

A Systematic Review of Human-Centered Design for Development in Academic Research

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Highlights

- Research on Human Centered Design for Development started in 2004, but is has risen in interest in the past couple of years.
- A large majority of the research locations and researchers come from the United States, though researchers from other countries and in other country locales is increasing over time.
- Authors from the “West”, broadly defined, are more likely to work in their country of origin, while authors not from the “West” work in their own country.
- The categories of global health and inclusive infrastructure are the largest focus areas for researchers.
- The large majority of authors publishing are new to the field; having never published a HCD+D paper before.

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Abstract

Recently, many organizations have begun to leverage human-centered design, a design approach where designers gain deep empathy for their stakeholders and use this empathy and understanding to produce solutions to address problems of poverty and development around the world. Despite the emerging proliferation of human-centered design for development (HCD+D), there has been no systematic review conducted which aims to describe the current research landscape. By utilizing metadata analyses of the critical researchers' locations, interests, and practices, of critical researchers in the field, this report contributes to the emerging HCD+D field by beginning to describe the history, the participants, their activities, and the geographic characteristics of the projects to paint a broad picture of the current HCD+D landscape. In particular, we also use choropleth-based analyses to investigate where researchers conduct research and from where they hail, to further describe the breadth of the current research landscape.

Keywords

Human-centered design

Development

Systematic review

Choropleth analysis

Introduction

Human-centered design is a cross-disciplinary design approach where design participants develop a deep understanding of their stakeholders and use these insights to drive idea generation, iterative prototyping, and effective implementation. To address many of the complex issues caused by the multi-dimensionally contextual realities of global poverty, companies, nonprofits, universities, and many other organizations in the global community have used the methodologies of human-centered design for development (HCD+D) to create contextual innovations. HCD is viewed as a particularly useful framework for design in development because it focuses on the needs and empathic understanding of humans in their daily realities. Celebrated design examples are growing with time: in the field of public health, the company D-Rev has developed the Brilliance high efficiency lamp which has treated 186,000 infants with jaundice in twenty-three countries who are not receiving adequate treatment in their home communities.¹ Organizations, such as the United Nations High Commissioner for Refugees and the nonprofit design house IDEO.org, are using the design field and its methodologies to figure out how to best develop interventions for housing solutions for Ghanaian refugees² and climate change resilience alternatives³ for urban slum communities. Universities are teaching design courses for global poverty, including the University of California, Berkeley's Design, Evaluate, and Scale Development Technologies course for the Development Engineering program,⁴ where multidisciplinary teams get experience collecting data, developing projects, and applying the foremost learning in development and design practice.

The design for social innovation field is being adopted by varied actors from many different disciplines, and in a wide range of geographical contexts. However, the field's spread has come with critique. Many critiques of design for development work stem from the criticism of "developed" world designers working in "developing" world regions. This critique is not unique to design for development work, as design practice in general tends to involve the designers bringing their external view and "designer" capacity into a context different from their own. However, the particularities of this approach in development can be more keenly felt, due to the long histories of colonialism and imperialism that affect modern relationships between the "developed" and the "developing." Therefore, critics of design for development efforts, including HCD+D, generally critique the problematic hierarchy between the outsider designers and the targeted design beneficiaries.⁵ These approaches also arguably focus too heavily on individual humans as the actor of interest for understanding a design context, which can make a designer blind to the broader social dynamics. Janzer and Weinstein also summarize three critical shortcomings of design thinking and HCD for

¹ "Impact | D-Rev". Accessed April 23 2016. <http://d-rev.org/impact/>.

² "Empowering Refugees To Create Their Own Housing Solutions | UNHCR Innovation." Accessed April 23 2016. <http://innovation.unhcr.org/empowering-refugees-create-housing-solutions/>.

³ "How Might Urban Slum Communities Become More Resilient To The Effects Of Climate Change?" Accessed April 23 2016. <https://challenges.openideo.com/challenge/urban-resilience/brief>.

⁴ Lina Nilsson, Temina Madon, and S. Shankar Sastry, "Toward A New Field of Development Engineering: Linking Technology Design to The Demands of The Poor," *Procedia Engineering*, 78 (2014): 3.

⁵ Alison J. Clarke, "Design for Development, ICSID and UNIDO: The Anthropological Turn in 1970s Design." *Journal of Design History*, vol. 29, no. 1 (2015): 43.

development: (1) research on the context of the problem is under-emphasized and oversimplified; (2) prior to implementation, there is little to no emphasis on ensuring that solutions are appropriate or contextualized; and (3) the designer and the designer's freedom of creativity are prioritized over the end-user's empowerment or worldview.⁶ Of course, individual instances of design practitioner and design problem may show wide variety in these shortcomings. But, on the whole, the design for development field must contend with these critiques.

The current collective popularity and framing of HCD+D as a panacea for addressing development issues harbors another issue: design researchers and practitioners do not know what others are doing. The collective knowledge of the recent history, disciplinary and geographic boundaries, participants, and activities of design practice for international development has not been analyzed. Engaging in such a task is difficult, especially in a field with a wide collection of differing definitions, actors, uses, lexicon, and practices. Moreover, there are growing numbers of researchers who proclaim interest in the field and intend to practice their methods. In this purview, a study that aims to systematically understand this burgeoning field of design development, HCD+D and create insights about HCD+D, would help chart its current state and needs.

Research Methodology

The dataset underlying our investigation of HCD+D was assembled through a systematic literature review of academic papers focused on human-centered design and development. We consider this dataset to be focused on the population of HCD+D efforts and should not be viewed as a representative sample of design for development efforts, in general. In this section, we outline how the dataset was assembled and subsequently analyzed.

