Information Architecture in the Anthropocene

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Abstract

Today's information architecture (IA) practitioners work in a morally and politically challenging climate where pervasive, systemic problems demand that we consider the consequences of our work for social justice and sustainability. Using "Information Architecture in the Anthropocene" as a framing device, and drawing from critical perspectives in design scholarship, this chapter explores what these systemic problems mean for everyday information architecture practice, and it asks what methodological, theoretical, and paradigmatic qualities would enable information architecture to respond adequately to social and environmental challenges. Both design and information architecture practitioners are deeply involved in ongoing sociopolitical problems, which highlights the need for awareness of their limitations and their situatedness within the systems that are traditionally treated as objects for detached research and design. Reflexivity, informed by a systemic epistemology, is identified as a critical attribute for information architecture in the Anthropocene. Three proposals are offered as ways to achieve this: information architecture as a developmental process, information architecture as ethical practice, and information architecture as a network. These approaches apply processual and relational interpretations, along with biological theory, to the practice of information architecture, challenging our field to include ourselves in the systems we study and to rethink information architecture as a responsible practice.

Sections

1. Introduction

Today's information architecture practitioners work in a morally and politically challenging climate. Digital technology and design professionals, among others, have been named as enablers of harmful phenomena including addictive and manipulative software, products driven by biased algorithms, surveillance capitalism, and misinformation spread through online advertising and social media. At the same time, ongoing social movements such as those focusing on racial and gender justice in the United States have asserted a shared responsibility for all to act in light of systemic injustices that pervade our cultural and economic institutions. All of this stands against the backdrop of the Anthropocene: a period in history marked by the large-scale human impacts on Earth's geology, climate, and ecology, which present existential threats such as anthropogenic global warming. The involvement of design and technology in these wicked social and ecological problems makes them a central concern for practitioners. Like the climatic markers of the Anthropocene, the ethical ramifications of information

architecture are everywhere. Practitioners must consider the broader consequences of their work and the systems that their work supports.

The field of design has wrestled with these issues. Critical scholarship in design (Costanza-Chock, 2020; Fry, 2011) have addressed design's contribution to, and responsibility within, ongoing systems of injustice and unsustainability. While the design professions have had more than a century of movements espousing design as a vehicle for social change, more recent critiques have departed from conventional idealism and celebration of design by acknowledging its *fallibility*. They show how social change-oriented design has often had negative outcomes. For example, it may generate undesirable second-order consequences, support colonial or imperialistic dynamics (Tunstall, 2013), or produce anti-social and anti-political effects (von Busch & Palmås, 2017). From this standpoint, a theory of design as an agent of social good is incomplete unless it can account for the complexity of social context, the likelihood of negative consequences, and the unequal power relationships that condition the act of design.

The same critiques apply to information architecture, as well as fields like user experience design (UX) as the settings where information architecture practice takes place. Information architecture has been framed as a kind of design that focuses on the structure of information environments for their inhabitants (Wodtke & Govella, 2009; Resmini & Rosati, 2011; Hinton, 2014; Arango, 2019). Information architecture is concerned with the human experience of information, the nature of information structures in the world (whether intentionally designed or not), and the process of modeling and planning those structures. Philosophically and methodologically, information architecture operates in ways similar to design (Fenn & Hobbs, 2014), but it has a distinct history, body of knowledge, culture, and communities of practice.

Like design, the field of information architecture features *origin myths* (Malazita, 2018) and narratives about the role that information architecture can, will, or should have in creating a better world; the unique strengths it offers; and why it is necessary in the world. It also includes narratives about the threat posed by a lack of information architecture done well. However, information architecture as a field does not yet have a mature set of theories and approaches that support information architecture as a practice that holds responsibility for its own consequences as it seeks better social conditions (Hobbs et al., 2010). If information architecture

practitioners aim to improve the wellbeing of human beings who are "living in information" (Arango, 2019), how will information architecture rise to the ethical, political, and systemic challenges of that work?

This chapter explores what it means to practice information architecture under *Anthropocene* conditions. The narrative of the Anthropocene is used here as a framing for information architecture and user experience practice to bring the ecologies of complex social and environmental problems into the area of concern for practitioners. The proposition of *information architecture in the Anthropocene* asks what configurations of values, practices, theories, and frameworks—what paradigms—might enable the field to operate responsibly in light of its complex interrelationships with these problems. To explore this challenge, this chapter applies a dual lens of *reflexivity* informed by a *systemic* epistemology. This approach draws from recent critiques in design and complements a range of discourses in science and technology studies (STS), human–computer interaction (HCI), and anthropology that emphasize the situatedness of the practitioner in a social, cultural, and political context, problematizing the traditional, Cartesian divisions between subject and object; process and outcome; designer and user and system (Suchman, 2002; Kimbell, 2012; Ingold, 2000; Escobar, 2018). The design or information architecture practitioner is not an outsider who intervenes in a system they wish to change, but an active participant whose behavior is shaped by personal, social, cultural, and political factors. To reconcile practice with broader systemic problems, practitioners and theorists must reflect upon how they are personally entangled with the objects of their work and the complex systems in which practice occurs. By bringing these ideas together with information architecture, I hope to broaden the conversation about what it might look like for information architecture and its practitioners to operate in a responsible, reflexive, and systemically aware way.

1.1 Limitations

Before continuing, I must acknowledge my own position and limitations as an author. As a Northeast US-based practitioner of information architecture and user experience design, my foundations are in mainstream, Western approaches to design thinking, design methods, interaction design, usability, and user experience. Although I have sought out alternative perspectives in Science and Technology

Studies and other fields, I work from an epistemically and socioeconomically privileged position from which many, though not all, of the "problems" discussed here are observed rather than lived. These problems hinge on power relationships, and their solutions must begin with approaches that center marginalized perspectives in understanding the world and its future—including feminist, indigenous, and other critical design scholarship that has already been exploring these issues for a long time. One version of this argument, along with a review of many such voices, is presented effectively in *Design Justice* by Sasha Costanza-Chock (2020). I cannot personally speak from marginalized perspectives in this chapter. Instead, I draw from critical approaches as much as possible while offering my own, situated interpretation of the challenges faced by information architecture practitioners.

