

Notes

Preface

1. Critical Art Ensemble 2008; Costanza-Chock 2014; Dizikes 2014; Jenkins et al. 2016.

Introduction

1. See alliedmedia.org.
2. For a recent discussion of the increasingly widespread use of the term trans* with an asterisk, see Halberstam 2018.
3. Sadat 2005.
4. Schneier 2006.
5. Despite my participation in social movement networks, including the global justice movement, Indymedia, the immigrant rights movement, countersurveillance work, and more, my white skin, institutional affiliations, educational background, and US citizenship have largely protected me from the most egregious types of abuse by state power.
6. Costello 2016.
7. Irani 2016; Dyer-Witheford 2016; and Gray and Suri 2019.
8. See <https://www.tsa.gov/transgender-passengers>.
9. Winner 1980.
10. As Anna Lauren Hoffmann notes about the simplified gender binary interface, “The thing that really gets me is that this screen was developed as a privacy-preserving compromise after folks realized the level of detail these machines were *actually* capable of rendering!” Twitter, September 3, 2018, <https://twitter.com/annaeveryday/status/1036635912761819136>.

11. In 2009, Toby Beauchamp wrote about state surveillance and trans* concealment/visibility (Beauchamp 2009). In September of 2016, Shadi Petosky brought national attention to the challenges of #TravelingWhileTrans when she live-tweeted her experience with an invasive search by TSA agents at the Orlando airport, after she was flagged in a millimeter wave scan for presenting as female while having a penis. See Lee 2016.

12. See <https://www.propublica.org/article/tsa-not-discriminating-against-black-women-but-their-body-scanners-might-be>.

13. Browne 2015.

14. Buolamwini 2017.

15. Throughout this book I use the identity-first term “Disabled people” rather than the people-first term “people with disabilities” because design justice is more closely aligned with a social/relational disability justice analysis than with the individual/medical model of disability. For more, explore Piepzna-Samarasinha 2018.

16. Ito 2017.

17. The seeds for this gathering were planted in 2015 at the Future Design Lab at AMC, itself inspired by the Discovering Technology events, or DiscoTechs, organized by the Detroit Digital Justice Coalition. See <https://www.alliedmedia.org/ddjc/discotech>.

18. The authors of the first version of the Design Justice Network Principles are Una Lee, Jenny Lee, Melissa Moore, Wesley Taylor, Shauen Pearce, Ginger Brooks Takahashi, Ebony Dumas, Heather Posten, Kristyn Sonnenberg, Sam Holleran, Ryan Hayes, Dan Herrle, Dawn Walker, Tina Hanaé Miller, Nikki Roach, Aylwin Lo, Noelle Barber, Kiwi Illafonte, Devon De Lená, Ash Arder, Brooke Toczykowski, Kristina Miller, Nancy Meza, Becca Budde, Marina Csomor, Paige Reitz, Leslie Stem, Walter Wilson, Gina Reichert, and Danny Spitzberg. The designjusticenetwork.org website includes blog posts that further describe the origins of the network; for example, to learn more about the first workshop at AMC, see <http://designjusticenetwork.org/blog/2016/generating-shared-principles>.

19. The Design Justice Network Principles and list of signatories are available at <http://designjusticenetwork.org/network-principles>.

20. The Design Justice Network has been built through the hard work of many, many people over the past several years. It would be difficult to list every individual, group, and community here. Many additional track coordinators are named in the acknowledgments at the beginning of this book, and can be found in the Allied Media Conference program books and on the Design Justice Network website.

21. See <https://www.alliedmedia.org/amc/previous-years>.

22. See <https://www.andalsotoo.net>.
23. And Also Too is known for projects such as graphic design with the Feathers of Hope First Nations Youth Action Plan; an infant feeding resource with HIV positive mothers with CATIE, the Teresa Group, and Women's College Hospital; and Contratados.org, a resource for migrant workers, with Research Action Design, Studio REV-, and the Centro de los Derechos del Migrante; among many other projects.
24. I was a co-founder of RAD.
25. See [EquityXDesign](http://EquityXDesign.com) 2016.
26. See <https://idrc.ocadu.ca/about-the-idrc>.
27. For more information explore <https://www.civicdesigner.com>, see also McDowell and Chinchilla 2016.
28. Chardonnet 2015.
29. For a list of people and organizations who have signed the Design Justice Principles, see <http://designjusticenetwork.org>. For expanded lists of organizations, networks, and projects working in this space, see <https://morethanocode.cc> and also <https://www.ruhabenjamin.com/resources>.
30. See Harding 2004 for an edited volume that brings together key scholars of standpoint theory including Dorothy Smith, Donna Haraway, Patricia Hill Collins, Nancy Hartsock and Hilary Rose.
31. Jobin-Leeds and AgitArte 2016; see also <https://agitarte.org>.
32. Downing 2003; Halleck 2003; and Kidd 2013.
33. See <https://archive.org/search.php?query=indymedia>.
34. See <https://www.alliedmedia.org>.
35. VozMob Project 2011.
36. Lewin 1946; Dewey 1933; Freire 1972; Fals-Borda 1987; and Smith 2013.
37. Costanza-Chock et al. 2018; see also <https://morethanocode.cc>.
38. For the *Oxford English Dictionary* definition, see <https://www.lexico.com/en/definition/design>. See also the *Merriam-Webster Dictionary*: "Design (transitive verb): to create, fashion, execute, or construct according to plan," <https://www.merriam-webster.com/dictionary/design>.
39. Hoffman, Roesler, and Moon 2004.
40. Furniture designer Charles Eames said that design is "a plan for arranging elements in such a way as to best accomplish a particular purpose." Quoted in Neuhart et al. 1989.

