Design for Existential Crisis

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Abstract

What should designers do with their design skills and orientation to the future as right-wing populism sweeps through politics; climate predictions worsen; mass migration (within/across countries) escalates refugee numbers; new classes of automation threaten workers' jobs and austerity policies destabilize society? What is to be done when it isn't "business as usual" and even broken concepts of progress seem no longer to be progressing? In this paper, we discuss aspects of humanity, such as the need for meaning, fulfillment, dignity and decency, which computers struggle to support but can easily undermine. We juxtapose design that offers hope with that which offers only distraction and conclude with a plea to avoid *Bovine Design*, or tools that encourage passivity, rote-behavior and a blinkered existence at a time of great uncertainty and change. The big question that alt-chi can ask for 2017 is: What is good design for existential crisis?

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Meaning; fulfillment; dignity; decency; change; design.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

Introduction

It is rash, just now, to make statements about the nature of the world. The world has started spinning

faster than normal and what was true in January may look stale by May. Yet, it is possible to discern trends, including uncertainty about the future of democratic leadership, which should give many of us pause for thought. There is a move away from globalization and greater connection. There is increasing indifference to the ecology of the world in important places at the same time as predictions for sustainability are at their bleakest. We might see these elements as related and detect denial [18] in the behavior of people who should know better. And while there are some winners as governments turn their back on social policies and long-term sustainability, ultimately there is a growing sense that, without fast action at every level of society, we cannot outrun crisis. In the Anthropocene age[1], shocks of all kinds are raising questions about the future and value of humankind.

Technology designers and design researchers are implicated in this wave of change and uncertainty because we have claimed a stake in the production of futures. As makers, we are practical people, as well as dreamers and theorists, and if there is no more "business as usual", we can choose to have a role in producing alternative narratives for present generations of humans and those who depend on them, such as other species and unborn children. This alt-chi paper is intended to open a discussion about how we take that role. First, we break down the existential elements of these concerns into two challenges that transcend politics, before then asking how designers might regard them in offering support during enduring crisis.

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[1] The Anthropocene refers to the present geological age, when humans are credited with having more impact on climate and planet than other factors combined.

We are not presenting an extensive review of literature at outset, referring to texts where apposite; however we will acknowledge two other pieces that focus explicitly on existential HCI ([24][29]) and differentiate our work from that on disasters and HCI, which has dealt exclusively with more immediately practical matters (e.g. [36][40][39]). We also recognize that there are many other initiatives to encourage more sensitive and thoughtful designing (e.g.[6][23][12]).

Challenge One: Our Mutability

Our first existential challenge as humans is knowing who we are. Humans are mutable beings, despite our perception of ourselves as something solid and defined. Our way of being can and does change. Biological evolution is so slow that it has little bearing here. But social evolution is fast and sometimes scary (see Arendt [2] or Bauman [4] on the conditions for the Holocaust, or recent events for the legitimation of hate). We are inscribed to certain social ends [5], so society can be changed by a change in inscription practices. And we need only look at clever social media practices during recent elections to see how technology can be an enabler of polarization in society.

Accompanying this potential for rapid alteration, however, is a strong sense of what we are capable of *now* and little insight into what we can become, the futures we might create, or how we effect difference through innovating, with even what is being called *ecological design* subsumed into a 'temporally-contracted close-present' [1] of commercial priorities. This lack of vision was true during rapid change in the Industrial Revolution and it remains true now. Yet, as we change our world, we change ourselves.

Remembrance Day for Lost Species

The *Remembrance Day for Lost Species* brings together events annually on November 30th and is commemorative in spirit, mourning the passing of the planet's species.

In 2016, WWF-UK reported that Earth had lost 58% of its wildlife in the last 56 years, including thousands of extinctions. But memorial celebrations also mark earlier extinctions, such as 100 years since the passing of the Passenger Pigeon in 2014.

2016 marked the first mammal to disappear as a direct result of rising water levels: the Bramble Cay melomys – a small rat-like creature, which lived on a low-lying coral cay on Australia's Great Barrier Reef.

