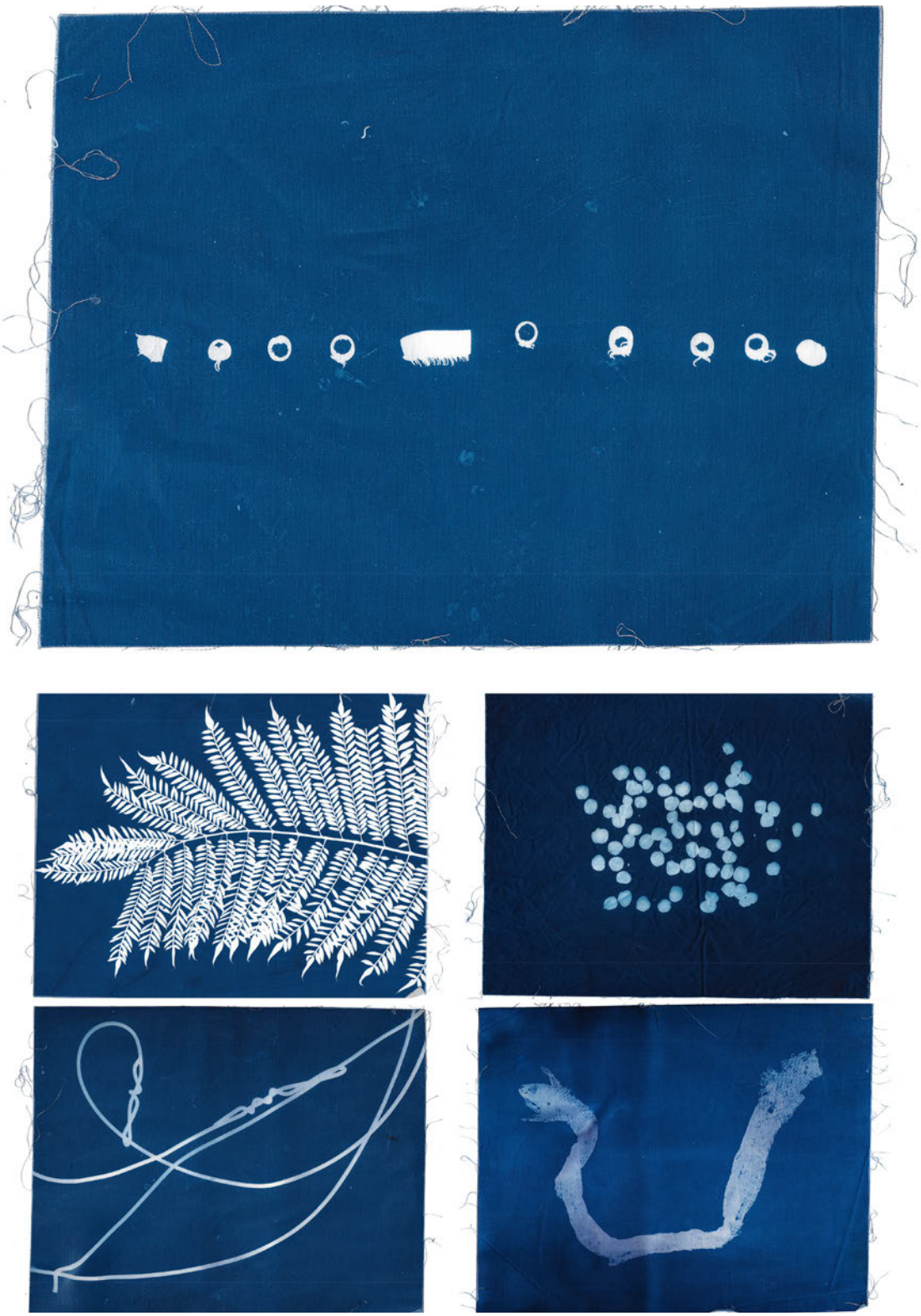


Fig. 16: Selection of Fabric Cyanotypes (Clockwise from top: Millipede rings, Antelope Dung, Snake Skin, Wire Snare, Unidentified Plant).

POACHING IN
SOUTHERN AFRICA

FINDINGS (DESIGN)

Findings Pertaining to Design Research

Reflecting on Fieldwork

After returning from field research in Africa, I used the cyanotypes, collected media and objects, and field notes to begin the process of documenting and reflecting on the trip. I began transcribing the interviews that were recorded, and in the same period of time wrote short essays about the interviews that weren't. It was an odd juxtaposition of attempting to perfectly capture the verbatim interviews, and also diving into my memory for impressions of particular situations. The process of long form writing jogged my memory more than my notes alone. What began to emerge was a reflection, not only of the unrecorded interviews, but of the spaces in-between; vivid recollections of my behaviors and emotions at particular times, and detailed observations of the people and environments around me. I had travelled to these locations to find information, which I thought would be revealed by asking questions. However, these essays shed light on the research topic in an altogether different way. As with the concepts I had created before traveling, these essays functioned as an updated "picture of understanding" [85:24], and are a form of impressionist, reflexive synthesis [91], driven by the process of writing.