41. In the original, Papanek says, "All men are designers."
42. Papanek 1974, 17.
43. In his 2010 book, *Design as Politics*, Fry also specifies at least three separate meanings of *design* that are often conflated: first, the design object; second, the design process; and third, the design agent, which may be an individual designer, a design firm, or an array of people and sociotechnical processes (what Latour might call an *actor-network*) that engages in design activities. See Fry 2010.
44. Willis 2006, 80.
45. Dalla Costa and James 1972.
46. Shetterly 2017.
47. Von Hippel 2005.
48. See <https://www.aiga.org>.
49. See <https://www.access-board.gov>.
50. Hoffman, Roesler, and Moon 2004, 89.
51. Hoffman, Roesler, and Moon 2004, 89.
52. Aliseda 2006.
53. Schön 1987.
54. DiSalvo and Lukens 2009.
55. Escobar 2018, 21.
56. Srinivasan 2017.
57. Hernández-Ramírez 2018.
58. Irani 2018.
59. See Natasha Jen's talk at <https://99u.adobe.com/videos/55967/natasha-jen-design-thinking-is-bullshit>.
60. Benjamin 2019a.
61. Truth 1995 (originally published in 1851); Jones, cited in Davies 2007; Combahee River Collective 1983 (originally published in 1977).
62. Crenshaw 1989.
63. Crenshaw 1989, 144.
64. Crenshaw 1989, 149.
65. Crenshaw 1991.

66. In that article, Crenshaw also goes on to describe structural, political, and representational intersectionality.
67. Crenshaw 1989, 140.
68. Buolamwini and Gebru 2018.
69. Collins 2002.
70. Collins 2002, 229.
71. Collins 2002, 223.
72. Angwin and Grassegger, 2017.
73. Gillespie 2018.
74. Harwell and Miroff 2018.
75. Segarra and Johnson 2017.
76. Collins 2002, 234.
77. Gibson 1979.
78. Friedman 1997.
79. Wajcman 2010.
80. Charlton 1998.
81. Von Hippel 2005; Schuler and Namioka 1993; and Bardzell 2010.
82. Siles 2013.
83. Downing 2000.
84. Maxigas 2012.
85. Irani 2015.
86. See <https://codesign.mit.edu>.
87. Allied Media Projects n.d.

1 Design Values

1. See <https://logicmag.io/03-dont-be-evil>.
2. Tweet by Imani Gandy (@AngryBlackLady), September 29, 2014, <https://twitter.com/AngryBlackLady/status/516604901883797505>.
3. Trans and Queer Liberation + Immigrant Solidarity Protest announcement; see <https://www.facebook.com/events/392408787772958>.

4. Tufekci 2017.
5. Gerbaudo 2012.
6. Srinivasan 2017.
7. Bailey, Foucault Welles, and Jackson 2019.
8. Treré 2012; Cammaerts 2015; and Renzi 2015. See also work by Veronica Barassi (2013) and Robert Gehl (2015), among others.
9. Gerbaudo 2012; Adamoli 2012, 1888.
10. For example, see Salsa Labs (<https://www.salsalabs.com/blog/practical-steps-engage-supporters>); for Arnstein's concept of the "ladder of participation," see Arnstein 1969.
11. De Vogue, Mallonee, and Grinberg 2017.
12. Interaction Design Foundation, "Affordances," 2019, retrieved June 11, 2019, from <https://www.interaction-design.org/literature/topics/affordances>.
13. Gibson 1979, 127.
14. Gaver 1991.
15. Norman 2006.
16. Norman 2006, 9.
17. Norman 2006, 216.
18. Norman 2006, 6.
19. Norman 2006, 162.
20. See the Union of the Physically Impaired Against Segregation 1975 and Oliver 2013.
21. For a brilliant recent overview of disability justice, see Piepzna-Samarasinha 2018.
22. Norman 2006, 219–220 and 229, respectively.
23. Gaver 1991, 81.
24. Wittkower notes that disaffordances have been little discussed in design literature but traces the concept to Gee and Marcus, who refer to a disaffordance as a design feature that may "protect from or exclude other species or members of [our] own species" (Wittkower 2016, 4). Future scholarship might further theorize disaffordances in light of Ruha Benjamin's (2019b) discussion of the expanding carceral logic that undergirds the design of technological systems in a growing array of fields, from prisons and criminal justice to housing and health care.

25. See Joy's TED talk about this experience at https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms.

26. Gaver 1991, 80.

27. Gaver does acknowledge that "whether a handle with particular dimensions will afford grasping depends on the grasper's height, hand size, etc. Similarly, a cat-door affords passage to a cat but not to me, while a doorway may afford passage to me but not somebody taller. Affordances, then, are properties of the world defined with respect to people's interaction with it." Gaver's affordance theory is thus relational, but it fails to acknowledge systematically structured inequality.

28. Wachter-Boettcher 2017.

29. Winner 1980.

30. Winner 1980.

31. Browne 2015.

32. See <https://siteselection.com/theEnergyReport/2011/may/sustainable-buildings.cfm>.

33. Hurley 2018.

34. Capps 2017.

35. Benjamin 2016a, 147–148. Benjamin also summarizes the concept of antidiscriminatory design in an excellent TEDx talk.

36. Benjamin 2016a, 147.

37. Benjamin 2019a.

38. Benjamin 2019b.

39. Chemaly 2016.

40. Miner et al. 2016.

41. Up to 20 percent of women in the United States will experience rape or sexual assault, while one in four will experience intimate partner violence. See the research digest of the National Coalition Against Domestic Violence in its fact sheet at https://www.speakcdn.com/assets/2497/domestic_violence2.pdf.