2. Anthropocene Conditions

The original use of "Anthropocene" describes a new period in geological history characterized by extensive human influence on the Earth's atmosphere, geology, and ecosystems (Crutzen & Stoermer, 2000). Various markers for the Anthropocene have been proposed, including anthropogenic global warming and the testing and use of atomic weapons, which has left traces of radioactive material virtually everywhere on Earth (Zalasiewicz et al., 2015). While the formal scientific status and timeframe of the Anthropocene is under active debate, the Anthropocene functions as a "semantically and symbolically rich cognitive cultural model" that has been appropriated by theorists, environmentalists, journalists, and others (including me) across multiple fields and has acquired multiple meanings in framing feelings and ideas about the relationships between humans and nature (Strydom, 2016; Delanty & Mota, 2017). As it relates to design, a key theme in accounts of the Anthropocene is the role of designed technology and sociotechnical systems in ongoing ecological crises that threaten the stability of human civilization.

2.1 Design and Plastic Pollution

One such crisis—to begin with an example from the domain of tangible products—is the accumulation of *microplastics* and *nanoplastics* throughout the biosphere. Micro- and nanoplastics are small plastic particles which are the ultimate fate of any plastic material that breaks down due to use, erosion, or degradation. Between 1950 and 2015, an estimated 8300 million metric tons (Mt) of plastic were manufactured, 6300 Mt of plastic waste were generated, and 4900 Mt accumulated in landfills and the natural environment (Geyer et al., 2017). As of 2016, approximately 11% of all new plastic waste enters aquatic ecosystems (Borelle et al., 2020) leading to hundreds of millions of tons of accumulated microplastics and nanoplastics in the oceans (the true amount is unknown and seems to increase with each partial estimate, e.g. Pabortsava & Lampitt, 2020). This plastic pollution—plastic fragments, films, and filaments—has now been shown to be present at virtually every location and depth in the ocean (Jamieson et al., 2019); falling from the atmosphere onto remote mountaintops (Allen et al., 2019); displacing food in the stomachs of large and small marine creatures and seabirds (Cole et al., 2016); flowing from washing machines into wastewater treatment plants and natural water systems (Browne et al., 2011); and finally, in humans' own food, digestive systems, and lungs (Wright & Kelly, 2017).

Research on the consequences of this pollution is still emerging, with physical, chemical, and microbial hazards presented by chronic exposure to plastic particles in the lungs and digestive tract (Wright & Kelly, 2017), and hypothesized impacts on marine organism populations across ecosystems (Worm et al., 2017). The effects are more difficult to study as the particles get smaller, while the quantity is bound to increase as the production and disposal of new plastic accelerates each year (Borelle et al., 2020).

Plastic pollution is the product of complex social, material, biological, and technical arrangements: industrialized lifestyles that are organized around habitual use of plastic products; the availability and affordability of plastic for both manufacturers and consumers; a lack of alternatives to existing products, materials, supply chains, manufacturing systems, and waste management infrastructure; policies that affect those industries; and economic relationships that enable the largest consumers of plastic (e.g. the United States) to externalize the

environmental and social impacts of manufacturing, disposal, and recycling to others (e.g. China). Among the actors who produce these systemic behaviors, such as consumers, engineers, business owners, and policymakers, designers must be considered. Throughout the decades after plastics emerged as usable materials for consumer products in the 1920s, industrial designers helped to make plastic acceptable and desirable to American consumers, sought new applications for it, and promoted it to manufacturers as a material of choice (Meikle, 1995). Today, industrial designers make choices about how to use plastic and what products to make with it.

Today's designers may seek to create sustainable products with fewer environmental impacts, but this comes with practical and moral challenges. Consider the oft-repeated story about an IDEO designer who was walking on a beach and found an Oral-B toothbrush he had designed lying in the sand, washed up from the water, months after the product had launched (Brown, 2009, p. 194). A designer in this position might feel that structural forces—their inability to influence their employer or client, the lack of feasible technological alternatives, or the medical necessity of toothbrushes—preclude any possibility for intervention in such an assignment. The designer has inherited a complex of social and economic arrangements that demand a plastic toothbrush which will ultimately become plastic pollution. Yet the designer may feel responsible for participating and facilitating this perverse systemic outcome—not only toothbrushes on beaches, but the microplastics that we are all eating and breathing in. This exposes a "crisis of agency" for design:

> The Anthropocene is a critical time in terms of our understandings of human agency–or lack of it. What are the possibilities for 'rational or concerted action'? Just at the moment when we recognise our 'gargantuan agency' we also become aware of our limited capacity to do anything at all. (Tyszczuk, 2014)

Problems like plastic pollution are frequently characterized in design literature as *wicked problems* that are so complex and dynamic that they cannot clearly be defined, understood, or solved (Rittel & Webber, 1973). The concept of wicked problems has been used extensively in theory on design thinking, which has positioned design as a pragmatic response to the *indeterminacy* of such problems (Buchanan, 1992). It is not only large-scale social problems, but also everyday

design problems, that carry this indeterminacy and share the characteristics of wicked problems (Coyne, 2004). Of particular relevance to the framing of the Anthropocene in this chapter, Levin, Cashore, Bernstein, and Auld extend the idea of wicked problems to *super wicked problems*, adding four characteristic features:

> time is running out; those who cause the problem also seek to provide a solution; the central authority needed to address it is weak or non-existent; and, partly as a result, policy responses discount the future irrationally. (Levin et al., 2012)

Although the authors were commenting on policy interventions in climate change, these challenges are shared by design, which is often situated in an organizational context that limits project scope to items of immediate concern to the organization (Resmini & Lindenfalk, 2021); is placed in service of narrow, short-term goals that may disregard or perpetuate the status quo (Jones, 2008); and continues to contribute to the same problems it seeks to address.

2.2 Systemic Problems for Information Architecture

The tangible problem of plastic pollution is analogous to intangible problems for information architecture. In a society where digital information systems play a vast role in the organization of political and economic power, information architecture has social and environmental consequences. A product as simple as online billing for a power company might affect how much electricity customers consume by changing what feedback they receive about that usage via their bill, or whether they receive feedback at all.