Sources: *ONCA*: http://onca.org.uk/lost-species/ and *WWF-UK*: https://c402277.ssl.cf1.rackcdn.com/publications/964/files/original/lpr_living_planet_report_2016.pdf?1477582118

This implicates all design in making social change, through the creation of new products and services that go on to reshape society, as well as through more deliberate acts of cultural redefinition. Much of this is incidental. Where visions exist, they are less about the good life (Aristotle [0] on), as much as enhancement. The dominant paradigm of existential enhancement is the Singularity [25], where cyborg life meets machine intelligence. No values attach to this except technocracy. Is this the best vision we can create?

Challenge Two: Our Ultimate Fate

Our second existential challenge is our mortality. Heidegger's notion of *Angst* [22] relates to the tension we feel as mortal living beings: knowing we are destined to die, but very much alive and unwilling to accept our finitude. The way that modern life ignores death as a certainty and sensationalizes particular, shocking, forms of death (murders by people unknown to the victim[2] or horrorism [8]) does little to support a world in which uncertainty is increasing. Instead, in the perceived absence of a chance at betterment, pressures to achieve and conform, and a breakdown in things to believe in, suicide rates are rising again [11] and anger is leading to fundamentalism and/or extremism.

Kaptelinin [24], in discussing the need for an existential HCI at alt-chi last year, notes 'limited success in HCI research in understanding the impact of technology on how people experience their own mortality' which cannot be explained by a lack of attention or research

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[2] Ignoring certain categories of unnatural death such as road casualties and domestic violence, which far outweigh acts of terrorism or serial killings, but garner no attention.

rigor. He attributes this partly to method, but we might also see this as a response to a fraught topic.

Worldwide, for many of us, safer childbirth has taken death out of the home; hospitals, hospices and nursing homes receive our old. Historian Harari points out that famine, war and plague are statistically, across the world, far less likely to kill us [18]: 'In the early 21st century, the average human is far more likely to die bingeing at McDonald's than from drought, Ebola or an al-Qaeda attack.' ([18] p2). With secularism and improved survival rates, many of our societies have sanitized the principal fact of life and buried it in films, books and games about untimely ends investigated by forensic sleuths. We are able to pretend we are not living with uncertainty and a terminal sentence, while amusing ourselves to death [37].

What People Need at a Time of Change

Existential psychologist Frankl's work [17] is a corrective to Maslow's hierarchy of needs. He relates how people who survived the camps of Nazi Germany did so because they cared about something so profoundly they had a reason to live. Somehow, a tiny minority of people sent to slave camps managed to survive without proper food or shelter over several years of physical and emotional abuse because their life had meaning. While a life's meaning is personal, the need for meaning and its abundance or absence at a particular time is broadly cultural. The Great Wars marked the last great periods of social upheaval for Europe, impacting worldwide. The shake-up as Britain and Germany went to war in 1914 gave people cause to question life and its value, often in very material ways. For instance, the single battle of the Somme took the lives of nearly 1.3M men and hastened the arrival of a

The symbol above represents extinction: the circle signifies the planet, while the hour-glass reminds us that time is rapidly running out for many species. The designers say "The world is currently undergoing a mass extinction event, and this symbol is intended to help raise awareness of the urgent need for change in order to address this crisis. Estimates are that somewhere between 30,000 and 140,000 species are becoming extinct every year. Within the next few decades approximately 50% of all species that now exist will have become extinct. Such a catastrophic loss of biodiversity is highly likely to cause widespread ecosystem collapse and consequently render the planet uninhabitable for humans." (www.extinctionsymbol.info)

new social order in Britain, in which women voted, the empire disintegrated and public loyalty to the Crown was no longer unquestioning. During this period, a crisis in meaning accompanied a complete redefinition of everyday life and values.

Frankl's work [17] points to a distinction between meaning and hope to an individual – one is now, the other is future-oriented. Other research shows that a prevalent human tendency toward optimism does not equip us well for survival [45], despite evidence that individual optimists to do better at times of stability [49]. If the future is bleak, then most important is a personal sense of the value of continuing existence.