42. Chemaly 2016.

43. Mohanty 2013.

44. For a recent book-length discussion of discriminatory design and digital technology, see Wachter-Boettcher 2017.

45. Sue et al. 2007.

46. Tynes, Rose, and Markoe 2013.
47. Gray 2012.
48. Adam et al. 2015.
49. Sue 2010.
50. Accuracy disparities in both sensing and image analysis by skin tone is a recognized and well-documented problem that affects multiple domains. For a recent example, see Buolamwini and Gebru 2018, a widely cited study that has been replicated by several companies, as well as Buolamwini 2017 (disclosure: I was a member of Buolamwini's doctoral committee). See also Coo et al. 2019. However, skin tone disparity in soap dispenser accuracy is a known but understudied problem in peer reviewed research literature. For example, see Rutkin (2016), who summarizes many examples of racial bias in sociotechnical systems and mentions the soap dispenser but does not provide supporting evidence, and Hankerson et al. (2016), who cite a 2015 article by Anupum Pant that provides additional reasoning about why these systems might work better for darker skin tones in India than in the United States, but no empirical evidence. Hankerson et al. also cite a *Slate* article that includes a passage where the reporter states that "Pete DeMarco, the director of compliance engineering at American Standard (the largest toilet manufacturer in the world) ... told me that when automatic fixtures first got popular in the early 1990s, they had difficulty detecting dark colors, which tended to absorb the laser light instead of reflecting it back to the sensor. DeMarco remembers washing his hands in O'Hare Airport next to an African-American gentleman. DeMarco's faucet worked; the black man's didn't. The black guy then went to DeMarco's faucet, which he had just seen working seconds before; it didn't work. This time DeMarco spoke up, telling him to turn his hands palm side up. The faucet worked" (Schulz 2006). See also Benjamin 2019a.
51. Woods 2016.
52. Winner 1980; Latour 1992.
53. Friedman and Nissenbaum 1996, 1997; Friedman, Kahn, and Borning 2002; and Friedman et al. 2013.
54. Friedman and Nissenbaum 1997.
55. Friedman and Nissenbaum 1996.
56. Paul 2016.
57. Muñoz, Smith, and Patil 2016.
58. Benjamin 2019a, 7.
59. Huff and Cooper 1987.

60. For an excellent summary of the literature about design personas and stereotypes, see Turner and Turner 2011. See also Cutting and Hedenborg 2019 for a recent critique of personas.
61. Friedman and Nissenbaum 1997, 39.
62. See Wajcman 2010; Benjamin 2019a, 2019b; and Noble 2018.
63. See <https://criticalracedigitalstudies.com/>.
64. Kirkham 2015.
65. Bivens 2017.
66. Haimson and Hoffmann 2016.
67. Flanagan, Howe, and Nissenbaum 2008, 327.
68. Friedman and Henry 2019.
69. Williamson 2011.
70. Williamson 2019.
71. Williamson 2019.
72. Hamraie 2017.
73. Alpert 2018.
74. Kafer 2013.
75. Davis 2017.
76. Story 2001.
77. Hamraie 2017.
78. Inclusive Design Research Centre, n.d.; see <https://idrc.ocadu.ca>.
79. Inclusive Design Research Centre, n.d.
80. Inclusive Design Research Centre, n.d.
81. Kuhn (1962) 1996, 76.
82. Krug 2000.
83. Krug 2000.
84. *Bounce rate* measures the proportion of site visitors who leave the site after viewing only one page. Web developers and site owners want the bounce rate to be as low as possible because that indicates that visitors explore multiple pages on the site (and can be served more advertising).

85. For a regularly updated overview of Spanish use in the United States, see https://en.wikipedia.org/wiki/Spanish_language_in_the_United_States, and for the gold standard data source explore the American Community Survey data at <http://data.census.gov>.
86. Reinecke and Bernstein 2011.
87. Zuboff 2015.
88. Holmes 2018.
89. Buolamwini and Gebru 2018.
90. For brief overviews, see Caplan et al. 2018; see also <https://bigdata.fairness.io>.
91. Collins 2002.
92. Eubanks 2017.
93. Crawford 2016.
94. Crawford 2016.
95. Buolamwini 2017.
96. See <https://www.ajlunited.org>.
97. See <http://www.fatml.org>.
98. Lorica 2018.
99. Keyes 2018.
100. Hoffman 2019.
101. Collins 2002, 297.
102. Collins 2002, 297.
103. Benjamin 2019a.
104. Angwin et al. 2016.
105. For example, see the most recent FAT* conference program at <https://fatconference.org/2019/program.html>, although the conversation there is beginning to grapple with tensions between fair decision making and the long-term goals of social equality, as in Mouzannar, Ohannessian, and Srebro 2019.
106. Lewis et al. 2018.
107. Irani et al. 2010.
108. Srinivasan 2017.
109. Escobar 2018.

110. Subcomandante Marcos 2000.

111. See <https://datasociety.net>, <https://ainowinstitute.org>, <https://www.newschool.edu/digital-equity-lab>, <https://datajusticelab.org>, and <https://publicdatalab.org>.

112. See <https://chupadados.codingrights.org>.

113. See <https://www.fatml.org>, <https://datasociety.net>, <https://civic.mit.edu>, <https://datajusticelab.org>, http://www.communitysolutionsva.org/files/Building_Consentful_Tech_zine.pdf, <https://www.odbproject.org>, and <http://femtechnet.org/about/the-network>.

114. See <https://alliedmedia.org/amc2018/design-justice-track>.

2 Design Practices

1. Wakabayashi 2017.

2. For refutations of the memo's arguments, see Sadedin 2017; Fuentes 2017; Johnson 2017; and Barnett and Rivers 2017. Eagly (2017) argued that there is some support for the memo's claims about biological differences between men and women, but not for the author's conclusions about diversity policies. Some scholars supported the memo; for an attempt to summarize scientific arguments on both sides, see Stevens and Haidt 2017. For an overview, see Molteni and Rogers 2017.

3. Wiener 2017; Bogost 2017.

4. Zaleski 2017.

5. Waxman 2017.

6. Shetterly 2017.

7. Volz 2017.

8. Angwin et al. 2016.

9. Eubanks 2018.

10. Lyons, It's Going Down, and Bromma 2017; see <https://www.politicalresearch.org/2017/01/20/ctrl-alt-delete-report-on-the-alternative-right>.

11. Tyson and Maniam 2016; CNN 2016.

12. Papanek 1974.

13. Wajcman 1991; and see Chanda Prescod-Weinstein's "Decolonising Science Reading List" at <https://medium.com/@chanda/decolonising-science-reading-list-339fb773d51f>; see also Beatrice Martini's "Decolonizing Technology: A Reading List" at <https://beatricemartini.it/blog/decolonizing-technology-reading-list>.