Information architecture and user experience practitioners may find themselves working on products or services that contribute to unchecked consumerism by influencing purchasing behavior (Crocker, 2016); toxic pollution and human abuses resulting from production of materials needed to manufacture increasingly networked consumer products (Frankel, 2016); enormous amounts of electricity consumption and greenhouse gas emissions due to wireless network usage (Andrae & Edler, 2015); and gig economy platforms that benefit from economic disparities while reinforcing segregation of customers from the workers who experience the consequences (Campbell, 2019). Information systems enable the acceleration and

scaling of these outcomes while introducing their own sphere of sociopolitical concerns, ranging from the "automation of inequality" (Eubanks, 2018; O'Neil, 2016) to challenges to the quality of civic discourse (Tucker et al., 2018).

As the influence of digital information systems becomes deeper and more pervasive, Resmini and Lindenfalk contextualize the practice of information architecture within a set of "distinct cultural and socio-technical shifts" that they call the "postdigital condition" (Resmini & Lindenfalk, 2021):

> William J. Mitchell observed that "once there was a time and a place for everything; today, things are increasingly smeared across multiple sites and moments in complex and often indeterminate ways" (Mitchell 2004, p. 14)... [U]biquitous data access, smartphones, tablets, sensors, ambient appliances, smart environments and wearables have made computing a dominant part of the cultural and social zeitgeist (Kirby 2009; Floridi 2014). Phenomena such as convergence (Jenkins 2008) and digital transformation (Skog 2019) have blurred the distinction between products and services (Norman 2009; Resmini and Rosati 2009) and between producers and consumers (Tapscott and Williams 2010); the rise of an online read/write culture (Lessig 2008, p. 28; Cramer 2015) and the generational shift (Prensky 2001; Swingle 2016) have challenged the centrality of authorship and ownership (Sterling 2005); linearity is losing its sway to the rhizome (Deleuze & Guattari 1987).

The "smearing" of information resembles the proliferation of microplastics, chemical pollution, and nuclear traces that "blur the distinction" between producers and consumers, the technological and the social. Social problems in this interconnected, rhizomatic information society are Anthropocenic: They extend across large, entrenched sociopolitical/sociotechnical systems, and they carry a moral weight and crisis of agency for practitioners who are entangled with these preexisting systems. To find a way forward, we must identify forms of agency within these complex processes that simultaneously give information architecture so much power and limit our ability as individuals to intervene in the consequences.

2.3 Ontological Design as a Link Between Information Architecture and Social Systems

Fry argues that "structural unsustainability is an ontology, which means that causally and essentially the unsustainable has become elemental to existing and extending modernized human beings" (Fry, 2011, p. 23). While Fry links these ontological conditions—conditions of *being*—to design, thinkers in information architecture have argued that information architecture, too, operates at an ontological level. Hobbs and Fenn (2019) characterize "the semantic, structural logics present in IA ... as efforts of meaning-making [that create] contrived ontologies which are encoded into the artificial, human-made world as subjective, constructs of reality" (p. 746). They warn that our engagement with artificial information ecologies

> will be so immersive that it will in all likelihood radically transform [humanity's] social ontological understanding of the world... [W]e are likely to see certain sets of cultural norms (as contrived ontological ecologies) imposed upon other cultures...preferring one way of 'being' in the world over others. (p. 763)

They conclude that information architecture "can and will make its most significant contribution to ensuring socially sustainable ontological ecosystems" (p. 747).

Such assertions that acts of design (re)produce social reality, which can then be extended to information architecture, are best elaborated in the literature on ontological design(ing). Anne-Marie Willis (2006) summarizes the basic claims of the theory of ontological designing,

> that designing is fundamental to being human – we design, that is to say, we deliberate, plan and scheme in ways which prefigure our actions and makings – in turn we are designed by our designing and by that which we have designed (i.e., through our interactions with the structural and material specificities of our environments); that this adds up to a double movement – **we design our world, while our world acts back on us and designs us** [emphasis added]. (p. 70)

By way of Heidegger, Willis explains this double movement as a process of interpretation, or a hermeneutic circle, "in which knowledge comes to be inscribed" in a relationship with a tool, "modifying (designing) the being of the tool-user," who then "acts back upon the tool or the material being worked on" in a third act of interpretation (p. 73). She illustrates this with the example of the "familiar brick-shaped, tetrapak fruit juice box" and how it structures the activity of humans around it:

> A single serve juice box gathers fruit juices and packaging materials from different parts of the world; it also gathers a distribution and marketing infrastructure and a product image (which could be thought of as its designated, and crudely, inauthentic essence). It quenches thirst and nourishes ... its design inclines against sharing – you can't outpour from a single-serve juice box. It is designed for, and it designs individual consumption on the move. Its handy size, its built-in straw which ingeniously doubles as a piercing instrument, its spillproof design, all make it possible to have a drink away from the gathering places of eating and drinking – at your desk or walking along the street. The juice box (along with other kinds of packaged take-away food) designs eating and drinking as an individualised, rather than communal activity...
>
> The juice box on the office worker's desk sits within a totally desacralised, instrumentalised culture of convenience where a worker's productivity has nothing to do with soil, rain and the bounty of the gods, and everything to do with de-materialised output of electronic work and production, which has no place for the gathering of eating, only for the sustenance of working bodies which can be conveniently met by products like single-serve juice boxes.... [The juice box] designs activities and 'the use of time', allowing its users to do several things simultaneously – keep working at the desk, answer the phone, have lunch... [It] designs its casting aside without thought or concern and its temporal destination and semiotic fate as 'garbage'. The juice box designs modes of eating, sociality, work, and even of disposition. (pp. 79–80)

It is important to note that ontological designing does not mean that a professional designer predetermines the world of users. Many approaches in the philosophy of design and technology have demonstrated that function and meaning emerge in the

context of use (Vardouli, 2015); users are engaged in ontological designing as well as designers. Nor does this mean that designers can singlehandedly overturn the structural unsustainability of our built world, only that understanding the ontological character of design may inform one's approach to design (Willis, 2006, p. 82).

To extend this to information architecture, let us consider another consumer product which embodies an ontologically designing *information* structure that leads us back to the macro-level social issues discussed in the previous section—in this case, systemic racism, white supremacy, and photographic film in the twentieth century.