Choosing the Right Bounds

To start such a literature review, we must first circumscribe boundaries: a systematic method to include and exclude publications. In this, however, lies the first challenge. Design as a field is fluid, amorphous, and vague, often adopting tools from many disciplines that are useful towards its intention to reimagine and redesign pieces of our world. Practically, however, it is a difficult task to determine which fields should be included or excluded from any systematic introductory study. If the boundaries are drawn too small, the study leaves out fields which better circumscribe the current field; if they are too large, analyzing the dataset manually becomes a logistical nightmare. So, as a start, we can begin to investigate the philosophical and logistic implications of drawing the correct bounds. Options for this study's bounds might include: interventionists who address poverty issues throughout all of history, networks of design professionals, compendiums of design-based journals, or by searching for research which claim to directly use well-known HCD method sets.

We decided to use a practical, yet circumscribed, method that focuses on published papers: keyword searching over Google Scholar. Google Scholar is globally available and presents results in a variety of journals, conferences, and other publication outlets. Performing a

⁶ Janzer, Cinnamon L., Lauren S. Weinstein, "Social Design and Neocolonialism," *Design and Culture*, vol. 6, no. 3 (2014): 327.

keyword search of ‘human-centered design’ on Google Scholar therefore gives us an expansive set of papers that mention the words ‘human-centered design’.

We chose to focus on HCD because of its current traction as a leading methodology in design-for-development work. In 2008, the Gates Foundation tasked IDEO to create the Human-Centered Design Toolkit,⁷ and it is through this document that human-centered design has gained major traction as a design approach for social impact, as is visible by its mention in many of the review papers’ contents. However, the terms *human-centered design*, *user-centered design*, *design thinking*, and others, are often conflated and there the delineation between the fields is hotly contested, fluid, and changes based upon the designer who uses the fields. We argue that design semantics are critical to design practice: two designers might use the same exact term ‘human-centered design’ and ascribe noticeably different practices and mindsets. While many design-based and development-based keywords could be used to create the dataset, we could not foresee a manageable boundary of keywords that would be manageable to analyze. Each cut was done by manually reading each document to determine if it fit the boundaries we set. Adding further design keywords would have massively increased the dataset size, and the time to develop effective analyses. We acknowledge there are many other possible systemization paths, and there might be a different method to circumscribe unknown design literature. Such is the complex experience of circumscribing an evolving field, and why a ‘systematic’ review is such a difficult endeavor. However, we contend that our choice to use a single design-based keyword allows us to develop the boundary we intend for our search. By using HCD as the anchor, instead of including other design keyword, we purposefully focus our search on the set of papers that explicitly use HCD. This paper has the opportunity to discern how specifically HCD-influenced researchers use the term for their own ends, as members of the growing field of practice.

In summary, we posit that the use of these words has meaning which should not be combined recklessly. The development and growth of HCD illustrates how the methods have spread to wide and far corners of the world. This paper is an effort to broadly characterize the HCD for development field and we welcome further researchers who aim to investigate how others have adopted, critiqued, or modified the language of HCD for development. By investigating the qualities of this HCD sector of the design world, we can gain insights about how to investigate the other sectors as well.

Assembly of the Dataset

To begin our literature review, we first developed a list of keywords that would comprehensively cover the set of academic publications related HCD+D. Based on a survey of keywords in the literature, we constructed a list of 13 keyword pairs: “human-centered design” conjoined separately with “developing countries”, “developing economies”, “developing world”, “global development”, “global inequality”, “global poverty”, “international development”, “low-income”, “low-resource”, “poverty”, “resource-limited”, and “third world”.

We input these keywords into the Publish or Perish⁸ software program, which allows a user to

⁷ Tim Brown and Jocelyn Wyatt. “Design Thinking for Social Innovation,” *Ssir.org*. Winter 2010.

⁸ Anne-Wil Harzing, “Publish or Perish.” *Harzing.com*, 2007, accessed November 23, 2016. <http://www.harzing.com/pop.htm>.

input keywords and searches the Google Scholar database to output the corresponding list of papers that contain these keywords. After deselecting all papers that we considered to be non-representative of our intended analysis, our dataset contained only archival peer-reviewed papers written in English that described practical examples of researchers engaging in an HCD+D approach. The output also contains various metadata for each paper, including the paper's author(s), the year of publication, and the citation count of each paper. Overall, we compiled a set of 1,441 papers, which we then systematically deselected those that were not representative of our intended analysis. A summary of these deselections is shown in Table 1.

Table 1: Filters used to systematically deselect papers from the dataset

	Description	Number of Papers Remaining
Initial List	Pulled from Google Scholar using sets of keywords	1,441
Deselection Round 1	Deselect papers that were cited 0 times, if published before 2014	877
Deselection Round 2	Deselect books	760
Deselection Round 3	Deselect: <ul style="list-style-type: none"> · Papers that were not actually about HCD+D · Papers that were not available in English · Papers that were not accessible online or in the UC Berkeley library system 	282
Deselection Round 4	Deselect: <ul style="list-style-type: none"> · Papers that were not classified as a case study or experiment · Papers that did not list a research site · Papers that were not peer-reviewed (e.g., undergraduate theses, master's theses, PhD dissertations, and policy briefs) 	128
Deselection Round 5	Deselect papers where the authors were not actually engaging in design practice (i.e., papers where the authors research was about design without designing anything)	83

Deselection Round 1: We only included those papers that have had some quantifiable impact on the research community. Therefore, we chose to exclude papers that were cited zero times. We did, however, keep papers that were cited zero times if they were published in or after 2014, because we did not feel that these papers had enough time to be found and cited.