The Designer's Obligation

In many ways, my family background and prior experiences in South Africa made this research possible. Yet, in recognizing the unique position brought about by having geo-cultural 'access' to the context and having theorized on my potential to affect change using design, I had unwittingly put myself in the situation of being complicit in the problem, should I neglect to follow through. 'Qui tacet consentit' as Plato's maxim goes: My inaction would be tantamount to consent. This has implications for all design practitioners. I don't mean to imply that all designers are obligated to contribute to this particular topic, nor that they are obligated to work toward social change, rather to suggest that we all have unique backgrounds that may be leveraged and allowed to guide us. 'De-colonizing' design has become a hot topic across the design community; it refers to a conscious shift away from eurocentrism, and an accounting for the plurality of world-building perspectives that exist [97]. It isn't about reversing historic dualities, such as producer and consumer, or east and west, but rather a dissolution of the hierarchies of dominance between these various dualities [97]. In aid of this, we are asked to consider that other designers may be better situated to taking on particular design opportunities. However, this movement requires

that we also look inward, to recognize our own unique positionality and access… and actually design within it! Our cultural and experiential backgrounds provide unique value to be harnessed. In this way, we may individually contribute to the process of 'decolonizing' design. In recognizing this value, we also acknowledge our positionality, biases, and privileges that suggest that others may be better positioned to work within a particular domain. In this way, we may individually contribute to the process of what, in the design community, has come be known as the 'decolonizing' of design. Decolonizing design refers to a shift away from eurocentrism toward an accounting for a plurality of perspectives [97]. It isn't about reversing historic dualities, such as producer and consumer, or east and west, but rather dissolving hierarchies of dominance within them [97].

I have acknowledged my privilege and obligation as it relates to engaging in this topic, but must also acknowledge that the things which facilitate my research and design perspective, such as the particulars of my experiences and education, in many ways distance and disqualify me as an 'insider' to the various cultures that intersect poaching and wildlife trafficking. For example, I lived in Asia for years, but would never presume to speak with any authority on the cultural importance of shark-fin soup at a wedding. I was born in South Africa, but this does not qualify me in any way to claim to be an insider in the topic of poaching. Exploiting one's cultural or circumstantial 'access' is an opportunity and obligation but should not be confused for representation.

Observations on Ethics

This thesis is not and was never intended to be centered around ethics. However, during the process of topic selection, research, and fieldwork, ethical considerations and lessons emerged throughout. If this thesis is to examine the role of the designer in research and in fieldwork, then it must also include a reflection on ethics, which is a necessary consideration in the undertaking of both.

There are many ethical considerations to take into account when researching complex, or dangerous topics. In design education, little time is generally spent on the topic of ethics, but this shouldn't disqualify or dissuade designers from embarking on projects that require serious considerations regarding ethics and consequences. This research project has compelled me to engage in ethics to a degree that I wouldn't otherwise have experienced. What emerged, was an appreciation for principled research, which has many overlaps with the social sciences and humanities. What also emerged was an appreciation found in the distinction between design research, and other research disciplines. The particular rationale of design research in the context of a wicked problem, has implications for how we interpret ethics in our research. In this context, nothing is gained through exposing controversy or in finding

"The indigenous view on wildlife is different and isn't visible....The definition of impact is defined abroad, it's not defined here."

- Anonymous Field Interview [14]

fault, and everything is lost if damage is inflicted. This situates the researcher in a subjective role, which is permissible in design, so long as it is made explicit. In order to protect and honor one's sources, one must function as a conduit through which a synthesized form of the source's perspective is disseminated. This isn't a compromise, but the differentiating proposition of design research when operating within complex problem-spaces and vulnerable communities.

A serious deliberation, considering the potential for severe consequences, was on how I would not endanger any of my primary sources. The danger surrounding the topic was reinforced when many people I contacted were hesitant to provide details such as full names and locations. This made planning difficult, but I had to respect this and allow information to be freely divulged without pressure. Some sources asked to meet first in public spaces and some asked not to be recorded, for concerns over their safety or reprisals. I was transparent with all sources regarding my intentions and their freedom to choose not to be recorded and to remain anonymous.

Obtaining informed consent from sources is one of the American Anthropological Association's (AAA) seven principles of professional practice, but so too is the practice of doing no harm [98]. A conflict may emerge, when a source consents to being identified and recorded, but I as the researcher have knowledge that would cast doubts as to their well-being, should this information be publicized. One wants to honor their decision, but also to protect them. This becomes more important and also more challenging when working with so-called "vulnerable populations" [98], where hierarchy, culture, education, literacy and language may affect consent, in sometimes inconspicuous ways. I will note, that I am uncomfortable with the use of the term 'vulnerable', as it enforces a hierarchy and duality of its own. Causing hurt to a subject's dignity is recognized as doing harm by the AAA, so it becomes challenging to both honor a source's intelligence and autonomy, whilst recognizing that their consent may be impaired by the factors discussed, and potentially an unawareness of possible consequences. Superseding their decision could harm their dignity, as could labeling them as 'vulnerable'. We designers cannot operate on the binary of 'on-the-record', 'off-the-record', but rather have to consider the best interests of the source according to our ethical obligations. This is one of the reasons why design researchers cannot simply adopt the "utilitarian ethics frameworks" provided to other research disciplines [91:10]. To give an example, what an interview participant may divulge to me, could negatively affect their employment. Despite asking for and receiving permission to record and share their comments, I would have to weigh the consequences, to the individual and to society, of divulging this admission. The decision is always flawed, in that one cannot possibly predict every unintended consequence. If the admission is one of a criminal nature, the adjudication is made even more difficult and consequential.

"I ask what is needed to shift the needle on this problem, apart from more boots on the ground that is. Her answer? -'A bomb, like in Hiroshima, but this time on China'".