14. National Center for Women & Information Technology 2018.
15. Nafus, Leach, and Krieger 2006, cited in Dunbar-Hester 2014.
16. See the report *Breaking the Mold: Investing in Racial Diversity in Tech*, <http://breakinthemold.openmic.org>.
17. See the *Mother Jones* exposé “Silicon Valley Firms Are Even Whiter and More Male Than You Thought,” by Josh Harkinson (2014), based on data gathered through FOIA requests. Later, Google released its own data at <http://googleblog.blogspot.com/2014/05/getting-to-work-on-diversity-at-google.html>. See also Swift 2010.
18. See Thurm 2018.
19. Skinner 2006.
20. Kleiman, n.d.
21. Google 2014.
22. Silbey 2018; Hicks 2017.
23. Dunbar-Hester 2017.
24. Weeden, Cha, and Bucca 2016; Wilson 2016; and Arce and Segura 2015.
25. For an excellent review of this literature, see Gardner, n.d.
26. Kushi and McManus 2016.
27. Irani 2015.
28. Herring, 2009.
29. For example, see Kochan et al. 2003.
30. OpenMIC 2017.
31. Hunt, Layton, and Prince 2015.
32. Hunt, Layton, and Prince 2015.
33. Penny 2014.
34. See <https://www.usability.gov/what-and-why/user-centered-design.html>.
35. For example, see the analysis of the design process for two virtual cities in the Netherlands, by Oudshoorn, Rommes, and Stienstra (2004).
36. Hamraie 2013.
37. See <http://contratados.org/>.
38. Melendez 2014.

39. Von Hippel 2005.
40. Schmider 2016.
41. It is beyond the scope of this section to more fully explore the arguments about why, under these conditions (unmet user product specifications for specific groups of users), markets often fail to produce new firms that in theory should emerge to cater specifically to unmet user needs. Suffice it to say that as of the time of writing, gender non-conforming people's specific user needs have not been met by dating app markets.
42. Nielsen 2012.
43. See Userforge.com.
44. Guo, Shamdasani, and Randall 2011.
45. Long 2009.
46. Norman 1990, 16.
47. For more on phenomenological variation, see Ihde 1990.
48. Flower et al. 2007.
49. Wittkower 2016, 7.
50. Wittkower 2016, 7.
51. Chris Schweidler from Research Action Design, cofounder of the Research Justice track at AMC, remixed this saying and turned it into a hilarious operating table meme that illustrates it best.
52. Von Hippel 2005; Schuler and Namioka 1993; and Bardzell 2010.
53. See <https://airbnb.design/anotherlens>.
54. Miller 2017.
55. O'Neil 2016.
56. McCann 2015; and see <http://www.buildwith.org>.
57. See the web magazine *Model View Culture* at modelviewculture.org for excellent summaries of these critiques.
58. Prashad 2013.
59. Pursell 1993.
60. Schumacher 1999.
61. Turner 2010.

62. Willoughby 1990.
63. Gregory 2003.
64. Asaro 2000.
65. Bannon, Bardzell, and Bødker 2019.
66. Sanoff 2008.
67. Muller 2003.
68. Dunn 2007.
69. Byrne and Alexander 2006.
70. Von Hippel 2005.
71. Eglash 2004.
72. Bar, Weber, and Pisani 2016.
73. Steen 2011.
74. See IDEO's design toolkit at <https://www.ideo.com/post/design-kit>.
75. Sanders and Stappers 2008.
76. Ries 2011.
77. O'Neil 2013.
78. Asaro 2014, 346.
79. Srinivasan 2017, 117.
80. For example, see the work of Jan Chipchase at Nokia: <http://janchipchase.com/content/essays/nokia-open-studios>.
81. Bezdek 2013.
82. For a humorously framed sampling of design process diagrams, see <https://designfuckingthinking.tumblr.com>.
83. Thatcher 1987.
84. Fals-Borda 1987; White 1996.
85. Mathie and Cunningham 2003.
86. Brown 2017.
87. Charlton 1998.
88. Goggin and Newell 2003.

89. Ellcessor 2016.
90. Kafer 2013.
91. From “10 Principles of Disability Justice,” by Patty Berne on behalf of Sins Invalid, quoted in Piepzna-Samarasinha 2019, 26–28.
92. Kafer 2013; Piepzna-Samarasinha 2018; and see <https://www.sinsinvalid.org>.
93. For example, see <https://www.d.umn.edu/~lcarlson/atteam/lawsuits.html>.
94. Another example of a social movement shifting research and design is the AIDS Coalition to Unleash Power (ACT UP!), which transformed both the state of biomedical research on HIV and the accessibility of treatment through a potent mix of direct action, media savvy, and policy lobbying. See Shepard and Hayduk 2002.
95. The project was funded and advised by Code for America and NetGain.
96. Detailed information about the project methodology is available at <https://morethanocode.cc>; we also analyzed secondary data, such as IRS form 990 data, for over thirteen thousand relevant nonprofits.
97. The report was coauthored by Sasha Costanza-Chock, Maya Wagoner, Berhan Taye, Caroline Rivas, Chris Schweidler, Georgia Bullen, and the T4SJ Project and is available at <https://morethanocode.cc>. See Costanza-Chock et al. 2018.
98. “Charley” (all interviewee names were changed for anonymity), interviewed in Costanza-Chock et al. 2018.
99. “Heiner” and “Hbiki” in Costanza-Chock et al. 2018.
100. “Hardy” in Costanza-Chock et al. 2018.
101. “Lulu” in Costanza-Chock et al. 2018.
102. “Alda” in Costanza-Chock et al. 2018.
103. “Tivoli” in Costanza-Chock et al. 2018.
104. “Gertruda” in Costanza-Chock et al. 2018.
105. “Charley” in Costanza-Chock et al. 2018.
106. “Matija” in Costanza-Chock et al. 2018.
107. Costanza-Chock et al. 2018.

3 Design Narratives

1. ElBaradei 2003.
2. Crawford 2017a.

3. Crawford 2017b; Burckle 2013.
4. Dyer-Witheford 1999.
5. Tarrow 2010; Walgrave and Rucht 2010.
6. Furness 2007.
7. New York Civil Liberties Union 2014.
8. See <http://wearemany.com>.
9. Jackson, Bailey, and Foucault Welles 2019.
10. In fact, Hirsch worked at the Center for Civic Media, the same research group that I would become affiliated with as an MIT faculty member years later in 2012.
11. Hirsch 2008.
12. Hirsch 2013.
13. Sifry 2012.
14. Hirsch 2013.
15. Hirsch 2013.
16. Dyer, Gregersen, and Christensen 2011.
17. Kelley and Littman 2001.
18. For example, see Carey 1983 and Starr 2004.
19. *Meritocracy* was originally a satirical term, as Robert Frank (2016) argues in *Success and Luck: Good Fortune and the Myth of Meritocracy*.
20. Merton 1968. The myth of meritocracy also provides key ammunition for challenges to affirmative action.
21. Rhode 1991.
22. Rogers 1962.
23. Bar, Weber, and Pisani 2016.
24. Bar, Weber, and Pisani 2016.
25. Von Hippel 2005.
26. Von Hippel 2005, 76.
27. See *The Eureka Myth* by Jessica Silbey (2014), who disentangles the relationships among creativity, innovation, and patent and copyright law.
28. Ferrucci, Shoenberger, and Schauster 2014.