This links to achieving fulfillment, with its implicit critique of happiness as a goal in life [49]. For many, gainful labor and/or nurturing family offers fulfillment, and disruption to these may be the most shocking event a life needs to weather. Finding new forms of fulfillment as things change is therefore a priority.

Technology and Humanity
These challenges and needs relate to technology in two ways: 1) our tools shape us (e.g. [47] [27] [43]), so what we make affects how we handle uncertainty in constructive ways; 2) we can design more wittingly for managing fear and *Angst* and finding fulfillment.

Neither of these relations points to the need for particular guidance, so much as a way of thinking as we go about our work. The word *humanity* carries a double meaning. It is at once a noun that refers to humankind and one that points to a form of supportive co-existence where faults are accepted and kindness, not impartiality, comes to the fore. In English, we seem

to imply that humankind is a social animal, doing best when attending to interdependence [30] and the mutual care [38] that sharing a planet entails. This maps well to the networks and webs of digital innovation that are our tools as we manage futures.

Saving Humanity v1
In *Homo Deus* [18], Harari talks about the narrowing margin for error in designing to support the 'double race' of climate change and the world's economic ambitions, as both accelerate. 'Paradoxically, the very power of science may increase the danger, because it makes the rich complacent,' he comments (p215). 'How rational is it to risk the future of humankind on the assumption that future scientists will make some unknown discoveries?' Those in control do not believe they are gambling on their own future: 'if bad comes to worse… engineers could still build a hi-tech Noah's Ark for the upper caste. …The belief in this hi-tech Ark is currently one of the biggest threats to the future of humankind and of the entire ecosystem' (p216).

Much work in HCI has taken environmental concerns for a theme and much of this has made conservation (of water, power, etc) a household or individual matter by producing monitoring technology. Others ([14] [11]) have noted this depoliticizes the issue of survival, overlooks the wider context of over-consumption and ignores the need for pressure on governments to act at an effective level [14]. A focus on individuals advertises a potential for empowerment, masking the sleight-of-hand of shifting responsibility for the damage to our ecosystems onto the same individuals. Further, a picture of privation as a solution runs against what we know about motivation for action. (In *Design for Sharing*, we began, instead, from the idea that a

'sustainable society is one in which we choose positive behaviours that make us feel happier, more connected and more disposed to help others' [32].)

Monitoring technology can support the development of awareness and change in consciousness as well as local modification of behavior. The question is how it is conceived. While sensing environmental conditions and the progress of other species might create a better understanding of them by humans, it can still be part of what Haraway calls a 'god-trick' that valorizes objective vision and human superiority [20]. Perhaps we can think more creatively if we reframe monitoring, and apply the potential for digital sensing in ways that are outward-looking and community-creating.

Creating communities will be important work. Plague, famine and war are predicted to return as competition for resources intensifies, being both the cause and the effect of a breakdown in civilization linked to growing climate impact. We are already seeing this in the failure of governments to handle drought (e.g. aggravating the refugee crisis in Syria and famine in Yemen). There are bouts of anthrax freed by receding ice [13] and stories of diseases that thawing mammoths may bring. We are not only dealing with runaway resource consumption; we are dealing with fear on a huge scale at a time when we need global leadership to handle both the physical and cultural aspects of global change.

Saving Humanity v2
Fear is a vital survival tool, but it is not a productive long-term state for human beings. It causes stress hormones to destroy our bodies. It narrows our thinking to black-and-white, fight-or-flee responses. It is known to inhibit creative thinking. However, ignoring

the future in a creative bubble does not wholly work either. It leads to fragmentation and the loss of agency to uglier forces.

To say the unthinkable, it is possible that we will fail to save humanity v1 and be left, on our watch, to face a bad end. We are all going to die somehow. As Sterling [43] puts it: 'What we really ought to fear is not "Oblivion" but irretrievable decline. This would be a grim situation in which we all knew that humanity's best days were behind us, and that none of our efforts, however brilliant or sincere, could redress the mistakes humankind had already committed.' Whether or not this fate awaits us, going toward the future with grace and bravery is simply better than travelling with fear, small-mindedness and hate.