Deselection Round 2: We focused only on papers pertaining to HCD+D. We felt there were more commonalities among papers than there were between papers and books. Furthermore, an initial exploration of the books in the dataset showed that there was a large range between the degree to which HCD+D is a focus, from fully integrated to mentioning the field in passing. We leave a book analysis for future research endeavors.

Deselection Round 3: We wanted to only include papers that were explicitly engaged in HCD+D, including those that engaged in foreign and domestic countries. Therefore, we kept only those papers that included:

- Work with a community experiencing a form of multidimensional poverty
- Work with a community experiencing “institutional voids,” or the absence of supportive intermediary institutions like credit card companies⁹
- Work with a community experiencing a loss of freedom or capabilities¹⁰

In this cut, we also excluded papers that were not available in English, due primarily to our own lack of proficiency in other languages. We also excluded papers not accessible online or in the UC Berkeley library system, as they might not be available to other researchers as well.

Deselection Round 4: We only included papers that discussed practical engagement with end users. We felt that only the papers classified as experiments or case studies (as opposed to, for example, a theory paper) could not defensibly contain research engaged with end users. Therefore, we cut out papers that were not experiments or case studies. We also excluded papers that were not peer-reviewed to ensure that the papers in our dataset were pursuing specific research questions with defensible rigor.

Deselection Round 5: We only included papers where the authors themselves were conducting the design practice. Therefore, we did not include papers where the authors discuss the design approach that other designers took (e.g., a professor writing about the experiences of student designers).

Analysis of the Dataset

We use a *who*, *what*, *when*, and *where* framework to analyze the dataset.

HCD+D: Who

To answer the question of *who* is researching in HCD+D, we used frequency counts of the number of authors who published papers in the dataset. We looked at the number of unique authors, the number of authors who published multiple papers, and the number of authors who published each year.

HCD+D: What

⁹ David I. Levine, Alice M. Agogino, and Martha A. Lesniewski. (2014). “Design Thinking in Development Engineering,” in *Proceedings of the 2015 Harvey Mudd Design Workshop IX*, Claremont, CA, USA, May 2015.

¹⁰ Sen, A. “Capability and Well-Being,” In *The Quality of Life*, ed. Martha Nussbaum and Amartya Sen (Oxford: Clarendon Press, 1993), 453.

To answer the question of *what* kind of research is being done in HCD+D, we used a closed-coding scheme¹¹ to classify each paper in the dataset by their designated focus area. In this closed-coding approach, we first determined the focus areas covered by the papers. To create this list of focus areas, we considered the goals and areas of four organizations and initiatives: the United States Agency for International Development (USAID),¹² the United Kingdom’s Department for International Development (DFID),¹³ the Sustainable Development Goals (SDG) proposed in 2015 by the United Nations,¹⁴ and the Millennium Development Goals (MDG) proposed in 2000 by the United Nations.¹⁵

We then consolidated the goals and/or topic areas of these projects. The list of focus areas we found, along with the associated goals and/or areas of work that comprise these focus areas is summarized in Table 2. Note that these goals are not *unique* to HCD+D, rather they are recurring themes in HCD+D work.

Table 2: List of HCD+D focus areas

	USAID	MDG	SDG	DFID
1. Poverty and inequality	Ending extreme poverty	Eradicate extreme poverty and hunger (split between Poverty and inequality and Hunger and food security)	End poverty in all its forms everywhere Reduce inequality within and among countries	
2. Hunger and food security	Agriculture and food security	Eradicate extreme poverty and hunger (split between Poverty and inequality and Hunger and food security)	End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Hunger and malnutrition in developing countries
3. Water and sanitation	Water and sanitation		Ensure availability and sustainable management of water and sanitation for all	Water and sanitation in developing countries
4. Global partnership and cooperation		Global partnership for development	Strengthen the means of implementation and revitalize the global partnership for sustainable development	Overseas aid effectiveness Overseas aid transparency

¹¹ S. Atod, “Effectively Using Qualitative Data.” *WilderResearch.org*, August 2009. <http://www.wilder.org/Wilder-Research/Publications/Studies/Program%20Evaluation%20and%20Research%20Tips/Effectively%20Using%20Qualitative%20Data%20-%20Evaluation%20Workshop%20Series,%20Presentation.pdf>

¹² USAID. “What We Do.” *USAID.gov*, accessed January 1, 2016. Available at <https://www.usaid.gov/what-we-do>.

¹³ “Policies – GOV.UK.” Gov.Uk. Accessed October 4 2016.

[https://www.gov.uk/government/policies?organisations\[\]=department-for-international-development](https://www.gov.uk/government/policies?organisations[]=department-for-international-development).

¹⁴ “Sustainable Development Knowledge Platform.” Accessed January 1, 2016. <https://sustainabledevelopment.un.org/sdgs>

¹⁵ “United Nations Millennium Development Goals.” Accessed January 1, 2016. <http://www.un.org/millenniumgoals/>.