- Extract from Field Notes [49]

In light of concerns regarding the wellbeing of my sources, a question arose as to whether or not to include an appendix of the essays I had

written to document and reflect upon my field research experiences. These materials include transcripts of audio recordings, and short essays that recollect both interviews and experiences which weren't able to be recorded. On the one hand, I felt a responsibility to include these materials, as they substantiate my findings. Even discussions with those who have been interviewed on this topic before, are likely unique reflections influenced by the particular context and dynamic. I initially intended to share this material as I felt it would allow other researchers the chance to 'meet' these sources, peeling back the 'lens' through which I've interpreted their perspectives. One solution might be to deidentify the sources by using alternate names and locations, or even to redact this information completely. On further reflection and consultation, this wouldn't be possible: In some cases, the level of abstraction needed would yield material that would be extraneous and counterproductive. It would either lose the specificity of information that could lend credibility to the findings or lose much of the meaning and impact derived from the context. The alternative would be to redact and anonymize the materials to a lesser degree. The challenge with this was two-fold. Firstly, in deidentifying sources, one runs the risk of generalizing the information. For example, a source may be from a small minority, so to deidentify them, I might refer to them more broadly. But in doing so, one implies that their perspective is applicable to that broader group of people. Surrounding this topic, are many tribes and language that should not be generalized. Secondly, it was determined that it wouldn't be difficult for well-resourced individual to investigate and discover a location or identity despite my efforts to obfuscate them. Moreover, I would feel responsible should I inadvertently fail to redact a particular piece of information that lead to a negative outcome. For these reasons, I have chosen not to include these materials in an appendix, but I am happy to share certain materials with suitable interested parties. Information contained within the source material has been used to inform my findings and conclusions. In cases in which primary sources are cited in this document, they are named with due consideration for the particular source and the corresponding information. In other cases, they are cited anonymously.

The decision to reveal particular information is one that is affected by reputation. A mentor recently shared with me a story of their recent fieldwork in Africa. The subjects had been previously visited by other researchers, who had published a disparaging report. Despite there being no relationship between the two research projects, the second had to overcome the reputational damage caused by the first [99]. This would be devastating if it were to be a consequence of my research. My conduct in the field, and my choice of what to publish, could hypothetically affect the research of those who come after me. If one of my sources is offended or negatively affected by my research, they may choose to never agree to an interview again. In this way, my research could become counter-productive. What's more, is that I have family who live in South Africa, who's reputation and safety could be affected by my conduct. I also wish to continue researching this and other topics in these particular regions, and this would become extremely difficult and dangerous were I to 'burn my bridges'.

"I don't see the usual speed signs that are common throughout this reserve, so ask them what the limit is. They tell me not to worry about it, and that they're the police in this part of the reserve. They crack open a can of beer and hand it to me."

- Extract from Field Notes

An ethical consideration that applies to many design research projects, and that I encountered within this research, is the abruptness experienced by some participants upon the conclusion of their participation. For many people, being asked to participate in research and to share their opinion on a particular topic is a rare experience. Researchers sometimes ask their subjects questions that put them in a highly reflective or analytical state, and then leave them abruptly thereafter. For example, I experienced interview participants who wished to be updated on the progress of the research or were curious as to other participants' responses. Some participants wanted to continue to be involved and helpful, and others were excited by the prospect of future collaboration. In one case, one of the participants offered to continue interviewing other members of their village on my behalf. As much I wanted to support this, it became clear that there were multiple ethics violations: Their research activities could put them in danger or expose others who divulge incriminating information. Moreover, it would be difficult to discern the integrity of the research, and it would yield verbatim answers without the nuances that are observable in person. This brought to light the regrettable reality that I am unable to facilitate a form of continued engagement within the scope of this thesis project. Especially in a form that would be ethical and of mutual value. This persists as a challenge to any design research project and requires continued discussion and initiative by the design research community.

Taking into consideration these ethics-related challenges, I attempted to experiment with a method of safely and ethically using the rich stories that emerged from my primary research. Instead of redacting or deidentifying primary source materials, as other research disciplines might, the alternative may be to apply a form of preliminary design synthesis to it. One method might be to amalgamate various sources into either a design persona, or a design fiction. Design personas are a typical human-centered product design method. They are traditionally constructed from preliminary design research, or from existing market data, in order to exemplify a particular target user or buyer of a product. Design fictions tend to combine insights from a variety of trend sources in order to construct a speculative imagining of the future, usually to provoke discussion or reflection. An example of design fiction is the popular television series, "Black Mirror". Both design personas and design fictions may be adapted as a design method to represent anonymized primary research data in a form that can be referenced. This conceptual approach needs to be refined though, as I discovered when I attempted it. I had intended to create a number of fictionalized personas from Southern Africa and Asia, and script their stories. The stories would be an amalgamation of primary and secondary sources, to be read and audio recorded. To have the passages read in my voice, or with an American accent, would have done the stories an injustice and created a sort of cognitive dissonance; it would be much more compelling and visceral if they were read in the voices of local people. The options were to either employ amateurs from communities near the original sources, or to employ professional voice actors from the same country. This was an attractive plan, as it could proceed despite the

The commander tell me a story of how they once hired some laborers for a particular job, and with their first paychecks, these laborers bought smartphones. The commander was furious with them: This money is for you to feed your families. These smartphones won't even work here. Why would you buy something you can't use?" – to which they replied: "Because we need something to make us feel human."