For much of the history of photographic film in the United States and beyond, film was engineered to capture the skin tones of white people. As shown by Lorna Roth, film and camera manufacturers gave little attention to the sensitivity of film to darker skin tones until the late twentieth century, when cultural and market pressures led to slow, incremental changes to photographic technologies. Illustrative of this history, "Shirley cards"—the color reference cards used in the photo printing process—exclusively showed photos of white women, reflecting gendered and racialized beauty standards in conjunction with the exclusion of dark skin (Roth, 2009). As a result, a photo of a Black person taken in this period might only show their teeth and the whites of their eyes against a dark, undifferentiated face. Syreeta McFadden writes a powerful account of her experience growing up as a Black child in a community where these photographic representations of Black people were commonplace. Linking these images to Western racial stereotypes, she describes the visual properties of these photos that play into a broader, ongoing system of prejudice:

> Our skin blown out in contrast from film technologies that overemphasize white skin and denigrate black skin. Our teeth and our eyes shimmer through the image, which in its turn become appropriated to imply this is how black people are, mimicked to fit some racialized nightmare that erases our humanity. (McFadden, 2014)

This is a persuasive example of a designed information structure shaping social reality, with destructive consequences: The informational properties of camera film inscribed a racial distinction that deeply shaped McFadden's lived experiences as a

child and, more broadly, reinforced cultural perceptions within a long history of Black exclusion in American film and media. What made this possible was the intentional engineering of this film for a presumed white subject—conditioned by, then conditioning, race relations in American society (Roth, 2009).

2.4 Information Architecture and Power

A wide body of research has examined how material and information technologies both embody social and political relations, whether these pertain to race, gender, (dis)ability, ethnicity, class, political and cultural hegemony, or colonialism. This is apparent in the multifarious history of encoded racism in photography. For example, Polaroid's ID photo system, the Polaroid ID-2, had a "boost button" that would increase the brightness of the flash; artist Adam Broomberg suggests this was designed precisely to compensate for light absorption by black skin (Smith, 2013). Notoriously, this camera was used during Apartheid in South Africa by government officials to take ID photos for the passbooks that the government used to limit the movement of black people around the country (Morgan, 2006). What might pass as an attempt at inclusive design was appropriated as a tool for control by an oppressive regime.

Encoded discrimination has been, for many years and still today, an ongoing problem with digital photography and facial recognition technology, from consumer products to surveillance used by law enforcement (Ogbonnaya-Ogburu et al., 2020). Like the biased algorithm and machine learning applications that have received much publicity in domains from human resources to law enforcement (O'Neil, 2016), facial recognition technologies have typically been less tested and are less accurate for non-white populations (Simonite, 2019), with serious consequences for marginalized and vulnerable populations who experience disproportionate surveillance, policing, and law enforcement violence (American Public Health Association, 2018). These examples echo McFadden's account in which photographic technology establishes who is seen and valued in a white-dominated society. But Julia Powles and Helen Nissenbaum remind us again that this is a problem of power, not just inclusion. In an article on bias in algorithms, they write: "Alleviating this problem by seeking to 'equalize' representation merely co-opts designers in perfecting vast instruments of surveillance and classification" (Powles & Nissenbaum, 2018). Technologies of control and

automation buttress existing power structures, and the consequences cannot be neutralized simply by encoding different information architecture structures in the product. Likewise, systems of categorization

> have been used historically as devices of control by some and resistance by others. That is, struggles over who defines agendas, interests, identities, and the like are expressed in part as contests over what systems of categorization will prevail. (Suchman, 1995, pp. 85–86; see also Suchman, 1993)

Nieusma sums it up: "Without direct intervention to the contrary, existing power relations usually, but not always, are reinforced by design decision making" (Nieusma, 2004). This occurs through several mechanisms. In the examples of photographic technology above, the outcomes were jointly determined by the creators of the technology (e.g. their assumptions and tacit racism [Roth, 2009]; Polaroid's choices about doing business in South Africa [Morgan, 2006]) and emergent processes in the context of use (e.g. South African passbooks; choices about how to use facial recognition technology). In any case, these information technologies are both shaped within, and come to reinforce, preexisting systems of power, segregation, and oppression. For a practitioner looking ahead to a new information architecture or design engagement, this raises questions about what power relations condition the current situation, who gets to make decisions, who is impacted, and what problems that may introduce or perpetuate.

We could think of this process of "reinforcing" or "intervention" as an area of ethical responsibility for practitioners, as well as a point of leverage that gives practitioners agency with respect to social issues. Our collective awareness of vast inequality, oppression, and unsustainability challenges us to consider our own role as individuals in reinforcing or intervening. Those who have the privilege of practicing design or information architecture professionally are in positions of power, however circumscribed, to establish "contrived ontologies" that will structure the lived experiences of others, sometimes in unexpected ways, at a large scale, over long periods of time, and in faraway places—which, in the Anthropocene, are never so far away. Yet we must also find the humility to know that we cannot overturn system-wide power structures singlehandedly. Contrary to popular narratives that design can "change the world," technology professionals cannot achieve sweeping cultural and institutional changes through design alone. An intermediate view is that practitioners participate, to varying degrees, in

processes of change. The transformation of design and technology is an insufficient but necessary component of broader transformation toward sustainable society (Fry, 2011).

2.5 Moving Toward a Reflexive and Systemic Practice

Let us return to the framing of information architecture in response to Anthropocene-like challenges. The preceding case studies show how the primary focus of information architecture—the design of information environments—is both implicated in and shaped by social and ecological conditions. Meanwhile, information architecture practitioners are situated as active participants in those conditions as they persist or change. This differs from dominant constructions of technology design as a process in which a solution is created *for* certain users and a context of use, or as an *intervention* in a system from the outside (albeit with user research, empathy-building, or participatory design activities that add perspectives but usually do not challenge the practitioners' objectivity). On the contrary, the outcomes of design are shaped by sociopolitical relations that cross the boundaries between the *context of design* and the context of use. Here, the systems targeted for intervention *include* practitioners—their actions, values, and beliefs; the design/IA processes and methods used; and the institutional context where the work takes place. This entire ecology is part of the "information architecture" that structures human experiences.