29. Matias 2012.
30. Gupta 2006.
31. Gray 2015.
32. Brock 2018.
33. Jackson, Bailey, and Foucault Welles 2019, 12.
34. Davenport and Beck 2001.
35. For example, see https://en.wikipedia.org/wiki/Kelvin_Doe.
36. Downing 2000; Rodriguez 2001; and Milan 2013.
37. Gamson and Wolfsfeld 1993.
38. Turner 2010.
39. Terranova 2000.
40. See the excellent literature review on this topic in Santa Ana, López, and Mun-
guía 2010.
41. Cottle 2008.
42. Wood 2014; Della Porta and Reiter 1998.
43. Baudrillard 1995.
44. Kellner 2004.
45. Klein 2003.
46. Kumanyika 2016.
47. González and Torres 2011.
48. Halleck 2002.
49. Costanza-Chock 2011.
50. Costanza-Chock 2012.
51. See midianinja.org.
52. Blevins 2018; Jackson, Bailey, and Foucault Welles 2019.
53. Taylor 2018.
54. Maxigas in AUTISTICI/INVENTATI 2017, 12.
55. Maxigas in AUTISTICI/INVENTATI 2017, 12.
56. Maxigas in AUTISTICI/INVENTATI 2017, 12.

57. AUTISTICI/INVENTATI 2017.
58. Lopez et al. 2007; Wolfson 2014; and Coleman 2011.
59. Metz 2016.
60. Simon 1996.
61. Schön 1983.
62. Steen 2013, 6.
63. Hoffman, Roessler and Moon 2004.
64. Alexander, cited in Hoffman, Roessler and Moon 2004.
65. Hoffman, Roessler and Moon 2004.
66. Dourish 2010.
67. Smith et al 2016.
68. Benford and Snow 2000, 614.
69. Smith et al. 2016, 23.
70. Hanna-Attisha et al. 2016; Butler, Scammell, and Benson 2016.
71. See 18F's guide at <https://lean-product-design.18f.gov/1-discovery-research>.
72. See <https://lean-product-design.18f.gov/1-discovery-research>.
73. Brown 2009.
74. Gates Foundation, n.d.
75. Gates Foundation, n.d.
76. *Economist* online 2012; and see <https://www.gatesfoundation.org/Media-Center/Press-Releases/2018/11/Bill-Gates-Launches-Reinvented-Toilet-Expo-Showcasing-New-Pathogen-Killing-Sanitation-Products>.
77. Kennedy 2013.
78. Kennedy 2013.
79. Kramer, quoted in Kennedy 2013.
80. See <https://www.appropedia.org>.
81. Kass 2013.
82. Prasad 2012.
83. Prasad 2012.
84. Prasad 2012.

85. Hurn, Gyi, and Mackareth 2014.
86. Hurn, Gyi, and Mackareth 2014, 7.
87. Hurn, Gyi, and Mackareth 2014, 7.
88. Hurn, Gyi, and Mackareth 2014, 8.
89. Alter 2012.
90. De Decker's exhaustively researched article details the history of human dung removal systems in relationship to agriculture and food systems. In it, De Decker describes the system of human feces and urine removal that operated effectively for about four thousand years in China, where sealed containers were removed from households all over the country and transported to farmlands, at which point they were composted and used as fertilizer. See De Decker 2010.
91. Tong 2017.
92. See <https://www.makethebreastpumpnotsuck.com>.
93. Hare 2013.
94. See <http://www.transhack.org>.
95. Downing 2000.

4 Design Sites

1. As described in Tweney 2009.
2. See <https://alliedmedia.org/news/2012/03/04/media-go-go-lab-seeking-work-stations-and-skill-sharing-sessions>.
3. Nucera et al. 2012.
4. Ito et al. 2009.
5. See <https://www.alliedmedia.org/ddjc/discotech>.
6. Detroit Digital Justice Coalition 2012a.
7. Allied Media Conference 2012, 112.
8. Detroit Digital Justice Coalition 2012a.
9. Allied Media Conference 2013, 24.
10. See <https://codesign.mit.edu/discotechs/countersurveillance-discotechs>.
11. Ad Astra Workshop 2014. The flyer for the event invited participants to learn poster design, screenprinting, book binding, and stop-motion animation, among other techniques.

12. Web We Want 2014.
13. See <https://codesign.mit.edu/discotechs>; for an account of the Oakland Co-op DiscoTech, see Spitzer 2016.
14. Maxigas 2012.
15. Irani 2015.
16. Nelson, Tu, and Hines 2001.
17. Bengry-Howell and Griffin 2007; Calvo 2011.
18. Rose 1994.
19. Henriques 2011.
20. Partridge 2010.
21. Patel 2009.
22. Durham, Cooper, and Morris 2013; see Durham 2014 for more information on hip hop feminism.
23. Gomez-Marquez and Young 2016, 5.
24. Gomez-Marquez 2015.
25. Watkins 2019.
26. Buhr 2016.
27. Shaddock-Hernández et al. 2016.
28. Wallerstein 2011.
29. Federici, 2004.
30. Ross 1997.
31. Smith et al. 2016.
32. Smith et al. 2016, 101; italics added.
33. Maxigas 2012.
34. Grenzfurthner and Schneider n.d.
35. Renzi, personal communication, 2018.
36. Grenzfurthner and Schneider, n.d., 3
37. Grenzfurthner and Schneider, n.d., 4.
38. Turner 2009.
39. Žižek, quoted in Grenzfurthner and Schneider, n.d.