- Extract from Field Notes

global lockdown caused by the coronavirus pandemic. However, a number of ethical concerns arose. With the first option, scripting the passages and then having them read by a local person would risk identifying the sources' locations, and would also be so believable, as to potentially be mistaken for the actors' own opinions, rather than a scripted story. It would be harmful if this content were to enter the public domain, divorced from any explanation, and be mistaken for the voice of these people. Furthermore, employing local people to produce a design artifact for my research thesis may be considered exploitative. The choice of media is equally important, in that it has the potential to be confused for verbatim documentation, and not as a fictionalized account. I had intended to use a podcast format, or audio stories overlaid onto video footage I had recorded of African wildlife. Both of these mediums (podcasts and video footage of nature) are commonly used journalistically and for documentaries. As a result, audiences could potentially associate my fictional content with the factual nature of content that is more common to that media type. The second option was also problematic, in that it is difficult to source professional voiceover artists that are truly representative of the sources. A voice actor in urban Cape Town, for instance, would give a very different impression to that of a rural person living over 1000 miles away, in Limpopo province. Languages, accents and racial identities are so diverse in South Africa. There are dynamics and politics related to this that I am ignorant to, and this was very much confirmed during my field research [49,61]. It would be insensitive and naive to 'cast' an audio story with an actor of a different tribal background to that of the story's source. This could be perceived as black Africans being generalized by an American academic.

"I park behind his bakkie, and then follow him into the small supermarket. We head to the back, joining the queue at a fast food takeout counter. I notice he's stretching his t-shirt over his sidearm to 'hide' it and I wonder what the other people in the queue think about us. He orders in Afrikaans."

- Extract from Field Notes

POACHING IN
SOUTHERN AFRICA

FINDINGS (POACHING)

Findings Pertaining to Poaching and Wildlife Trafficking

Field research confirmed some of the insights gathered from secondary research and also resulted in some new ones. In this section, I will first expand upon insights that were confirmed, and then move onto insights that were unexpected, or novel to the field research. At the end of the Findings section, I will synthesize these findings into systems leverage points.

Confirmatory Insights

What I had previously learned of advanced technology in this domain was confirmed. Trials of technology, such as drones, night vision and advanced sensors have had mixed rates of success. Many drone and sensor technologies are currently incapable of functioning within these hostile environments, with crashes, fires and animal damage cited [14,71]. Advanced technologies are considered to be effective in limited, specific applications [55,57], but often requires dedicated operators and budgets [71]. Sometimes the value of visible or highly publicized new technologies is in their dissuasive effect [55]. These technologies are expensive, and resources are already strained, so as anti-poaching programs and syndicates both invest in technologies, antipoaching resources are likely to be further stretched. The adaptiveness of commercial poachers and organized criminal syndicates was also confirmed. Antipoaching technologies and strategies that once worked, no longer work [59], and new technologies and strategies may work today, but are unlikely to work tomorrow. There is a desire to use technologies that are complimentary to existing tasks, and a distrust for technologies that purport to replace then need for human tasks [49,59]. In fact, there was a common sentiment that the ROI for certain technologies cannot compete with the ROI of extra boots on the ground, so any technologies will need to account for this reality, and/or perception.

Poachers and syndicates are constantly adapting their methods to account for changing anti-poaching strategies, market demand, and declining animal populations. The result is that poaching hotspots and trafficking routes are constantly moving [9], whether from country to country, from government conservancies to private conservancies, or from one species to another. Novel concealment strategies [9] and increased global, containerized trade makes detection extremely difficult once illegal product enters this extensive global logistics network [29].

The futility of arresting poachers was confirmed, and this fact is well understood by those in front-line enforcement roles [14,56,57,71]. This was a surprise to me, as I expected these particular people to advocate for their enforcement strategies over other strategies. Reactionary enforcement is seen as an uphill battle, which is necessary in order to buy

time for another more effective strategy to take effect [14,57]. With that said, there is also a desire to do what is possible and necessary, and not to rely on strategies such as consumer demand reduction, which is considered too slow and also out of their control [14,49,59]. I sensed a lot of frustration amongst government and private rangers, who's lifestyles and work responsibilities can be extremely punishing and traumatic [14,49]. They are having to rearrests the same culprits in some cases [57], as prosecution and incarceration success rates are low. Public sentiment is oftentimes on the side of the poachers [49,57], which not only effects prosecution, but puts rangers in danger within their own communities [14,49]. I was told that many are purchasing illegal handguns to protect themselves when they return home from weeks in the field [14].

Harsher financial penalties and sentences are generally effective as a deterrent, but not for the most desperate of poachers, including those who suffer from HIV/AIDS and don't view prison as a bad alternative to their already challenging lives [56]. For the syndicates, arrests and incarceration don't affect their business [55], as there is a constant supply of unemployed, desperate people to recruit from [14]. Harsher penalties aren't a deterrent for those who can afford lawyers and flee on bail [55,56]. Harsher bail laws have been effective, although with forensics lab resources stretched thin, bail is all but guaranteed for some suspects while they await results [55,56]. Advocacy for harsher sentencing is lacking, as the judiciary and general population don't view wildlife crimes as serious crimes. Educating investigators, prosecutors and the judiciary on the downstream ecological and economic consequences of poaching has been successful in motivating them to impose commensurate penalties [56]. Harsher penalties have been seen to have momentary success but can be undermined as market conditions change and syndicates offer greater incentives and protection guarantees [55].

"We need a long-term holistic approach, he says, including community uplift-ment programs. It must be sustainable. There's no point in arrests, that not what success looks like. Deterrence is better."