What's Good about People
In *HCI as Heterodoxy* [31], I (Ann) identified the human 'weaknesses' of forgetting, obscuring, cheating and eluding that could inform design and modify the innate rigidity of computers to keep futures open. I was inspired by witnessing computer scientists' dismay at the prospect of computation that tidies humans out of all their foibles and complications, and 'tension between the formalisation of computers and the richness of the lived world' [28]. Here, we explore human strengths that make us more than the sum of our frailties and mistakes – in the same spirit of celebrating humanity.

Decency and Dignity
It has been suggested that justice and fairness may be best meted out by machines, which do not succumb to the dangers of bounded rationality [42] or implicit bias. A counter to this is that the algorithms that control them regularly show built-in bias: they are written by

authors - and regimes - with particular agendas or blindspots. For instance, even the blockchain, which is conceived to be a value-neutral form of exchange, has been written specifically to avoid takeover by political agendas – itself a value system.

However, there is a greater argument, about priorities. Machines may excel at logic and rules, which can help maintain an equal society (and/or create conditions for control), but not graceful enactments of kindness and decency. It is humans that excel at discretion, empathy and compassion, going the extra distance where they feel the need. Margalit points out that a society that is just and equal may not necessarily be one that is decent and respectful of human dignity [33].'A civilized society is one whose members do not humiliate one another, while a decent society is one in which the institutions do not humiliate people.' [33, p.1]

Institutional humiliation comes in many digital guises. There is an intensification of system efficiency at the expense of flexibility (and the absence of an empathetic hearing for exceptions). There is techno-paternalism, nudging users unthinkingly toward behavior identified by others as positive, right or useful. There is data collection that affects social mobility as our pasts come to define us to the machines that make decisions about our futures. There are addictive network distractions, tested to engage and keep users gambling, shopping, viewing pornography or trading content on social media beyond what is known to be reasonable. There is automation at checkouts and interactive voice response phone calls that suck out our souls. There is the policing of performance in factories and offices, then replacement of labor by machines. There is personalizing that promotes dislocation of individuals

from collectives, and silo-ing of collectives, invisibly classified by advertisers and decision-makers to align behaviors with business goals and/or governmental values. There are smart cities, homes and tools that take over the management of everyday affairs too completely. Humiliation, whether through techno-paternalism or a sense of powerlessness, can be seen as a form of mental cruelty [33]. Even equal access to opportunity in these contexts looks unappealing without respect for dignity.

Meanwhile, all this presupposes others know what is right or useful as circumstances change and keep changing. What if, long-term, our tools have programmed us to do wrong better and more whole-heartedly? Are we hastening disaster? Only a loudly observant, critical chorus can mitigate that possibility.

Higher efficiency, more distraction and greater streamlining may mean fewer cracks through which people can fall in the short-term, but it also silences the critical chorus who would bring other ideas to try. We may be left with facile values, lack of perspective and a reduced sense of responsibility. At its best, this is unfortunate. At its worst, it could be a convenient way of controlling the masses while the Ark is built. Either way, fewer people would look beyond themselves and take initiative. Discussion of fulfillment would cease.

But, while all these tendencies exploit the nature of digital machines, they are not determined to work like this. The power of computers to sense, connect and infer can be used to have huge benefit in more decent ways. It already is. It is being used to improve health and wellbeing, support civil society, give access to new forms of decision-making. We can add to this list a

more deliberate quality of challenging ourselves to become our kindest and creative best as we deal with rising uncertainty.

Design for Existential Crisis

We close with ways of thinking about the future and what functions we might like to design for. How will *we* lead fulfilling lives? The following are not design ideas, but suggestions for qualities we can employ in our design work that speak to the existential crisis we find ourselves facing. These suggestions might encourage tools that focus on meaning, purpose and fulfillment in difficult, unstable and rapidly changing times.