This redrawn problem space demands reflexivity on the part of practitioners. To be reflexive means one is aware of the specificity of the perceptions, values, beliefs, practices, and philosophies that one brings to one's work, and how they shape, legitimate, and constrain one's work, with consequences for users and stakeholders. For information architecture practice, it also involves an awareness of the ways in which one's tacit perceptions, values, worldviews, etc, become inscribed in the "contrived ontologies" and artifacts one produces. This process, viewed through a systemic lens, intersects with multiple levels of personal, social, institutional, societal, and environmental systems that matter to the work we do and the products we create. To be reflexive and systems-aware in this way means realizing that, as human beings, virtually all of us have grown up, learned, and become ourselves within environments structured by systems of unsustainability,

exclusion, and oppression. We embody these ontologies and bring them to our work until we gradually develop the capacity to change them.

I propose *reflexivity*, informed by a *systemic epistemology*, as an explicit theme in the research and practice agenda for information architecture, and a core attribute of the discipline that should be acknowledged, deepened, or introduced where it is missing. Although these orientations have extensive roots in the social sciences and systems sciences, they are not often embodied by mainstream design and information architecture practice apart from approaches that are academically driven or otherwise sit outside the dominant paradigms in industry. For example, industry interpretations of design thinking have been critiqued for a lack of reflexivity (Kimbell, 2011). In contrast, reflexivity is exhibited in less widely adopted approaches to values, ethics, and equity in design (e.g. Friedman & Hendry, 2019; Creative Reaction Lab, 2018; Castillo et al., 2020) that explicitly ask practitioners to identify and reflect upon the values, beliefs, politics, and personal limitations they bring to their work. Similarly, systemics (systems thinking, theories, and practices) have been adopted in limited contexts within mainstream design, albeit with increasing popularity. In IA, they have provided a central thread in the contemporary shift toward themes such as information ecosystems (Resmini & Rosati, 2011) and the cognitive, social, and organizational systems affecting information architecture (Morville, 2011, 2014). Exemplifying the shift to systemic approaches, Resmini and Lindenfalk articulate systemics as a paradigmatic foundation for information architecture theory: "To capture critical systemic aspects now part of the design space (...) (it is necessary to) thoroughly reconceptualize the object of design," which "is not a tangible, finished, individual artifact, but rather the volatile actor-instantiated spaces of relationships between artifacts" in an ecosystem (Resmini & Lindenfalk, 2021).

I affirm this proposal but insist that it go even further: the ecosystem and "object of design" being reconceptualized here include not only users and artifacts, but also the practitioners, practices, and organizations that produce information products and services (Kimbell, 2012). This information architecture of this ecosystem both structures and is structured by the professional activity of information architecture itself. This position is both practical and theoretical: It means that practitioners give attention to their context, selves, and their relationship to design outcomes, and theorists (while being reflexive themselves) conceptualize practitioners as part

of the information architectures being considered. While it should not be construed as an egocentric version of information architecture that privileges a professional practitioner over other agents, this reflexive move enables reflection on the practitioner's situation, agency, responsibility, and limitations within the systems targeted for design intervention. It means that practitioners, and their organizations, are part of the design problem and must transform in the search for solutions. Without this move, it is impossible for the theorists and practitioners of information architecture to account for their deep involvement in the social conditions they wish to improve through their work.

3. Three Proposals for Information Architecture in the Anthropocene

Information architecture in the Anthropocene is a speculative framing that asks what kinds of paradigms, theories, and practices (Lacerda & Lima-Marques, 2014) might enable information architecture to respond to Anthropocene conditions, today and in the future. I have highlighted reflexive and systemic orientations as core attributes of theory and practice that acknowledge information architecture's complex involvement and responsibility within broader social and ecological processes.

To take a self-aware and systems-aware approach, with sustainability and justice as guiding values, suggests that information architecture should develop in a pluralistic and emergent way. It should encompass a wide range of perspectives—especially those that are marginalized within an unsustainable and unjust status quo (Costanza-Chock, 2020). While I cannot speak from those perspectives, I hope to use my partial view of *information architecture in the Anthropocene* to provoke dialogue within my own community of practice and open a space for imagining what alternative forms of information architecture might look like.

As prompts for further conversation, the remainder of this chapter offers three proposals about how information architecture in the Anthropocene might extend its reflexivity within a systemic epistemology, toward a more responsible practice.

3.1 Information Architecture as a Developmental Process

The idea that the information architecture discipline holds responsibility for its social outcomes sits in tension with the indeterminacy—and uncontrollability—of the sociotechnical arrangements that actually emerge in practice. How can we conceptualize a systemic "information architecture"? On one hand, information architecture has traditionally focused on the planning, creation, organization, management, and evaluation of information for human use. Information architecture uses techniques including modeling, mapping, diagramming, prototyping, and specification in order to solve information problems and design the structure of information-based products and services.

On the other hand, these structures are never truly specified by professional individuals or teams—the products or service development lifecycle is a social and political one, distributed across many actors and groups within an organization. Organizational structures, information flows, incentives, values and beliefs, points of view, personalities, and external forces all shape the decisions made about a product/service and how it is delivered. Development, marketing, sales, customer support, and other functions influence the informational experience of external actors and who those actors are. The production of "information architecture," such as the political negotiation of categories described by Suchman (1995), may play out through negotiation and revision of information architecture and design artifacts (maps, prototypes, specifications), or it may bypass the "designer" in the form of changes made directly to documents, software code, policies, operational programs, or communication channels controlled by different parts of the organization. Information architecture expertise may enjoy a degree of status and credibility in the organization, or it may be ignored entirely.

Ultimately, it is not only design or information practitioners, but the entire organization that provides the conceptual structures, knowledge, values, preferences, and actions that become inscribed in—or Bruno Latour's terms, "delegated" to—material and digital products (Latour, 1992; Willis, 2006; Friedman & Hendry, 2019). As discussed earlier, processes of design, interpretation, and negotiation then continue in future contexts outside the organization. From a systems point of view, the direct, first-order design techniques of research, modeling, prototyping, etc., are insufficient to account for information

architecture as the (re)production of ontological structures across environments and levels of system scale.