-Anonymous Field Interview [57]

The scale of poaching and associated corruption is far greater than it would seem [14,56,59]. Although I focused on wildlife poaching in this research, my primary sources revealed the extent of illegal resource extraction that is occurring across sub-Saharan Africa [55]. This includes abalone, carmine bee-eaters, illegal logging in national parks, and large-scale freshwater fishing [55]. Poor literacy (and financial literacy) contributes to the vulnerability of communities who are easily manipulated by sinister actors [49]. They are persuaded to allow extractivist activities to occur, against their best (long-term) interests [49]. There are many overlaps between the actors, methods, motives and corruption surrounding wildlife poaching and trafficking, and these other illegal products [14,55]. The other commonality is that demand for any of these products creates extreme corruption across all levels of government, which opens the door for all manner of illegal activities. It is a viscous cycle. This corruption is driven both by organized crime syndicates, as well as particular governments which stand to benefit from the proceeds of illegally extracted African resources [55]. On the ground, underpaid government and private rangers, and other conservancy staff are often found to be working for the syndicates [14,61]. Resource limitations mean that there's isn't enough money to pay rangers enough to compete with what the syndicates are offering them [14]. There may,

"Many people come in and want to replace the guys on the ground with technology. Especially a guy with 20yrs experience, you can't replace them with a vehicle, drone or robot. These technologies can't assess the situation like a human can. But you can equip the human to improve their job"

-Anonymous Field Interview [61]

however, be non-economic motives that could be identified and harnessed to decrease the likelihood of a rangers and staff feeding information to poachers [59]. Financial and cellphone record investigation and lie-detector testing has been used to great effect, but in some places requires a magistrate's order, and so cannot be used preemptively and at scale [57]. Moreover, it introduces questions regarding the ethics of preventative policing and privacy.

Community 'upliftment' came up often in interviews as a fundamental long-term strategy. Providing tools such as agricultural implements, to enable subsistence farming [71], and increasing employment opportunities near conservation areas [59] were two suggested strategies. In both Namibia and South Africa, community game guards have been employed [55,59]. These community members have multiple functions. They conduct antipoaching and educational tasks [55,59], or can be used as a flexible labor force, carrying messages between villages, for instance [55]. They are a visible, human face to conservation programs, disseminate educational material to their communities, and publicize antipoaching operations which has a dissuasive effect [59]. Namibia has had great success in enabling indigenous communities to prosper from state conservation land [55,56]. It isn't necessarily possible to imitate this effect, as it is made possible by constitutional, historic and cultural factors [55]. Having said that, developing schemes that enable communities in South Africa to directly benefit from nearby conservation land would be ideal [14]. This may be in the form of employment opportunities, or prioritized business licensing opportunities to operate within private and public parks. One source suggested a dividend scheme, based on a community's active reduction of annual poaching numbers [14]. The key is to dissolve the divide between outside and inside, and visibly distribute the wealth that is generated by conservation areas [59]. When communities have a highly visible and tangible revenue source, they are less likely to tolerate poaching organizations that threaten that revenue.

"It is our belief that the 'war' on poaching will not be won with guns and bullets, but through social up-liftment and the education of local communities surrounding the reserves."

-Black Mambas [72:np]

My secondary research suggests that wildlife-based tourism has a unique potential to ease poverty in many African nations [51]. I did not discover anything to contradict this per se, but I did witness an unanticipated result of overreliance on tourism revenue. The Covid-19 pandemic has closed national and private conservation areas and ravaged the global tourism industry [67]. As a result, poaching is on the rise, and many people who work in conservation and wildlife-based tourism have become unemployed [61]. This illustrates the importance of considering revenue-diversity and resiliency when planning conservation and antipoaching strategies.

"In many areas, the community on the ground is the problem. In this area where people have the rights, they become part of the solution."

-Dr. Chris Brown, Field Interview [55]

Novel Insights

The value of conducting primary research was explicitly confirmed, when multiple sources explained how little of their story seems to make it out to the global community [14,55,59]. This opacity of the situation is made worse by the lack of free press in many African nations [55]. Government data is framed in such a way as to imply progress, when this isn't always the case [9,59]. Wildlife population growth statistics sometimes fail to account for external factors, implying that government conservation initiatives are to be thanked [9]. I was told by one source that these misleading statistics have resulted in the global press failing to accurately represent the situation in its entirety, an in false optimism [1]. In South Africa, I observed widespread distrust of the government [59,61]. Some sources cited stories of corruption, financial misconduct and inefficacy across this and other topics [59,61]. Others suggested that one cannot rely on the central government, and that local governments and tribal chiefs would be more effective vectors of change [14,59].

At the core of government inaction and apathy to this issue, is that politicians pander to the desires of the majority, and wildlife conservation isn't a priority for the majority of Southern Africans [14]. For many of these constituents, their priorities are education, security, employment and healthcare [14]. These priorities are sometime incorrectly perceived as unrelated to conservation and competing for the same finite resources [14]. In regions that experience human-wildlife conflict, the relationship between constituents and conservationists is downright adversarial [10]. Conservation may be more likely to receive wider support from constituents, and their political representatives, if the mutual beneficial relationship between conservation and these other priorities is publicized. For example, conservation jobs are more sustainable than agricultural jobs [14,51], antipoaching patrols result in decreased crime where they operate [14], and investment into conservation programs in schools is highly effective [59,100]. Likewise, the results of wildlife poaching can have detrimental effects on these other things. But oftentimes these tangible benefits and consequences aren't well known. For example, poaching actually exacerbates human-wildlife conflict (contrary to common beliefs) [9], pangolins increase soil quality [59], and creating conditions that favor, or hurt one species can result in the overpopulation of others [9], effecting landscapes and insect populations [11]. In cases where the proceeds of wildlife-based tourism are in fact benefiting constituents, then this benefit should be well publicized and made extremely tangible [59]. Taxes paid by a luxury lodge to a central government, may not be as tangible, when compared to building a local clinic, for instance. One that is clearly sponsored by that particular lodge and plainly beneficial to the community [59]. Furthermore, if tax revenue is kept local and associated with its source, constituents may develop an affinity for these nearby enterprises [55].

"The politicians will never priorities something that is going to benefit the few... they will always look for the masses. What are the priorities in the masses?... education, health, safety and security, conservation will be number last".