The radical act of paying attention to things that we do not wish to see and that make us uncomfortable can be aided by design if it takes up the challenge of resisting smoothness and self-centeredness. We can do this from both an individual and a species perspective. 'Paying attention to the more-than-human world doesn't lead only to amazement; it leads also to acknowledgment of pain. Open and attentive, we see and feel equally the beauty and the wounds, the old growth and the clear-cut, the mountain and the mine. Paying attention to suffering sharpens our ability to respond. To be responsible.' [25]. Paying attention is the least we might do as we strive for the grace to accompany fellow-species towards their own (and perhaps our) extinction. We can design for noticing.

We can design to show the beauty of the world and to help people come to terms with the poignancy of losing it. Morton [35] suggests 'the ecological "enchants the world", where enchantment means exploring the profound and wonderful openness and intimacy of the mesh [the weave of 'entangled presences']'. Bennett

has gone further, proposing that the world inspires 'deep and powerful attachments' and that 'one must be enamored with existence and occasionally even enchanted in the face of it in order to be capable of donating some of one's scarce mortal resources to the service of others' [5]. We can design to embrace the rhythms of life and death around us. Projects that promote growing plants, such as The Connected Seeds Library (www.connectedseeds.org), are a way of introducing seasonal rhythms to a wide population, showing relationships between life, death and care.

Kimmerer [25] suggests that 'The practice of gratitude can, in a very real way, lead to the practice of self-restraint, of taking only what you need. Naming and appreciation of the gifts that surround us creates a sense of satisfaction, a feeling of "enoughness" that is an antidote to the societal messages that drill into our spirits, telling us we must have more.' We can design for more gratitude and taking only what we need.

Tsing writes: 'Human exceptionalism blinds us. Science has inherited stories about human mastery from the great monotheistic religions. These stories fuel assumptions about human autonomy, and they direct questions to the human control of nature, on the one hand, or human impact on nature, on the other, rather than to species interdependence.' [46]. We can design to unseat humans from the center of the universe and support a more equitable gaze. In her most recent work, Haraway [21] proposes an ethics of kinship that connects humankind with many others, especially those who are alien or not alike. She calls for a renewed sense of connection with the other beings of the world, even if that connection rests in the knowledge that the

relationship is one constituted from grimly exploitative relationships. We can design for kinship across species.

At the same time, we can design new rituals to mark ensuing rites of passage and moments of significance (see the sidebars for a new festival and an icon that acknowledge loss and mark diversity). We can celebrate the sacred in the everyday and remind ourselves what is still important. We can search out and employ alternative types of value and means of exchange that express respect for each other and provide access to basic means.

We can design to think creatively, not in the present, but in how we greet futures, so that we come to change with a flexible responsive approach, ready to make the best of it, mitigate the worst of it and find fulfillment in the choices to be made. We can design to connect with others in our acts of creativity, where our making pays back more than it takes. We can take common action.

While seemingly at odds with the actions of forgetting, cheating or eluding [31], mentioned above, these values of attentiveness are also messy, because they involve perceiving the experiences of others as being as valuable as the experience of humans and because they always aspire, never attain. They help us be critical and to reassess the shortcuts of routine, not just in everyday consumption practices (e.g. [40]), such as shopping and showering, but in expectations of life. This is slow and messy, but technologies can help.

Cohen [9] insists that technologies of the future must be imperfect – allowing spaces for creativity and exploration away from the systems of surveillance and in the interstices between the spaces of predictable,

algorithmically-ordered human practice [9]. We can design with gaps, building in inherent incompleteness of technical systems – as spaces where the 'play of everyday practice' [9] can happen and future values can develop [31].

Whose future is made and how is a question of knowledge and power [48]. Yet, imaginaries of the future have agency as these come to define what is possible. We can design stories for technology just as we can design tools. Freedom for dignity can outlast other freedoms as resources become scarce. We can aspire to visions of decent futures that value kindness, grace and respect for human dignity as much as efficiency, justice and equality.

We can go on asking key questions as circumstances change and change again:

- What results in fulfillment?
- What supports a compassionate response?
- What brings us all into constructive intimacy?
- What cultivates a creative mind?
- What is the decent society?
- How do we design for these?