5. Education	Education	Achieve universal primary education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Education in developing countries
6. Global health	Global health	Reduce child mortality Improve maternal health Combat HIV/AIDS, malaria, and other diseases	Ensure healthy lives and promote well-being for all at all ages	Health in developing countries
7. Economic inclusion	Economic growth and trade		Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Free trade Economic growth in developing countries Export control
8. Gender equality	Gender equality and women's empowerment	Promote gender equality and empower women	Achieve gender equality and empower all women and girls	Sexual violence in conflict (split between Gender equality and Governance, human rights, and conflict) Women and girls in developing countries
9. Governance, human rights, and conflict	Working in crises and conflict Democracy, human rights and governance		Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	UK overseas territories Humanitarian emergencies Conflict in fragile states Governance in developing countries Weapons proliferation The commonwealth Afghanistan Peace and stability in the Middle East and North Africa Stability in the western Balkans Sexual violence in conflict (split between Gender equality and Governance, human rights, and conflict)

10. Environmental Sustainability	Environment and global climate change	Ensure environmental sustainability	<p>Conserve and sustainably use the oceans, seas and marine resources for sustainable development</p> <p>Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss</p> <p>Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation</p> <p>Ensure access to affordable, reliable, sustainable and modern energy for all</p>	<p>Climate change impact in developing countries</p> <p>Climate change international action</p>
11. Inclusive infrastructure			<p>Take urgent action to combat climate change and its impacts</p> <p>Ensure sustainable consumption and production patterns</p> <p>Make cities and human settlements inclusive, safe, resilient and sustainable</p>	

We applied this list of eleven focus areas to the dataset by classifying each paper in the dataset according to their focus area(s). We then counted the frequencies of papers in each of the focus areas.

HCD+D: When

To answer the question of *when* HCD+D research is occurring, we used frequency counts of the year each paper was published. We then looked at patterns of when projects were conducted, including the peaks and valleys of publication and other trends over time.

HCD+D: Where

Understanding where designers work affords us a novel opportunity for inquiry. The concept of “Remote Design” was discussed in the paper Design for Development: Three Questions,¹⁶ where the authors expressed the unfortunate reality that many designers are geographically, culturally, and institutionally separate from the communities that they aim to impact, which limits their ability to engage in design which actually helps the communities they purport to

¹⁶ Krista Donaldson, “The Future of Design for Development: Three Questions,” *Information Technologies & International Development*, vol. 5, no. 4 (2009): 97.

serve. By learning where authors operate, and where their institutional knowledge was formed, we can investigate the prevalence of this phenomenon with increased precision.

To answer the question of *where* HCD+D research is occurring, we coded three categories: the country where the first author's host institution is located, the country where the rest of the author's host institution is located, and the country where the authors were located at the time of publication. We then counted the frequency of country. Additionally, influenced by the capacity of geographic information systems to analyze and visualize many types of data, we provided visualizations along each of these dimensions across the world through simple choropleths, using QGIS, an open-source geographic information system software. By comparing the location of the publishing authors with the location of their chosen countries to conduct research, we can ascertain the distance between those who direct HCD+D projects and potential end beneficiaries. Which countries are engaging most heavily in HCD+D? Which countries are not engaging at all? Where do certain countries decide to engage in research? Where are the targets of such research located?

We developed filters to give us insights into country-specific research. For example, one might ask where do researchers from the United States engage in design research, or conversely, where do researchers who are conducting research in India come from? These choropleths also give us another opportunity to map all collected metadata (time, impact, researcher involvement, etc.) by location as well.

Findings

The full set of 83 papers is available at tinyurl.com/HCD-D-publications. Our findings for each specific question are presented below.

Who is Working in HCD+D?

Shown in Table 3, there were 261 unique authors in the dataset, and forty-two of these authors published multiple papers. Because the dataset is relatively small, certain authors who published multiple papers make notable contributions. Because so few examples of HCD+D work are available in the literature, a single author can have a significant impact on the rest of the field. For example, Beth Kolko, a professor at University of Washington's Human-Centered Design & Engineering department, was a co-author on over 14% of the papers in the dataset.

Table 3: Authors who published more than one paper in the dataset

Authors	Number of papers	Authors	Number of papers
R Anderson	3	J Kamano	3
B Aryana	2	M Kawooya	2
D Ascheim	2	S Kimaiyo	3
E Blank	2	B Kolko	12
C Boks	2	C Le Dantec	2
G Borriello	2	J Machiavelli	2
W Brunette	4	M Mahmud	2
M de Araujo Novaes	2	L Misoï	2
S Fox	2	R Nathan	2
V Fuster	3	C Putnam	3
W Gerard	3	R Rege	2
M Glaser	2	E Rose	3
M Hicks	2	JS Sandhu	2
A Hope	4	WD Tucker	2
CE Hsu	2	N Tuikong	2
I Hussein	2	R Vedanthan	3
C Hutchinson	2	R Vogler	2
S Iyengar	2	R Walton	4
C Johnson	2	M Were	2
E Johnson	2	J Yaaqoubi	2
A Joshi	2	J Zhang	2

Figure 1 shows the cumulative number of total authors publishing by year as compared to the cumulative number of new authors publishing by given year. With the exception of 2011 and 2012, the set of authors publishing HCD+D papers mainly tends to be authors who have not published an HCD+D paper before. This suggests that HCD+D continues to reach new researchers as time goes on, and that HCD+D continues to become more popular for a wider audience. However, it might also infer that researchers have little incentive to continue to publish in this field over time.