40. AUTISTICI/INVENTATI 2017.
41. Lombana Bermúdez 2018.
42. See <https://registro.tecnos.org>.
43. Duong, personal communication, 2018; see also Duong 2013 for a discussion of blogging and other DIY cultural practices in the Cuban context.
44. Fernandes 2010.
45. See <http://www.midiaetnica.com.br>.
46. Mihal 2014.
47. Chan 2014.
48. See <http://www.civicinnovationlab.la>.
49. Fung and Wright 2001.
50. City of Boston 2015.
51. See <http://kendallsquare.org>.
52. Cornell Tech 2017.
53. Gordon and Walter 2015.
54. Gordon and Walter 2015.
55. Chun 2005.
56. Escobar 2012.
57. Gordon and Walter 2015, 14.
58. Schudson 1998.
59. See Smith et al. 2016, 102.
60. This is a widespread pattern in global cities, but in some places, wealthy people never left the city centers; in others, they left but aren't interested in coming back.
61. Wikipedia, n.d.
62. Mikhak et al. 2002; Gershenfeld 2008; and Walter-Herrmann and Bueching 2014.
63. See fablabs.io.
64. Gershenfeld, Gershenfeld, and Cutcher-Gershenfeld 2017.
65. Kafer 2013.
66. See <http://fab.cba.mit.edu/about/charter>.

67. See http://peerproduction.net/wp-content/uploads/2012/07/maxigas-geneology_of_hacklabs_and_hackerspaces_draft.pdf.
68. See <https://store.alliedmedia.org/products/how-to-discotech-zine>.
69. See <https://adainitiative.org/2014/02/18/howto-design-a-code-of-conduct-for-your-community/>.
70. See http://aorta.coop/portfolio_page/anti-oppressive-facilitation/.
71. Clay 2013.
72. Smith et al. 2016, 105.
73. Smith et al. 2016; and see Scholz 2013.
74. Terranova 2000.
75. Smith et al. 2016, 105; Scholz 2013; and Soderberg 2013.
76. Smith et al. 2016, 105.
77. Smith et al. 2016, 106.
78. Benkler 2006, 60.
79. See Gershenfeld, Gershenfeld, and Cutcher-Gershenfeld 2017.
80. Holman 2015.
81. Smith et al. 2016, 108.
82. Smith et al. 2016, 118.
83. Smith et al. 2016, 119–120. As they put it: “Vested economic interests, positions of political authority, cultural privileges, social norms, technological infrastructures and research agendas selectively appropriate the innovative ideas and practices emerging from community workshops. At the moment, a kind of crowd-funded, Silicon Valley social entrepreneurship predominates in workshops, and that frames developments accordingly. [Workshops may be] reduced to specific design issues ... without attention to the wider causes and consequences of alternative development pathways. ... The question is, can the workshop movement move beyond its demonstrated possibilities for prototyping and become involved in processes for catalyzing deep-seated transformation? ... Where workshops try to connect with community activism for social change, as with the Ateneus in Barcelona, or with FabLab in Amersfoort, effort is required to make design, prototyping, and fabrication tools meaningful for the grassroots activists and their causes. Relevance needs to be demonstrated, and not assumed” (Smith et al. 2016, 120).
84. Smith et al. 2016, 110–111.

85. See <https://web.archive.org/web/20171115182528/http://www.techshop.ws/techshop.pdf/>.
86. Briscoe and Mulligan 2014.
87. Charlie DeTar has written about hurricane hackers, and how hackathons do produce community but don't typically produce new working technologies or tools, let alone "solve problems." See DeTar 2013a.
88. Zukin and Papadantonakis 2017.
89. Zukin and Papadantonakis 2017.
90. DeTar 2013a.
91. Broussard 2018.
92. Lin 2016.
93. Lin 2016.
94. DeTar 2013a.
95. "Becca," "Joss," and "Tal," interviewed for #MoreThanCode in Costanza-Chock et al. 2018. See <https://bit.ly/morethancode-keytakeaways> and <https://morethancode.cc/quotes> to explore key findings and pull quotes from practitioners.
96. "Erica" and "Heiner," in Costanza-Chock et al. 2018.
97. "Heiner," in Costanza-Chock et al. 2018.
98. "Elioenai," in Costanza-Chock et al. 2018.
99. "Matthew," in Costanza-Chock et al. 2018.
100. Robinson and Johnson 2016.
101. "Hardy," "Tal," and "Joss," in Costanza-Chock et al. 2018.
102. "Manuel" and "Margerta," in Costanza-Chock et al. 2018.
103. "Isaac," in Costanza-Chock et al. 2018.
104. "Ivar" and "Luna," in Costanza-Chock et al. 2018.
105. "Luna," in Costanza-Chock et al. 2018.
106. Grenzforthner and Schneider 2009.
107. Toupin 2014.
108. Henry 2014; see also Fox, Ulgado, and Rosner 2015.
109. See <https://www.facebook.com/sugarshackLA>.
110. Smith et al. 2016; Hielscher 2015.

111. Smith et al. 2016.
112. Selvaraj 2016.
113. Smith et al. 2016, 122.
114. See Palfrey 2015; Lee and Phillips 2018.
115. Resnick and Rusk 1996; Resnick, Rusk, and Cooke 1998. See also Jaleesa Trapp's work as an educator, activist, creative learning advocate, and former Tacoma Club-house Coordinator. See <https://www.media.mit.edu/people/jaleesat/updates>.
116. Juris 2008.
117. See Costanza-Chock 2003 and Sreberny 2004.
118. Dichter 2004.
119. Costanza-Chock 2012.
120. See <https://lesbianswhotech.org>.
121. See <http://www.transhack.org>.
122. See <https://whoseknowledge.org>.
123. See <https://hackathon.inclusivedesign.ca>.
124. D'Ignazio et al. 2016.
125. Lin 2016.
126. Lin 2016.
127. Richard et al. 2015.
128. National Center for Women & Information Technology, quoted in Richard et al. 2015, 115.
129. "Tom," in Costanza-Chock et al. 2018.
130. "Odell," in Costanza-Chock et al. 2018.
131. "Landon" and "Odell," in Costanza-Chock et al. 2018.
132. Costanza-Chock et al. 2018.
133. Lorde 1984.