We can look to process-relational approaches to help us account for information architecture as a distributed sociopolitical phenomenon without removing the agency of individual practitioners. Processual and relational approaches include a variety of philosophical, theoretical, and methodological approaches that view the world as constituted by ongoing processes and dynamic relations between things; these processes and relations are the primary units of analysis (e.g. Mesle, 2008; Emirbayer, 1997). This aligns with Kimbell's call for an approach that

> helps researchers see design as a situated, local accomplishment involving diverse and multiple actors. (...) (A)cknowledges the roles of objects in constituting practices (...) (and) de-centers the designer as the main agent in designing. (Kimbell, 2012, p. 129)

Kimbell achieves this by applying *theories of practice* to the phenomenon of design. This allows us to "switch the unit of analysis from individual actors or society and its norms, to a messy, contingent combination of minds, things, bodies, structures, processes, and agencies" (Kimbell, 2012, p. 141). Within this analysis, the capacities and effects of individual practitioners can be revisited.

While Kimbell uses theories of practice as one tool to rethink design, I suggest biological theory—in particular, *developmental systems theory*—as a key resource to rethink the *structures* that information architecture is concerned with in terms of the messy, contingent processes that produce them. In his anthropological studies of making, Tim Ingold (2000) shows us the connection between biological and technological development: "Artefacts not only grow, but they also evolve as they are reproduced repeatedly and are changed in the process of reproduction" (p. 340). He writes that artifacts are not replicated from designs or blueprints, but they *develop* in an environment:

> Where plans or blueprints exist, as they often do in the fields of architecture and engineering, they are generated within the same, environmentally situated process from which also emerge the forms they are said to specify. But they may not exist at all. (Ingold, 2000, p. 372)

An artifact grows through a process of autopoiesis,

> the self-transformation over time of the system of relations within which an organism or artefact comes into being. (...) The artefact, in short, is a crystallisation of activity within a relational field. (Ingold, 2000, p. 345)

This is an apt description of the system development lifecycle. An artifact, product, service, structure, or any other "object of design" emerges within the context of an organization, over time, bearing the cognitive and social imprints of the activities around it.

To make this relevant to information architecture in the Anthropocene, we might ask how, in a developmental process, semantic, social, and political relations are conferred by the organization to its products (and later to the environments of external actors); how day to day activities relate to macro-level societal processes; and where agency or control resides, if not with design and information architecture practitioners. These questions mirror fundamental problems in evolutionary and developmental biology: how traits are conferred between generations, how biological processes relate to cultural processes, and what controls the development of an organism. *Developmental systems theory* (DST), as articulated by Oyama et al. (2001), and its extensions to *scaffolding* articulated by Caporael et al. (2013), are part of an ongoing movement in evolutionary theory that has emerged in response to dominant, gene-centered approaches to evolution and development. Scholars associated with DST have argued that a "gene's eye view" of evolution, which treats genes as a "specification" or "blueprint" for a biological organism, has failed to account for human development, social behavior, and human culture. Meanwhile, it has been used to maintain unchallenged narratives about human nature, such as that of the rational economic individual who engages in social behavior only in their own Machiavellian self-interest, or the dichotomy between humans and the natural environment that they are seen to dominate. Instead, DST offers process-oriented frameworks to analyze inheritance, development, and evolution across multiple levels, from the molecular to the cultural, without privileging one type of causal agent. DST shows how genes, bodies, sociality, culture, and environment have co-evolved in complex, nonlinear ways, with *distributed control* by many agents across different levels of scale (Oyama et al., 2001; Caporael et al., 2013).

DST and scaffolding represent robust bodies of work across biology, environmental science, social theory, and anthropology that offer many lessons for

design and information architecture, which cannot be fully explored here. As a starting place, let us consider the following themes and the questions they raise for information architecture:

1. **Heterogeneous resources in development**. Organisms inherit not only genes, but many other types of resources from generation to generation, including cellular material, nutrition, other material resources, the activities of parents and other individuals, and culture. Caporael's *repeated assembly* describes "recurrent entity-environment relations composed of hierarchically organized, heterogeneous components having different frequencies and scales of replication" (Caporael et al., 2013, p. 11). DST emphasizes "Joint determination by multiple causes—every trait is produced by the interaction of many developmental resources" (Oyama et al., 2001, p. 2). Similarly, in design, blueprints and design deliverables are only one set of resources used in the construction of products, and they themselves are constructed in the social environment of the organization. Returning to Ingold's (2000) "crystallisation of activity", many other kinds of relations—power relations, categories, information flows, value exchanges—may be inherited from the organization. *In information architecture, what kinds of semantic or ontological traits are inherited from the organization, with downstream consequences? What tools, resources, and artifacts are generated and used by the organization? How and where are "information structures" materially or behaviorally embodied as they are reproduced and transformed throughout the product development process?*

2. **Organism–environment relations.** DST challenges the traditional nature/nurture dichotomy in which organism and environment "interact" with or "shape" each other while remaining ontologically separate. For example, many animals construct their own environments in significant ways, thus shaping their own phenotypic and genetic evolution (Laland et al., 2001). Organism and environment coevolve, each constituting and forming a part of the other. For information architecture, the organization can be seen as both the environment for a developing product, and as an entity within a larger environment. *How does an organization itself change in the process of developing a product? How does the "external" environment (market, society,*

etc.*) change? Does this offer benefits or challenges for information architecture? Could it be used strategically (Hill, 2012)?*

3. **Scaffolding**. Scaffolding is both a noun and a verb. A scaffold is a temporary structure that either falls away or becomes assimilated into the scaffolded organism or structure. By providing support that the organism does not have by itself, it *scaffolds* the development of activities and capabilities that would not otherwise be possible without the scaffold. For organisms and people, scaffolding may take the form of artifacts, infrastructure, or other agents (Caporael et al., 2013). In design and information architecture, practitioners scaffold the organization's development of products/services as well as its own capacity-building in design. The organization also scaffolds the practitioner's daily work and enculturation as an employee by providing artifacts, tools, information resources, and cultural resources. The organization scaffolds the development of products and services. Those products scaffold the activities and development of their users. *What capabilities of the organization provide scaffolding that makes certain outcomes possible or likely for information architecture? What kinds of scaffolding does information architecture need? How does information architecture provide scaffolding to the organization?*