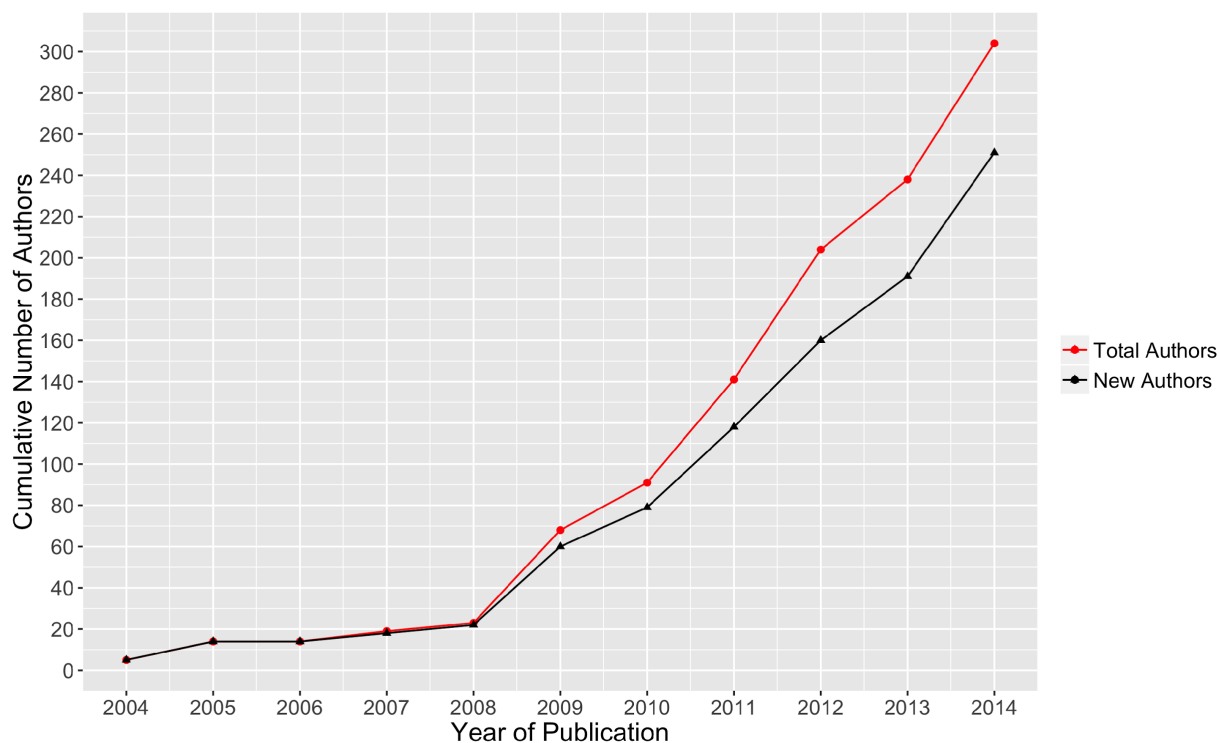


Figure 1. Cumulative number of total and new authors who publish papers in the dataset by year. (Note: We have excluded 2015 from this graph, as the data was pulled in March 2015 and therefore the counts for 2015 are incomplete).

What is Being Done in HCD+D?

As shown in Figure 2, the papers discussed all but one of the focus areas we developed in our analysis. Inclusive infrastructure (a focus area for thirty papers) and global health (a focus area for twenty-four papers) were the largest topics to be discussed in the dataset. Each paper may have presented research in multiple focus areas.

Inclusive infrastructure consists of, among other things, information and communication technologies (ICTs), which has become an increasingly popular field of study in recent technological history. The relative frequency of inclusive infrastructure projects may be due in part to the proliferation of mobile and internet-capable devices around the world, which has given rise to a large set of research focused on leveraging ICTs for development projects.

Global health is a large priority on the global development agenda and may be a particularly popular focus of HCD+D projects because it lends itself to technological intervention. However, water and sanitation also lend themselves to technological solutions, so it is not clear why global health is the focus of many more publications. Why certain focus areas are more popular than others needs further research.