- Anonymous Field Interview [14]

In some communities, extoling the tangible benefits of conservation and consequences of poaching may not be enough. Building community advocacy will require a reframing of poaching from an ecological and

economic issue, to one of principles [59]. Communities may be more likely to take a critical stance against poaching if they are aware that it brings drugs, violence and predatory lending practices into their neighborhoods [14]. Or, if they feel complicit in supporting locally stigmatized crimes, such as grave robbery for illegal traditional medicines ("muti") [59]. As with the Namibian judiciary, helping communities to associate poaching syndicates with the sabotage of their economy and economic prospects could be effective [73]. Children I spoke with expressed concern about losing their heritage and failing future generations [100], and so loss-aversion bias, which describes a human psychological tendency towards loss-avoidance, over gain [47,101] . This behavioral economics theory may be leveraged to motivate a protective stance from this audience.

There are programs in South Africa that teach conservation values to children [100], but they do not exist at a scale necessary to affect generational values at scale. The only rhino most children in South Africa get to see, is the one on the back of the 10-rand bank note [100]. There are important lessons to be learned from existing programs that could translate into large-scale intervention. They have had most success, when starting to teach children at the earliest possible age [59]. These children take educational materials home where they are seen by other family members [59]. A particulate demographic that perhaps isn't utilized to the extent possible, and could be leveraged for significant impact, is rural grandmothers. In South Africa, it is common for preschool-age children to be cared for by their grandmothers while their parents are away at work [59,61]. Grandmothers are the matriarchs of their communities and pass down their stories and values to the children they care for [59]. This presents an opportunity to educate children about conservation values at a very early age. Similarly, one of my sources explained to me that women are the one who are always around the village, and so they see and hear everything [59]. Recruiting from this population could assist in building local intelligence resources, which I'm told have been extremely valuable in preemptive policing [14,56,59].

"No one passes through a community without a woman knowing about it."

- Anonymous Field Interview [59]

The population in Southern African nations is predominately black, and so the fact that conservation is widely perceived as a 'white' issue, is detrimental to promoting political advocacy for it [14]. In part, this is due to the legacy of apartheid and the colonial heritage of conservation areas. In fact, I spoke with school children who, even at their young age, were aware of their grandparents' displacement from land that is now a national park [100]. Another source explained that as a white man working in conservation, I will be perceived by some as a white supremacist, by association [71]. Black communities that live near to public and private conservation areas see wealthy tourists enjoying these places, but aren't able to enjoy the same access [59,100], and don't reap the financial benefits. The public sentiment, therefor, is that these parks are playgrounds for white people [71]. Alienation and exclusion from these places have resulted in indifference to the species that are affected by

"When I grew up, I only knew that wild animals are for white people! They didn't belong to black people."

-Abby Ellin [75:np]

poaching. Killing a pangolin is, as one source put it, like someone offering to pay me to pick a weed in my neighbor's garden [59]. Reversing this apparent apathy and replacing it with conservation focused values is an immense, but necessary challenge.

A source declared to me, that conservation needs to become a 'black' issue that is championed by black representatives [14]. The sentiment is valuable but should not be confused for promoting a generalization of black cultures. This is a message that came up often in interviews [14,49,61]. It is imperative that we don't make this generalization. I experienced firsthand the extraordinary culture and language diversity within a single South African province. And so, when considering the vast land masses that experience poaching and wildlife trafficking, we must also the diversity of perspectives and values. What works for one community is unlikely to work for another [49]. Furthermore, it shouldn't be assumed that governments or partner-organizations are representative of this diversity and may in fact favor one community over another. Likewise, I experienced tensions between tribes that suggest that there is potential for inter-community cooperation challenges [61], and unintended political consequences as a result of poorly researched interventions.

Reframing the value of conservation is necessary in building advocacy in Southern Africa, and also in building empathy and advocacy for this issue at a global level. In my experience, discussing poaching and wildlife trafficking with my peers in the US, its relationship to drugs, terrorism and organized crime isn't well known. Pressure from the international community has successfully stemmed poaching and corruption in some African nations [55], and there is a desire for the global community to be made more aware of this issue [14,59]. International support could be strengthened if voters and their representatives understood the broader consequences of poaching, instead of seeing it as a purely environmental cause. There are cases of wildlife crime investigations resulting in drug investigation breakthroughs [9], and examples of criminals being prosecuted for financial crimes when they can't be successfully prosecuted for their wildlife crimes [9]. There are reciprocal benefits in the co-investigation of wildlife, narcotics, and financial crimes investigation, and this association makes the substantial resources assigned to investigation non-wildlife crimes [9,57], available to wildlife crime investigations [9].

"When people in Europe tell us we mustn't do trophy hunting…We say to them: We know you don't understand it. You live in an urban, Western society, where you're so far away from your food production system, that you don't understand it."

-Dr. Chris Brown, Field Interview [55]

There is a desire in South Africa and Namibia to legalize and promote wildlife hunting and wildlife product trading [14,55]. This is contentious and highlights significant cultural differences. Hunting generates huge profits for few animal deaths (<1% population p/a in Namibia [55]), incentivizes rare game breeding, funds conservation [14,55], and can occur in places that aren't appropriate for general wildlife tourism ventures [55]. Yet, there are arguments that this is counter-productive and spurs market demand [9]. In these two countries, I sensed a desire to cooperate with international governments and NGOs [14,55,56], but also an exasperation that these partners and the general global audience just don't understand the perspective of those on the ground [14,55].