5 Design Pedagogy

1. Harvey 2008.
2. Baptiste 2014.

3. Joint Center for Housing Studies of Harvard University 2018.
4. See http://www.clvu.org/our_history.
5. See <https://righttothecity.org>.
6. Leyba et al. 2013.
7. Aristotle, cited in Halliwell 1986.
8. Freire 2018.
9. Mayo 1999.
10. Highlander Research and Education Center 1997.
11. For the full statement, see <https://progressivetech.org/blog/2018/02/27/movement-tech-statement>.
12. See <https://projectsouth.org>.
13. See <https://www.movementhistory.org>.
14. Costanza-Chock 2014. See also <http://idepsca.org>.
15. See <https://www.myalia.org>.
16. Center for Urban Pedagogy 2011.
17. See <https://detroitcommunitytech.org/?q=learning-materials>.
18. For an excellent recent summary of a parallel ongoing scholarly conversation about digital media and literacy, see Hobbs 2016.
19. Wagoner 2017, 12.
20. Wagoner 2017, 12.
21. See <https://walkerart.org/magazine/never-not-learning-summer-specific-part-1-intro-and-identities>.
22. See <https://www.cmu.edu/qolt/>.
23. Ding, Cooper, and Pearlman 2007.
24. According to the authors, one PAD student developed an interesting method for gathering user requirements and possible solutions from wheelchair users in India: the student provided end users with a camera, and asked them to document mobility barriers that they encountered in daily life and then fill out a form that included open-ended comments, an accessibility scale, and a space for suggested improvements to both the built environment and to the assistive device.
25. D'Ignazio and Klein 2019.

26. See <http://eqxdesign.com>; Smyth and Dimond 2014; and <http://designjustice.network.org>.
27. See <https://databasic.io/en/>; see also Bhargava and D'Ignazio 2015.
28. See <https://www.alliedmedia.org/ddjc/discotech> and <https://databasic.io/en/culture>.
29. See <http://openstreetmap.org>; <https://publiclab.org>; <http://mapafemicidios.blogspot.mx/p/inicio.html>; civic.mit.edu/2013/08/07/the-detroit-geographic-expedition-and-institute-a-case-study-in-civic-mapping; and <https://www.propublica.org/article/lost-mothers-maternal-health-died-childbirth-pregnancy>.
30. See <http://rapresearchlab.com>; for data murals, see <https://datatherapy.org> and see also Bhargava et al. 2016.
31. Papert and Harel 1991.
32. Piaget, cited in Sabelli 2008.
33. Boud and Feletti 2013.
34. Wilson 1996.
35. Resnick et al. 2009.
36. Resnick, Rusk, and Cooke 1998.
37. Resnick, Rusk, and Cooke 1998.
38. Bruckman and Resnick 1996.
39. Levitt 2017.
40. See <https://www.decolonisingdesign.com>.
41. Margolin 1996, 3.
42. Margolin 1996, 5.
43. See hooks 1994, 148.
44. I taught the course five times; while I was on leave during the spring of 2013, it was taught by Federico Casalegno, with graduate student Denise Cheng.
45. Scholz and Schneider 2016.
46. All project case studies are available at <https://codesign.mit.edu/projects>.
47. Leyba et al. 2013.
48. Crockford et al. 2014.
49. McGregor et al. 2013.

50. See the blank template working agreement that we use in the Codesign Studio, available at <http://bit.ly/codesign-agreement-template>.

51. Racin and Gordon 2018.

52. Duncan et al. 2013, 22.

53. Duncan et al. 2013, 22. In addition to the importance of written working agreements with a community partner, teams in the Codesign Studio also emphasize the need to create an ecosystem map at the beginning of the project to better understand all of the players in the space, to respect community partners' decisions about what to prioritize for prototyping and validation, and to be wary of the dynamics of appropriation (CCTV 2013).

54. Design Studio for Social Intervention 2013.

55. Henderson et al. 2017.

56. Wu et al. 2017.

57. Fernandez et al. 2014.

58. Leyba et al. 2013.

59. Weishaar, Zhong, and Cheng 2017.

60. Fernandez et al. 2014.

61. For example, Goldschmidt (2003) analyzed design education in architectural schools and found that students primarily desired a focus on form and creativity, while paying less attention to, and in some cases actively resenting, seminars, instructors, and crits (desk critiques) that focus on real-world aspects of architecture. Students expected design education to be an area where they were able to give free reign to their creative impulses and produce architectural models and concepts that were formally interesting and aesthetically appealing, creative, unique, or new. They disparaged those aspects of design education that emphasize how real-world architectural structures or spaces are always linked to a particular location with people, history, culture, environment, and so on. In part, the author traced this to the *star culture* of world-famous architects, which permeates the atmosphere of design schools and student aspirations despite the reality of the actual job market, let alone the larger structural questions of the long-term unsustainability of corporate megastructures.

62. See <https://aorta.coop/resources>.

63. Chakravartty 2006.

64. Fernandez et al. 2014.

65. Freeman 1972.

66. Mohammad et al. 2016.
67. D'Ignazio and Klein 2019.
68. Jordan et al. 2016.
69. Asharia et al. 2013.
70. Wu et al. 2017.
71. Mohammad et al. 2016.
72. Delazari et al. 2016.
73. Fernandez et al. 2014.
74. Shah et al. 2014.
75. Mohammad et al. 2016.
76. Mawson 2003.
77. Shah et al. 2014.
78. Henderson et al. 2017.
79. McGregor et al. 2013.
80. Irani 2015.
81. Design Studio for Social Intervention 2013, 20.
82. Lu et al. 2014.
83. Broussard 2018.
84. McGregor et al. 2013.
85. Design Studio for Social Intervention 2013.
86. CCTV 2013.
87. Obama 2016.
88. Kastrenakes 2016.
89. See <https://advancementproject.org/issues/stpp>.
90. Abraham 2011.
91. Flores 2007.
92. Burdge, Hyemingway, and Licona 2014.
93. Cottom 2017.

94. As Cottom argues, tech and design courses at community colleges are crucial to enable low-income people to develop their knowledge and skills.

95. Reich and Ito 2017.

96. See <http://www.exploringcs.org>.

97. See <https://code.org/diversity>.

98. See <https://tsl.mit.edu/projects/swipe-right>.

99. Resnick 2017; although somewhat ironically, Ito and Reich (2017) found that Scratch's approach to learning (open-ended, minimally guided, student-driven) may disproportionately benefit students who are already the most advantaged.