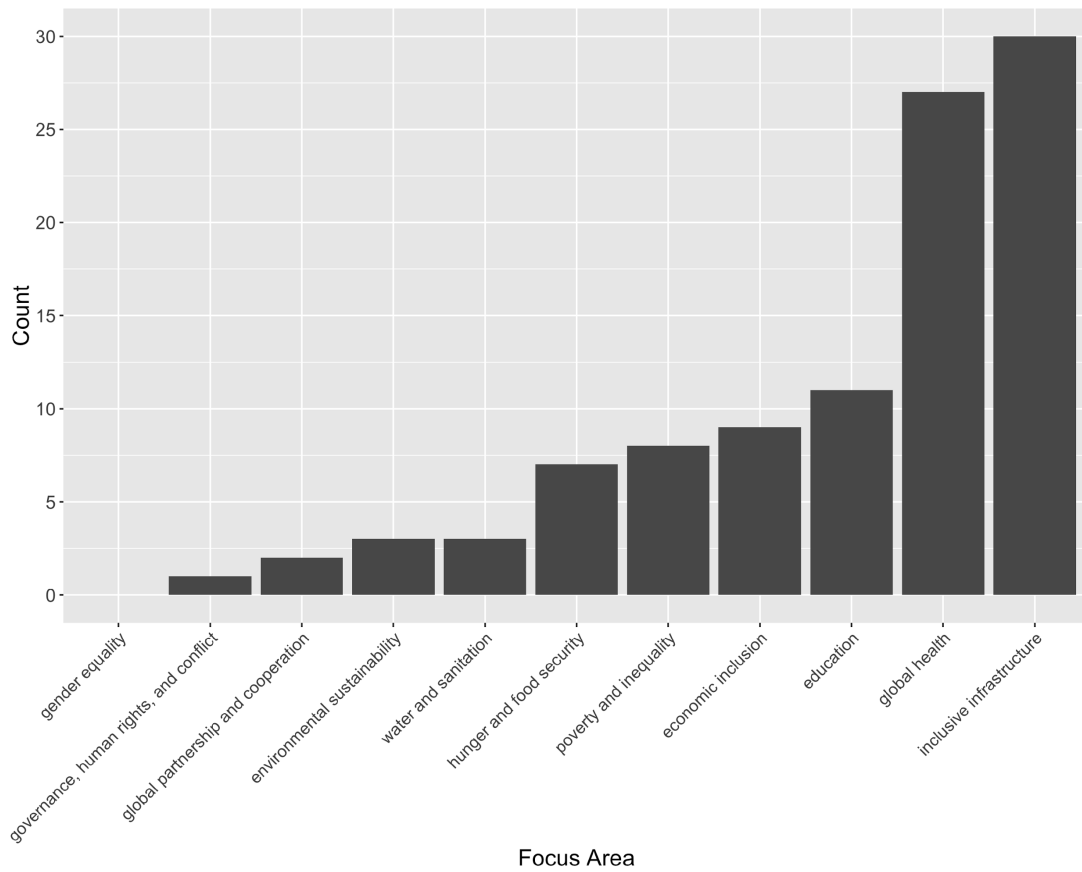


Figure 2. Number of papers published in the dataset in each focus area.

The number of papers published in each focus area per year is shown in Figure 3. Global health and inclusive infrastructure were the most frequent focus areas in most years. The increasing popularity of both inclusive infrastructure and global health projects is recent, which is likely due in part to the recent technological advancements of ICTs.

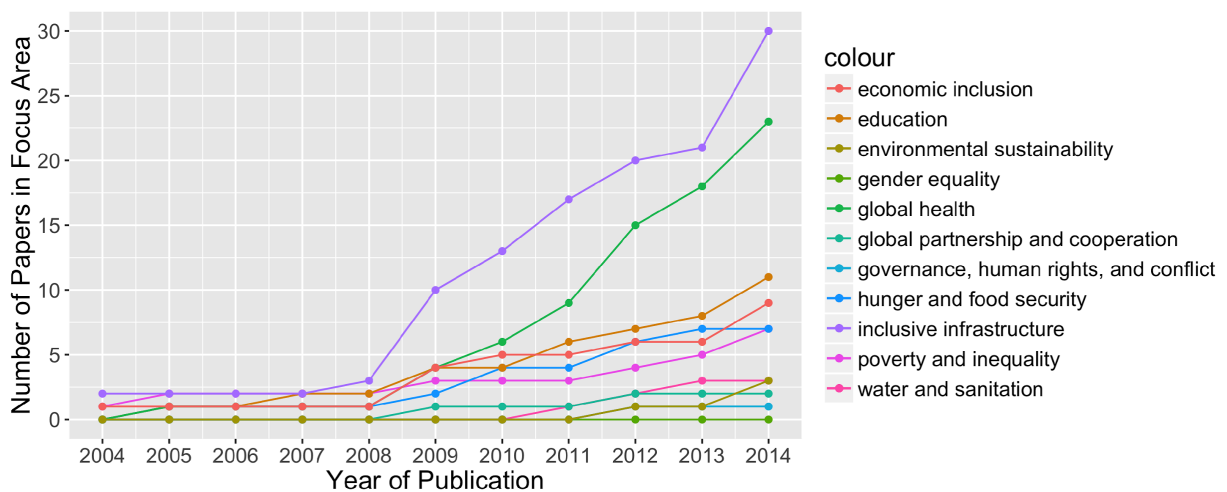


Figure 3. Cumulative number papers published in the dataset by year, separated by focus area.

(Note: We have excluded 2015 from this graph, as the data was pulled in March 2015 and therefore the counts for 2015 are incomplete).

When is HCD+D Being Done?

Figure 4 shows the trends over the span of time for which HCD+D papers have been published. The first HCD+D paper was published in 2004, but only seven papers in our data set were published before 2009. In 2009, there was a large spike in publications, and since then, between six and twenty HCD+D papers have been published each year.

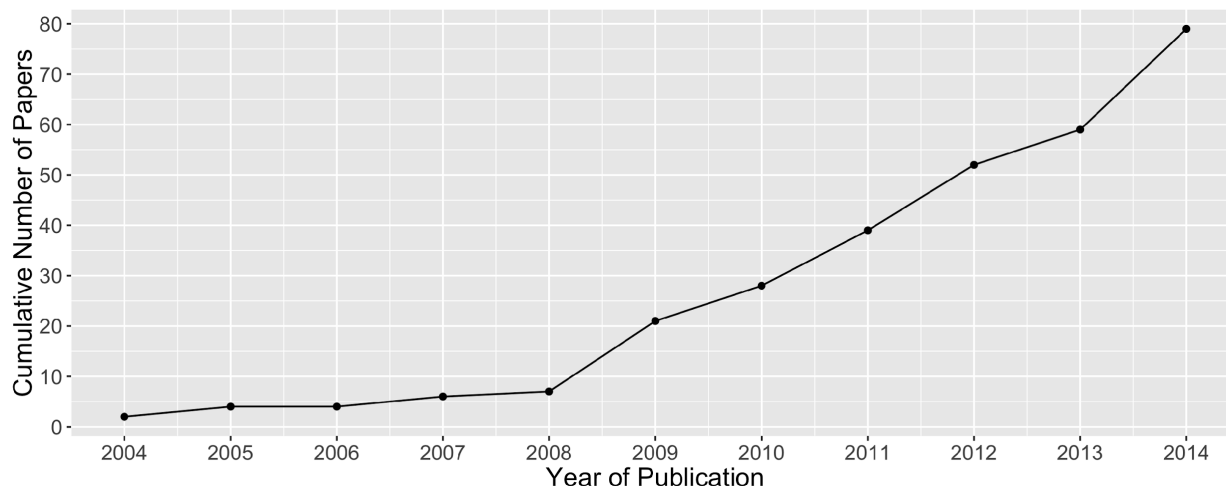


Figure 4. Cumulative number of papers published in the dataset by year. (Note: We have excluded 2015 from this graph, as the data was pulled in March 2015 and therefore the counts for 2015 are incomplete).