There is an impression that metrics of success and the very definition of conservation is imposed from outside and doesn't take into account indigenous and contemporary African perspectives [14]. Moreover, the five-year funding schedules and measurability requirements imposed by these partners precludes their involvement in longer-term strategies, such as community workshops [14]. Arguments for hunting and legal trade aren't going away anytime soon. I would suggest that it may be futile to fight against them, and that constructive proposals should be made that account for the consequences that are expected to arise should various forms of legalization be enacted.

Leverage Points

From these combined insights, I have identified a number of leverage points. These are opportunities for maximum systemic impact, some of which I believe to be suitable for future design-driven interventions. The leverage points are divided into two categories: Building widespread advocacy and instilling conservation value and Developing creative and sustainable revenue models. This is an incomplete list, and I encourage the reader to continue to identify leverage points according to their own interpretation of this thesis research. It is my hope that the leverage points identified herein, and the research that underpins them, will provide the necessary rationale to catalyze specific intervention proposals by designers and others.

Building Widespread Advocacy and Instilling Conservation Value

Southern African politicians are unlikely to strengthen conservation laws without international pressure and widespread domestic advocacy. As organized crime syndicates are quick to adapt to the policies of individual nations and adjust their methods with an agility that is hard to match with top-down, centralized policy, it makes sense to initiate advocacy and action from the grassroots. Changing values at-scale will make conservation a majority issue, spurring politicians to act according to their constituents' values, while simultaneously creating a hostile environment for syndicate operations across jurisdictions. There are four leverage points that may be harnessed to affect this change:

"Who participates in the conservation industry? It's white South Africans, isn't it?,Wwho are the majority of the voters? Is it white?"

-Anonymous Field Interview [14]

Disseminating the Existing Benefits of A Wildlife-Based Economy

The positive effects of wildlife to the individual and to the local community, aren't always clear. There are pragmatic benefits, including crop-health, tax revenue and employment from tourism operations, and improved community safety and security that come from a healthy wildlife economy and conservation activities. These benefits need to be made more tangible. Gathering and disseminating data and tangible examples that align wildlife conservation with majority political concerns, such as education, healthcare and

employment will shift the perception of conservation away from its white, historic legacy, reframing it instead as an issue for today's majority.

Leveraging Existing Values in Order to Reframe the Issue

Even in communities adjacent to wildlife conservation areas, some people will not be able to relate to the pragmatic benefits of conservation, as they are so removed from it. This audience, and those who live farther from conservation areas, cannot be persuaded by the pragmatic, local benefits conservation brings. However, seemingly unconnected issues are likely to strike a chord with particular people. Other criminal activities, such as drug-dealing, weapons-dealing, gangs, rape, murder, and particularly stigmatized activities such as grave robbing for dark-magic remedies, and predatory moneylending can be connected to those individuals and organization involved with poaching and wildlife trafficking. Making poaching synonymous with these other 'immoral' activities, will turn communities against these 'robin-hoods', as they're currently perceived.

Creating New Wildlife-Based Economic Opportunities

Few people reap the economic rewards associated with wildlife conservation. Living wildlife needs to be more valuable than dead wildlife, and to a critical mass of people. Communities are unlikely to advocate for wildlife conservation, if few individuals prosper from it. If communities and their individual members see themselves as shareholders and beneficiaries of nearby wildlife, they stand to personally lose if this wildlife isn't protected. New schemes are needed that dramatically increase the number of people economically linked to wildlife. Whether through direct employment, sub-contracts, accessible licensing for wildlife business operating on public and private conservation land, or direct ownership schemes. Developing pragmatic, sustainable ways of bestowing ownership of wildlife to nearby communities would be helpful in reframing poaching as a crime against the people. If many people hold a direct stake in nearby wildlife, then loss aversion psychology could be leveraged to mobilize communities against nearby commercial poaching activities that today are unimpeded and perceived as benign.

Early Intervention to Instill Generational Change

We know that wildlife conservation isn't a priority for the majority of Southern Africans, and that changing anyone's core values is extremely difficult. If we are to impart conservation values at a necessary scale, we need to develop large-scale, low-cost programs. Current conservation-centered education programs are most successful when children are involved at an early age. We can leverage rural childrens' informal carers/educators to impart conservation values before they reach school-age. This could be a large scale, affordable and localized style of intervention. Similarly, children from rural backgrounds and urban backgrounds need to be encouraged

"The older women are matriarchs of their community - at home with the children while their parents work. They're the ones telling the stories, raising these kids."

-Anonymous Field Interview [61]

to experience wildlife at this early age. The walls established by fortress conservation strategies and the elitist legacy of safari parks, needs to be dissolved. It might be argued that changing a child's values, will not be quick enough to save certain species. However, these children can act as vectors for these values in their families and communities. Moreover, we need to consider that conservation values may be needed for the next extractivist threat around the corner, even if they don't help today.

Developing Creative and Sustainable Revenue Models

Government resources are finite, and many government and non-profit programs rely on donor support [14,56,59]. There are so many needy organization, and emerging causes, that donors are fatigued, and the pool of funding is stretched thin [59]. Developing creative, sustainable revenue models to fund wildlife conservation is necessary.

Leveraging the Wealth that Creates Demand for Illegal Wildlife Products

The burgeoning middle class in China and Vietnam, and their disposable income, can be perceived as a threat, or as a potential source of conservation funding. It is almost a cliché, but the millennial generation has become known for their willingness to spend on experiences, rather than possessions [47]. Building wildlife experiences that leveraging this target demographic may generate revenue in African nations and instill a firsthand sense of empathy for African wildlife and people.