Avoiding Bovine Design*
*with apologies to cows, who would live more inquisitive, adventurous lives if they could.
From architecture to social media, we have designed our world to suit merely one species of primate. But even we are not going to find it hospitable in the years to come. We need to adjust. We call for the rejection of *bovine design*. Maybe this is too trite a term, but our ability to describe succinctly a genre of tools and systems that herd and control is missing.

The daily life of cows is a placid one, designed to go from milking to feeding to rearing with no sudden movements or deviation from the farmers' plan. Cows are not, in this presently designed context, pursuing any more broadly defined goals, nor are they ever permitted to. When people across the world amuse themselves quietly with their multiple screens, following the latest fad, doing little of consequence or ambition, we might also see this as an achievement of *bovine design*. We can choose to regard this as the socio-technical achievement of late capitalism, exploited to keep the masses calm, or as a feature of what technologies enable of our ludic selves. Undeniably, we share with cows and other animals a respect for the herd that designers use to move us unwittingly through airports and into airport shops.

Bovine design deliberately exploits the well-worn track, thereby curbing reflection, stifling creative energy and writing out dignity. There is no dignity where there is only rote behaviour. Where there is no conscious choice and no appeal to the imagination, narrow horizons lead others to tread uncritically the grooves we design for them. Nudging, personalization and ease are ultimately only more efficient ways to achieve greater conformity.

Some people will never be curious or alive to possibilities around them. Many people's circumstances do not allow for a full use of their creative faculties. While worth observing, this is no reason to design only to the lowest common denominator. If we become what our interactions make us, the real range of our potential humanity is lost to us.

This is not just a political consideration. While the direction of travel keeps evolving, *bovine design* may

do more than peddle distraction or humiliation; it may also be dangerous folly. It can keep people stuck in old ways that need to be superseded. It can reduce their generic capacity for adaptation at a time when change is accelerating. It is likely to create a culture where initiative never breaks out of familiar paradigms. Yet, the old ways are not working; we need a sea change and it has to come from somewhere.

Just as the elite may be trusting in the Ark to survive, we may also be looking to existing professional paths for our safety and sanity. We could be watching automation take the self-respect from another quarter of the workforce [50], with nothing to replace the fulfillment that labor gave them and no means to pay for their former standing in society. And we might be glad that we are in an industry that still feels essential to the Ark project.

We make the distinction here between designing for 'them' (with the idea of an 'us' that is somehow separate and safe), and designing for all of us together. We cannot afford to treat others differently. So we may have to abandon some classic HCI ideas.

The users are not different from us. Design for our own dismay, fear, hope, sadness, joy and need for purpose. Avoid designing for someone else to use fewer resources and behave well.

Ease is not serving us. At present, for many, everyday life is fallaciously comfortable. We need to be capable of effort. We need to feel alive. We need to celebrate our existence as fully and palpably as we can, now and in the future, however it is different. We need to enable others to share in this amazement at life. We need to

be wholly attentive to the wonder of life while we have it. And we need to give the best chance we can to our fellow species, our children and all those beings depending on us, to feel that wonder too. That might include time spent connecting through computers, but it should not mean *disconnecting* through computers or using them as another drug.

HCI is not the right term. Years ago, I (Ann) wrote about moving toward an existential HCI: designing 'with awareness of the many ways that identity, meaning and use interrelate and the impossibility of separating the social and technical at an existential level as well as in the everyday.' [29]. It was a plea to consider the wider interactions of our engagement with technology and its consequences. It was a challenge to our understanding of the 'I' and the 'C'. Here we challenge the 'H'. All entities on the planet engage with (human-made) technology; that is what Anthropocene means. Not all entities have a say. The field of ACI has also taken off [33], but this too limits its focus. Instead we need a discipline looking at *ecological technological interaction* (ETI), in other words, the balance and impact of our digital next steps, for all, with all.