Where is HCD+D Being Done? Where is HCD+D Coming From?

To show the geographic landscape, we developed choropleths that display the prevalence of publications and authors, inhabited inside a country.

The authors were in thirty-seven different countries, as shown in Table 4. We split the set of authors for each publication into two subgroups, first author and other authors, in an attempt to capture the primary location of knowledge creation, as proxied by the location where the first author was affiliated at the time of publication. However, for completeness, we still include the “other authors” (i.e., the rest of the authors on the paper) in our analysis, but we present the “first author” and “other author” counts separately. Each author might carry several affiliations and therefore represent multiple countries.

Table 4 shows that 145 unique authors (out of 261 authors who published in the dataset) are from the United States. Fifteen authors are from Kenya and fifteen authors are from Malaysia, rounding out the top three most frequent countries of location. It is noteworthy that the majority of authors in the HCD+D dataset carry affiliations in the United States.

Table 4. Number of authors who published in the dataset, separated into “first authors” and “other authors”, who are from different countries.

Country Name	Country Code	Number of First Authors	Number of Other Authors
United Arab Emirates	AE	1	2
Australia	AU	3	5
Bangladesh	BD	1	1
Brazil	BR	2	6
Botswana	BW	1	0
Canada	CA	1	0
Switzerland	CH	2	1
China	CN	2	2
Colombia	CO	1	0
Cyprus	CY	0	2
Germany	DE	2	5
Denmark	DK	0	1
Egypt	EG	1	3
Spain	ES	1	4
Ethiopia	ET	1	2
France	FR	0	1
United Kingdom	GB	4	3
Greece	GR	1	5
Ireland	IE	0	1
Israel	IL	0	1
India	IN	1	8
Italy	IT	1	7
Japan	JP	2	3

Kenya	KE	1	14
Cambodia	KH	0	1
Korea	KP	1	2
Malaysia	MY	4	9
Mongolia	MN	0	2
Netherlands	NL	3	9
Norway	NO	2	2
New Zealand	NZ	0	1
Sweden	SE	2	5
Singapore	SG	1	0
Thailand	TH	1	6
Taiwan	TW	1	0
Uganda	UG	0	3
United States of America	US	40	105
South Africa	ZA	5	10

Forty-eight unique countries have been studied as research locations, as shown in Table 5. Each paper might include multiple research sites, or might refer to a broader geographical area than just a single country (e.g. “East Africa”). Table 5 also shows that the United States (thirteen papers), India (nine papers), and Kyrgyzstan (seven papers) are the three most frequent locations where HCD+D research is completed.

Table 5. Number of papers in the dataset that engage in research in different countries.

Country Name	Country Code	Number of Mentions as Research Site
United Arab Emirates	AE	1
Australia	AU	1
Bangladesh	BD	1
Brazil	BR	4
Botswana	BW	1
Democratic Republic of the Congo	CD	1
Switzerland	CH	1
China	CN	4
Colombia	CO	2
Cyprus	CY	1
<i>N/A</i>	East Africa	1
Egypt	EG	1
Spain	ES	1
Ethiopia	ET	1
United Kingdom	GB	1
Ghana	GH	1
Greece	GR	1
Indonesia	ID	1
India	IN	9
Iran	IR	2
Italy	IT	1
Japan	JP	2
Kenya	KE	5

Kyrgyzstan	KG	7
Cambodia	KH	1
Kazakhstan	KZ	4
Lao PDR	LA	1
Sri Lanka	LK	1
<i>N/A</i>	Middle East	1
Mongolia	MN	1
Malawi	MW	1
Malaysia	MY	4
Namibia	NA	1
Nigeria	NG	1
Netherlands	NL	1
Peru	PE	1
Pakistan	PK	2
Paraguay	PY	1
Rwanda	RW	2
Sweden	SE	2
Thailand	TH	2
Tajikistan	TJ	4
Turkey	TR	1
Tanzania	TZ	1
Uganda	UG	6
United States of America	US	13
Uzbekistan	UZ	4
South Africa	ZA	6

There is a more uniform dispersion of locations where HCD+D research has been conducted (Table 5), as compared to locations where HCD+D authors reside (Table 4). There are also more countries where research has been conducted than there are countries that have produced design projects. In total, fifty-seven countries are represented in the dataset as either a country of author location or a research site, which is only a small portion of all countries in the world.

Country Classifications

In order to gain further insights concerning the differential prevalence of the research sites and author location, we categorized countries into three development-based groups:

developed economies, economies in transition, and developing countries. Based on the groupings of the United Nations Development Programme (UNDP), the categories select countries based on their geographic/regional context, gross national income per capita, fuel exporter status and other ‘ad-hoc criteria’ as the UNDP deemed appropriate. While these demarcations made by the UNDP are imperfect, their classification can serve the purpose of illustrating which countries conduct this research, and broadly in which regions they focus their work¹⁷.