Reframing Scarcity and Status

Illegal wildlife products that are purchased for status, are made desirable by their price and scarcity. These two things are co-dependent. Unsuccessful efforts to reduce the price have centered on 'flooding' the market with inventory, reducing the product's scarcity and therefore desirability. Leveraging scarcity may be an alternative. Reframing possession from something that requires the product to be separated from the living animal, to something that is made even more elusive in its attachment to the animal, may provide a conservation revenue source, and also satisfy the consumer's demand for status, without any animal deaths. Corporate and individual sponsorship, competitive bidding and subscription, leasehold rights, and gamifications could all be potential avenues to enable wealthy Asian consumers to 'buy' something that is superior to a stagnant ivory tusk or ornamental bangle.

"If they still see Kruger national park as a place to kill a rhino, not see Kruger national park as our investment… at the end of the year we should sit down and give them their dividends."

-Anonymous Field Interview [14]

Hunting and Legalization

Hunting and the legalization of wildlife products that are currently prohibited by CITES, is argued for by SADC nations [9,14,55]. These both have the potential to generate revenue for individual governments and businesses but do nothing to ensure that that revenue is protected from corruption and beneficial to the majority. This is

a lost opportunity. Granting hunting licenses for local businesses to operate on national park land could decentralize hunting revenue away from elite private parks. Taking a page from marijuana legalization, an international, regulated market for certified, sustainably hunted or farmed ivory and horn, could create taxable revenue for source nation and undermine the criminal black market for these products.

Sustainable TCM

The Chinese government is promoting and supporting the traditional Chinese medicine industry (TCM) [55]. And there is evidence that demand for certain illegal TCM products is artificially fabricated by the syndicates [9]. A concerted effort to market more accessible, sanctioned, sustainably gathered or farmed TCM remedies to replace endangered species-derived remedies, may be a more effective use of marketing dollars, than campaigns that fight against the consumption of these illegal products and offer no alternatives. TCM ingredients that are sustainably farmed in Southern Africa could provide rural employment and alleviate demand for poached products.

Employment and Poverty Reduction

Any efforts to curb unemployment and poverty in Africa indirectly help to curb poaching. Programs that provide income-generating opportunities for rural people who live near to wilderness conservation areas is particularly valuable, as they reduce the pool of indigent labor currently available to poaching syndicate recruiters. These individuals will never earn as much as poaching syndicates currently pay them to poach, however I am optimistic that supporting autonomous subsistence can improve standards of living, and provide dispersed, rural economic opportunities that begin to dissolve the disadvantaging effects of historic and contemporary colonialization.

"Later, James pulls out an AK47 from his passenger seat. His glove box is peppered with Monster energy drink stickers… Driving in the twilight, with our windows rolled down, he stops every 5 minutes or so to listen and observe… We pause in a small gully, he points next to the road, to a circle of flattened grass where a leopard must have slept only moments earlier."

-Extract from Field Notes [57]

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CONCLUSION

Conclusion

I set out with this research to understand the issue of poaching and wildlife trafficking, and to do so through the lens of design. The process was adaptive and amorphous, which I found to be necessary when trying to understand this particularly ill-structured problem. It was an unfamiliar research process for someone who is more at-home with typical hypothesis-driven design research and the design requirements and constraints inherent in well-defined problems. I cannot claim that the way I undertook this research is exemplary, but I can confirm that this topic, and presumably others of equal complexity, cannot be engaged as discrete problems to be 'solved' with discrete solutions.

"Hunger and impotence lead the poor to demand rapid industrialization, and the defense of growing luxuries pushes the rich into more frantic production." -Ivan Illich [90:44]

A burgeoning middle class in Asia and an increasingly industrialized society in Africa has created the conditions which drive the extraction of Africa's natural resources, including its wildlife. Poaching and wildlife trafficking is underscored by desperation, ambition, individualism and greed. At its core, this topic is a symptom of the human condition and of the contemporary world. The latter is a result of design. The question, therefore, is whether design can be put to use in the dissolution of the conditions it has historically contributed to, or whether design, with its obsolete interpretation of progress, is antithetical to the resolution of its own consequences.

"Design has become too important to be left to designers." -Tim Brown [83:2]

In attempting to alleviate poaching in Southern Africa, one has to declare a position and accept that any intervention will cause a displacement of problems. Decreasing poaching in one location will push it to another. Decreasing demand or supply of one species, may stimulate poaching of another. The hypothetical resolution of poaching or of market demand for illegal wildlife products, may incite organized criminal syndicates to pivot to other lucrative criminal activities. In light of this, one cannot 'do good' holistically, but must declare a priority.

Conclusion Cont'd

"Society has to be reinstrumentalized to satisfy the twin goals of conviviality and efficiency within a postindustrial framework."
-Arturo Escobar [83:9]

I have discussed within this document, the tendency for design to favor newness and inventiveness. I have sought to attempt a different style of design practice within this research project; one which is reflexive and representative. Herbert Simon [89] observed that to properly represent a problem, is to contribute to the revealing of its solution. My research and findings do not suggest a singular solution but represents a multiplicity of leverage points that can be applied in tandem to affect a positive outcome. This research is but one representation of this topic, which I hope will contribute a unique and constructive perspective to existing discourse on the topic of poaching. I further hope, that designers will turn their attention to reinterpreting their postindustrial role, and their conception of progress, in aid of contributing their unique abilities to problems such as this. This is of particular import for those who design technologies and are accountable for their exponential global effects. Designers who play a key role in advocating for technologies that promote distributed creation, competence and autonomy.

> The former subsistence farmer is put out of business by the green revolution. He earns more as a laborer, but he cannot give his children their former diet."
>
> -Ivan Illich [90:44]

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Note: For an explanation as to why certain interviews have been anonymized, please refer to the "Findings Pertaining to Design Research: Observations on Ethics" section of this thesis.

P O A C H I N G I N
S O U T H E R N A F R I C A

END.

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