4. **Time and sequence**. Development is not a uniform process of growth. The interactions, resources, scaffolding, and developmental changes occurring at one stage differ from those at another. Wimsatt's principle of *generative entrenchment* asserts that "items that are reproduced and repeatedly assembled can become entrenched early in a system and are thereby available to serve as scaffolding for later items, as a platform or as a constraint" (Caporael et al., 2013, p. 2). Entrenched components lead to qualities or behaviors that are more stable than others, and they "acquire downstream dependencies" (Caporael et al., 2013, p. 2) that make it more difficult for the previously integrated elements to change. Together, scaffolding and generative entrenchment describe "pathways by which features of environments *become* features of systems" (Caporael et al., 2013, p. 367). In an organization, behaviors occurring early in the product/service lifecycle may acquire dependencies, and entrenchment continues even in contradiction of overwhelming feedback from experts or customers. *What stages does "information architecture" go through over the course of development? What*

features of the organization—e.g. funding sources, influential stakeholders, technological platforms, data assets, sales pathways, cultural assumptions, routines—lead to entrenched information architecture relationships that are difficult to change? When is that desirable or undesirable? Could that be used strategically (Hill, 2012)?

These themes help us interpret the distributed process of development in an organization. In contrast to an "information architecture" that is generated anew by a practitioner team, the architecture of a product or service comes from many sources, is embodied in multiple ways, and moves through multiple developmental stages as features are added, modified, incorporated, removed, or entrenched along the way.

When information architecture is viewed as a developmental process, information architecture practitioners may begin to examine this process as part of the research, sensemaking, and mapping that already characterize the discipline. This might describe a new type of information architecture practitioner that in some ways resembles a sociologist or anthropologist within the organization. Could information architecture practitioners play a role as researchers, interpreters, and storytellers of the organization's behavior and its ontological consequences? Could they identify new areas of engagement in order to affect information architecture outcomes? Could their insights be leveraged to direct the organization's activities toward more just, inclusive, and sustainable outcomes?

3.2 Information Architecture as Ethical Practice

Responsible practice means struggling with ethical questions: What should I do here? What are my obligations? What can I do that will have the best outcomes for others? In a processual mode, I characterize ethical practice not as the application of ethical rules or procedures, but a process which is ongoing, personal, social, reflective, inclusive, pluralistic, dialogic, agonistic, and contextual. Ethical problems in complex systems are never thoroughly solved. Solutions are approached through ongoing questioning, learning, rethinking, and imperfect decisions along the way. This is also a perpetual process of self-understanding, coming to recognize one's own beliefs, values, and partial perspective in a complex world.

Ethical design practice relies not on detached scientific study of users and systems, but "moral engagement" (Findeli, 1994). While the developmental systems approach breaks down the dichotomy between organization and product, ethical practice breaks down the boundary between practitioner and user. In the words of Lucy Suchman (2002), "we need to begin by problematizing the terms 'designer' and 'user' and reconstructing relevant social relations that cross the boundaries between them" (p. 94).

Suchman (2002) observes that Western approaches to technological production are commonly informed by an unchallenged "myth of the lone creator of new technology on the one hand, and the passive recipients of new technology on the other," underwritten by a "simple designer/user opposition" (p. 93). On the contrary, "recent research on the actual work involved in putting technologies into use highlights the mundane forms of inventive yet taken for granted labor, hidden in the background, that are necessary to the success of complex sociotechnical arrangements" (Suchman, 2009, p. 1). Drawing on feminist critiques of objectivity, she describes a culture of design that, "by losing track of the social mediations of technical production, supports the impossibility of specifically locating responsibility for it" (Suchman, 2002, p. 93). She writes:

> A recurring question for me as a participant in discussions on design is "Who is doing what to whom here?" Within prevailing discourses anonymous and unlocatable designers, with a license afforded by their professional training, problematise the world in such a way as to make themselves indispensable to it and then discuss their obligation to intervene, in order to deliver technological solutions to equally decontextualized and consequently unlocatable users. This stance of design from nowhere is closely tied to the goal of construing technical systems as commodities that can be stabilized and cut loose from the sites of their production long enough to be exported en masse to the sites of their use. (Suchman, 2002, p. 95)

She adds:

> On the contrary, it is precisely the fact that our vision of the world is a vision from somewhere—that it is inextricably based in an embodied, and therefore partial, perspective—which makes us personally responsible for it. (...) (T)he only possibility for the creation of effective objects is through collective

> knowledge of the particular and multiple locations of their production and use. (Suchman, 2002, p. 96)

Suchman resolves this with "a shift from a view of objective knowledge as a single, asituated, master perspective that bases its claims to objectivity in the closure of controversy, to multiple, located, partial perspectives that find their objective character through ongoing processes of debate" (2002, p. 93). In a complementary view, Fenn and Hobbs (2015) argue that because wicked problems exist "at the intersection of many possible points of views held by a variety of potential stakeholders," *wicked ethics* involves ethical pluralism across the many (possibly conflicting) stakeholder perspectives in a system as well as perspectives from across the extended contexts and time scales of sociotechnical change. Thus, responsible practice involves recognizing one's own subjectivity and partial knowledge of complex situations, the active role of others' subjective knowledge, and pluralistic debate as a core process within design.

The designer–user relationship intersects with multiple, asymmetrical power relations that raise complex ethical questions. For example, personal, sociopolitical, economic, and institutional power relations are at play when a white, privileged, male designer is working for a profit-driven corporation that has a large market share and mass-produces a product that will be purchased by customers across many racial and socioeconomic groups. In this situation, the practitioner cannot neutralize this asymmetry, but they can interrogate its role in design.