100. To take just one of many examples, a group of philosophers and computer scientists at Harvard recently developed a set of learning modules called Embedded EthiCS, designed to integrate ethical reasoning into a CS curriculum and teach students about how to consider the ethical implications of their work, as well as how to decide what technologies should be built or refused (see <http://embeddedethics.seas.harvard.edu>).

101. See <https://www.ncwit.org>, and the Wikipedia category "Organizations for Women in Science and Technology" (http://en.wikipedia.org/wiki/Category:Organizations_for_women_in_science_and_technology); for a recent review of best practices in inclusive computer science education, see Hamilton et al. 2016.

102. See debianwomen.org, geekfeminism.org, pyladies.net, <http://www.blackgirlscode.com>, and the Wikipedia category "Organizations for Women in Science and Technology" (http://en.wikipedia.org/wiki/Category:Organizations_for_women_in_science_and_technology).

103. See <http://www.blackgirlscode.com>.

104. See <http://girlswhocode.com>.

105. See <http://www.code2040.org>.

106. In *Education and Work*, Du Bois attacked trade schools on their own terms, for continuing to teach trades that he argued were being rapidly displaced by the larger reorganization of work, automation, factories, and the rise of multinational firms. This double critique remains surprisingly relevant. Is it really true that we can expect continued growth in well-paying coding jobs? Many factors militate against this possibility: these include outsourcing, automation, and increased competition for the well-paying coding jobs that do exist. Du Bois describes how, for Booker T. Washington and other advocates of the trade schools, the goal was to train Black people for employment; this was meant to provide the foundation for the creation of Black wealth and ultimately lead to the uplift of all Black people and eventually to integration with white society. Du Bois, on the other hand, wanted higher

education to become an institution that would train Black people for leadership, vision, and moral and cultural excellence. He also wanted college graduates to be prepared to take on key roles at the highest levels of industry and science.

107. Du Bois 1932, 61. See also Du Bois 1903, 63. Du Bois said “men,” not people.

Directions for Future Work

1. Luo 2018, 5.
2. Godz 2018.
3. See <https://www.icrac.net/open-letter-in-support-of-google-employees-and-tech-workers>.
4. Child and family detentions increased under the Obama administration as well, as documented by Detention Watch Network and other immigrant rights organizations, but the Trump administration took these policies to new heights of cruelty. Detention Watch Network, n.d.
5. Smith and Bogado 2018; Human Rights Watch 2018.
6. Chao 2018. MIT faculty members (I was a coauthor) also circulated an open letter from scholars and scientists in support of the Microsoft workers’ campaign; the letter was signed by nearly five hundred faculty, scientists, and researchers across the country. It is available at <https://actionnetwork.org/petitions/an-open-letter-to-microsoft-drop-your-194-million-ice-tech-contract>.
7. Captain 2018.
8. Kauffman 2018.
9. Sydell 2018.
10. Forsythe and Bogdanich 2018.
11. Gallagher 2018; Kottasová 2018.
12. Condliffe 2018.
13. Bright 2018.
14. See <https://www.ibmpetition.org>.
15. Segarra 2018.
16. See <https://techworkerscoalition.org>.
17. Science for the People 2018a.
18. Science for the People 2018b.

19. Allen 2019.
20. Gilpin 2015.
21. Moore 2009.
22. Schuler and Namioka 1993.
23. Wolfson 2014.
24. Smith et al. 2016.
25. Braman 2011; Braman 2012.
26. See <https://www.thejustdatalab.com/resources>.
27. Koopmans 2004.
28. Dyer-Witheford 1999.
29. Browne 2015.
30. Roston 2017; Brian Resnick 2017.
31. For example, Ben Green's (2019) book *the Smart Enough City* will hopefully lead to a wave of actionable critiques of so-called smart city discourse, policy, and practices.
32. Costanza-Chock 2018.
33. Flyvbjerg 2005.
34. DiSalvo 2012, 118.
35. Coffey 2015.
36. Mills 2015; Alexander 2005.
37. Noble 2018, 171–172.
38. See <https://criticalracedigitalstudies.com>.
39. Khalil and Kier 2017.
40. Brock 2018.
41. Friedman and Nissenbaum 1996.
42. Lee et al. 2016.
43. ADA 2007.
44. Hamraie 2017.
45. Bush 1983.

46. Raji and Buolamwini 2019.
47. See <https://bostoncivic.media>.
48. Here, Fox Harrell's work on phantasmal media (2013) and Sandra Braman's work on identity and the information state (2009) provide extremely relevant touchstones.
49. Connell et al. 1997.
50. See <http://www.iccsafe.org>.
51. See <https://www.iso.org/standard/52075.html>.
52. Varon and Cath 2015; ten Oever 2018.
53. Braman 2012.
54. See, for example, <https://en.wikipedia.org/wiki/Accessibility>.
55. However, law can be a very slow and sometimes blunt instrument for shaping technology design. For example, a recent paper by Goodman and Flaxman (2016) discusses the push for a *right to an explanation* or *algorithmic transparency* law. The authors argue that transparency as an approach will not address the most important algorithmic harms for several reasons: first, they claim that the right to an explanation in the EU General Data Protection Regulation (GDPR), if conceived of as a requirement meaning that algorithm makers must disclose "how their algorithms function," will be both overbroad and impossible to fulfill. The authors describe how common machine-learning techniques do not produce decision-making processes that are explainable in the common meaning of the term *explanations*, as in "meaningful information about the logic of processing." In other words, computer scientists who use machine learning to create algorithms often can only provide explanations of this kind within a very specific kind of limited query.
56. Federici 2012.
57. Purao, Bagby, and Umapathy 2008.
58. Cizek et al. 2019.
59. Braman 2012.
60. Purao, Bagby, and Umapathy 2008.
61. DeTar 2013b.
62. Bernal 1998; Collins 2002; and Harding 2004.
63. Broussard 2018.
64. Dyer-Witheyford 1999.

65. Scholz and Schneider 2016.

66. See <https://colloqate.org/design-justice-summit>.

67. See <http://eqxdesign.com>.

68. Racin and Gordon 2018.

69. See <https://foundation.mozilla.org/en/initiatives/responsible-cs/challenge>.

70. Spelic 2018.

71. Spelic 2018.

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