We can choose to challenge the values intensified by digital machines and networked data, noting that machines conform because they cannot do otherwise. We can reject blinkers, rote-behavior and passive acquiescence and ask important questions about who we are and what we might do. We can resist leaders that are ignoring our peril. We can promote care, wonder and fulfillment. We can design our digital interactions specifically to these creative ends.

In Conclusion

'There is survival value in the will to meaning, ...but as to mankind [sic], there is hope for survival only if mankind is united by a common will to a common meaning - in other words, by an awareness of common tasks.' ([16] p135) says Frankl, already last century. As designers, researchers and makers, we can help deliver tools that promote both the enduring search for a common task and the task itself, leading the process of discovering collective and personal purpose.

HCI has design for peace [23] and for social justice [12], and value sensitive design [6]. We see this call sitting alongside such important appeals, with the difference that we are not advocating any one end-state, but a process of staying aware, responsive and light on our feet and designing to support evolutions in state. In Kimmerer's words, we believe our motivating question needs to change from "What more can we take from the Earth?" to "What does the Earth ask of us?" [25]. The answer will go on developing, affected by everything that has gone before and who and what we have, and can, become.

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Commentary

For alt.chi paper
Design for Existential Crisis

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I love many things about this paper. It needs tightening up in its presentation of some arguments a little, but it touches on many issues that I personally think are currently important to HCI: not least (i) our thinking beyond the human to non-human species and wider ecology, (ii) the necessity of avoiding designs that incorporate a Garbettian threshold (see below*), and (iii) of considering design elements that promote critical thinking and frictionful interactions rather than ease of use and conformity. Note to the authors: there are a few people working on this latter idea that are not mentioned in the paper (e.g. see Cox, A.L., Gould, S.J., Cecchinato, M.E., Iacovides, I. and Renfree, I., 2016, May. Design Frictions for Mindful Interactions: The Case for Microboundaries. In *CHI'16 Extended Abstracts on Human Factors in Computing Systems* pp. 1389-1397 ACM).

The first half of the paper is perhaps not as intriguing as the second: mostly because to my mind similar arguments have been made before - sometimes at alt.CHI (e.g. in Kirman, B., et al CHI and the future robot enslavement of humankind: a retrospective. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems* pp. 2199-2208 ACM) - but it is useful to see a synthesis of these as a set up to the main contributions that come in the second half. Indeed the second part of the paper is laced with not only delicious – but also pretty concrete - calls to action: e.g. some of my favorites are "paying attention to things that we do not wish to see and that make us uncomfortable can be aided by design" (my own group will basically have a CHI 2017 paper on this around TV+social media), "(we can) design to unseat humans from the center of the universe and support a more equitable gaze" and "(yes we can)

design with gaps, building in inherent incompleteness of technical systems – as spaces where 'play … and future values can develop". This latter point takes me back to the time where approaches like seamful design were proposed to make the best of technological limitations (like patchy GPS coverage as in Broll, G. & Benford, S, 2005. Seamful design for location-based mobile games. In *Int Conf on Entertainment Computing* pp. 155-166); now I totally agree we have to try and put these seams back in.

The call to take into account relationships with nature I think is particularly alluring – I'd draw further attention to concepts such as E.O. Wilson's 'biophilia' (Wilson, E.0. (1984) Biophilia. *Cambridge)* whilst Harraway's most relevant writing here, to me at least, is where she talks of the (wonderful) otherness of animals (Haraway, D. J. (2003). *The companion species manifesto: Dogs, people, and significant otherness* Prickly Paradigm Press). I think that maybe the weakest part of the paper, unfortunately, is the 'bovine' design idea – I get the 'herd' thing but the idea is barely touched upon yet is in the title and to me also serves to confuse the reader a little following earlier mentions of ACI and of designing for the non-human. This meant for me the paper ended a bit weirdly - but the strengths were already there in the previous discussion.

*Garbettian Threshold: a threshold perversely applied to something completely unquantifiable yet quantified anyway by many apps. For instance the quality of one's sex life, or the bounciness of one's pet dog: above the threshold then things are 'good' – below and it is time for a visit to the appropriate clinic.