One place in which these power relations manifest is in the way practitioners construct "the user." For example, Villamil (2020) identifies a "deficiency model of user behavior" operating in design projects that focus on behavior change, particularly those targeting people of color, low income, or other marginalized groups. In this model, users are seen as "uninformed, unskilled, distrustful, disorderly, undisciplined, irresponsible, etc." (Villamil, 2020). Perceived unhealthy behaviors are attributed to "individual and cultural failings" that must be addressed through behavioral interventions such as education, as opposed to structural inequities that create conditions where those behaviors are necessary (Villamil, 2020). Another common model in design is the notion that "users don't know what they want," therefore, users cannot speak for themselves. This meshes with user research methodologies that are seen as more or less valid ways to bring the user's

point of view into technology development. A step further, Steve Woolgar's (1997) ethnographic study of the practice of usability testing observed how the design and testing process "configures the user"—defines "the user," establishes parameters for user action, and brings users into a "correct" pattern of interaction with a product. Designer–user relations such as these deserve examination as mechanisms for power relations to play out in technology production. In addition to the words *designer* and *user*, we might reflect on relational metaphors such as *helping*, *care*, *intervention*, *facilitation*, *service*, *contract*, or roles like *client*, *customer*, *expert*, *advocate*, *producer*, *storyteller*, and the advantages or disadvantages each may have in structuring equitable partnerships between the participants in a design process (Nelson & Stolterman, 2012, p. 47).

Finally, like the development process itself, ethical problems are distributed across institutions and social systems, and they cannot be solved by changing design practices alone. Practitioners must make difficult decisions about what to do and what not to do, when to choose personal sacrifices or self-care, when to engage in politics, and whether to do so through direct engagement or subversion (Wendt, 2017). These are all personal and context-specific decisions.

These are only a few considerations that result from a processual and relational approach to responsible practice. Practitioners can learn a great deal from philosophy of ethics (Bowles, 2018) and design scholarship related to gender, race, colonialism, participation, and other alternative design approaches (e.g. Nieusma, 2004; Irani et al., 2010; Tunstall, 2013; Escobar, 2018; Costanza-Chock, 2020; Ogbonnaya-Ogburu et al., 2020). These resources prompt information architecture, as a form of design, to ask *Who is doing what to whom here?* and to challenge the power relationships that are supported by information architecture practices.

3.3 Information Architecture as a Network

After this inward look at practice, let us end by looking outward at the communities and social networks of information architecture. What does responsible information architecture look like at the community level?

In relation to Anthropocene conditions, it is not through individual action, but through collective action, that lasting change occurs. Therefore, information

architecture cannot be an individualistic practice, but must form collective responses to social problems. Similarly, the distributed nature of Anthropocene problems requires solutions to be reached through radical political inclusion and collaboration across areas of knowledge and expertise. To function in the Anthropocene, information architecture cannot succeed as an insular discipline, and it must participate in cross-disciplinary change.

Information architecture exists largely in the form of communities of practice (Hobbs et al., 2010). In the United States, the explicit narrative of "the information architecture community" strongly shapes the identity of events, conferences, and conference-goers. While all communities necessarily engage in discussion about what is *in* or *out* in order to establish shared identity, a lack of reflexivity in this process may undermine the success of the field. First, the narrative of "the community" precludes a pluralistic interpretation of what "communities" might exist. In other words, the North American community is not the only community of information architecture practice (IA Roundtable, 2019). Second, the way boundaries are established may either support or hinder cross-disciplinary collaboration on systemic problems that cut across the formal boundaries between fields. Third, "the community" fails to distinguish between the temporary social networks that currently exist, and what Jason Hobbs suggests we frame as a *field* that includes many types of practices and interpretations, and "should pursue an authentic agenda of global, cultural and social inclusion without fear or favour towards any majority" (Hobbs, 2019; Hobbs et al., 2010). If information architecture is framed this way, what new kinds of practices and practitioners might we have?

Cultures share origin myths that, according to Jim Malazita, "do at least the following vital kinds of cultural sensemaking work":

- Origin work: where are we from, when did we begin?
- Identity work: who are "we," and who are "other?"
- Normative work: how should we act?
- Proscriptive work: where are we meant to go? (Malazita, 2018).

Origin myths are indeed vital, but they also represent partial perspectives. By reflecting upon what myths are at work, what is left out or suppressed, and what

alternatives are possible, information architecture communities might avoid the mistakes of Western design in the twentieth century.

To conclude, we might reframe the function of information architecture communities: not only to support individuals applying skills, but to scaffold collective action within and across disciplines toward the transformation of our shared cultures of technology production, and of ourselves.

4. Conclusion

The idea of the Anthropocene represents the knowledge that human experience in the world is inseparable from broad, interconnected ecologies of social, political, technological, biological, and meteorological processes, and the challenges to justice and sustainability that they entail. It also represents a belief that, as humans, we have powerful, albeit dangerous, collective agency within these ecologies, and therefore a moral responsibility for our relationships with them. This chapter inquires into what developments in information architecture theory and practice might enable the field to respond adequately to the complexity and breadth of systemic challenges in which information architecture already plays an active role.

This chapter explored the character of Anthropocene problems that are distributed across, and entrenched in, multiple levels of social, political, and technological structure. An analogy was drawn between ecological and social problems, both of which implicate design and information architecture in the histories and the ongoing maintenance of undesirable and unsustainable system behaviors. This presents a moral urgency and a crisis of agency for practitioners who wish to improve these conditions. The link between these issues and the practice of design and information architecture was framed in terms of the reproduction or modification of power relations through design and the *ontological designing* of modes of being and acting in the world. As a result, the central insight is that information architecture theory and practice must take a systemic and reflexive approach that includes practitioners, and their social and institutional contexts, within the systems that produce and reproduce the outcomes and experiences with which information architecture is primarily concerned.

Finally, with this reflexive orientation, three rough proposals were offered as examples of approaches that might factor into information architecture in the Anthropocene: developmental systems, ethical practice, and collective change. A developmental systems perspective views the design of information environments as a situated, relational process within and beyond an institution. Taking cues from social and biological theories that break down the dualisms of subject and object, specification and structure, organism and environment, inside and outside, and so forth, this framework approaches information architecture as a socially and materially distributed process of development and change. Similarly, an ethical practice perspective crosses the boundary between practitioner and user, prompting moral engagement and a reflective, dialogic habit that values pluralism and an interrogation of power relationships. Through the lens of social networks and collective change, information architecture communities of practice are challenged to reconsider community boundaries and focus on collective engagement as a core function of our communities.

Through these ideas, I hope to broaden the conversation about responsible information architecture, urge my colleagues to consider the limitations of the ways in which we frame information architecture, and ask what kind of *information architecture* we will embody in our changing and precarious world.

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