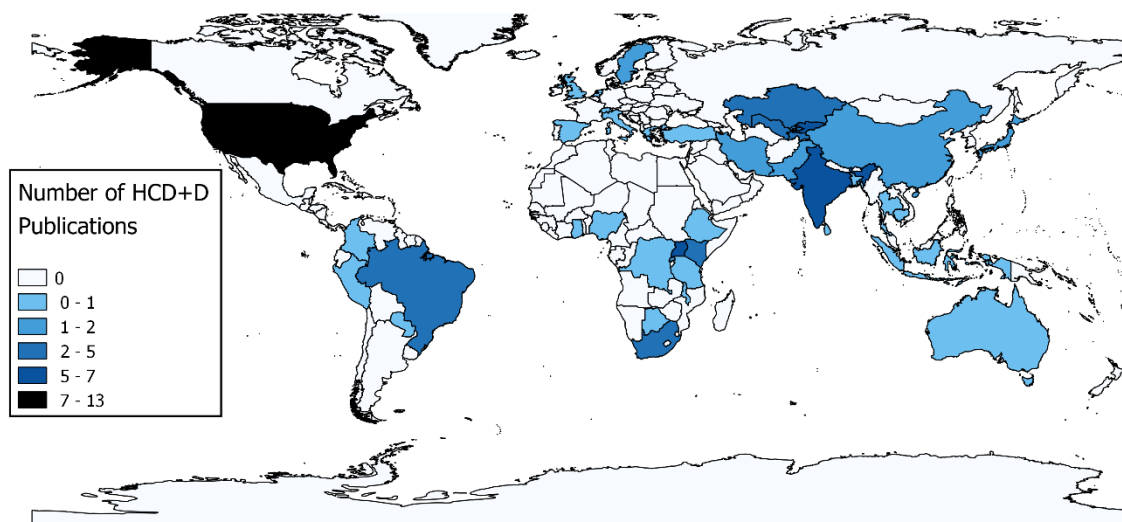


Figure 5. Choropleth of where researchers from developed countries conducted their research.

For authors who are currently located in developed countries, the overwhelming majority of research is in the U.S., as evidenced by Figure 5. Authors from developing countries are also engaging in HCD+D outside of the U.S, such as India, Brazil, Kenya, Uganda, Kazakhstan, and South Africa.

¹⁷ United Nations Development Programme. Department of Economic and Social Affairs. United Nations, n.d. Web. <http://www.un.org/en/development/desa/policy/wesp/wesp_current/2012country_class.pdf>.

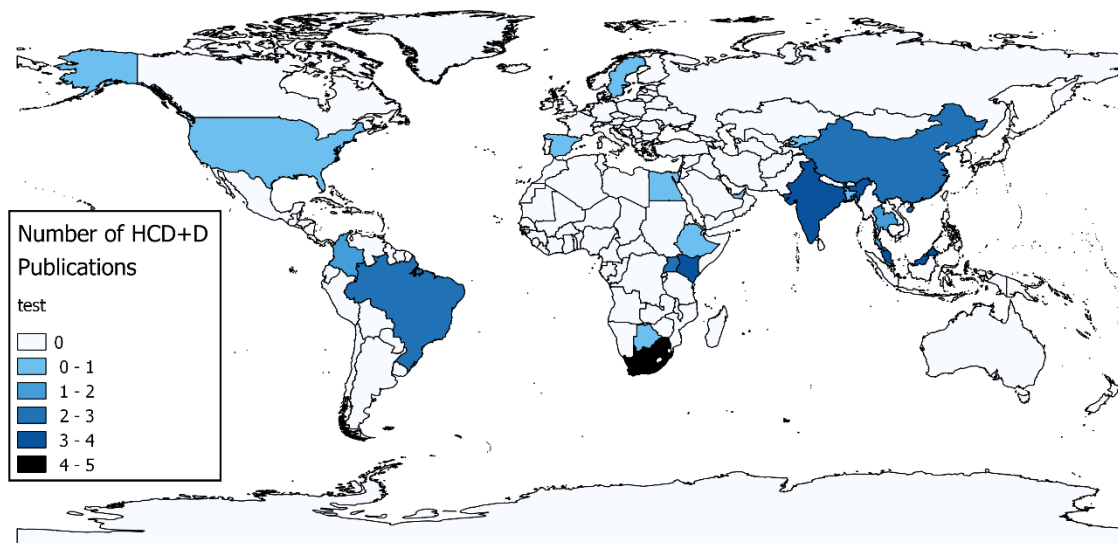


Figure 6. Choropleth of where researchers from developing countries conducted their research.

Authors who are not from developed countries conduct research most commonly in South Africa, India, and Brazil, as evidenced by Figure 6. Other notable countries are Kenya, Uganda, Malaysia, and Kazakhstan.

Interestingly, we see that none of the authors in our dataset were from transition countries,” and the only authors who conducted research in transition countries were from the United States and Israel.

Hybrid Insights

We also combined the separate question categories we asked above (who, what, when, where) in different ways to describe crucial insights of the data that might not be captured by filtering across one of the single categories. These insights are nowhere near comprehensive; however, they tell further interesting stories about the data. We invite researchers to utilize, critique, and more deeply investigate the methods for their own systematic characterizations.

As expressed before, the earliest HCD+D research, according to our dataset, was published in 2004; in this year, first authors only hailed from South Africa and the United States. It is not surprising to see the United States among the first to publish HCD+D research; however, the publication in South Africa may insinuate an increased awareness of HCD+D in South African communities.

In 2004, the HCD+D studies were all performed in the first author’s country of origin. Later, data is expressed on the existing trends of where HCD+D studies are performed relative to the origin of the authors that are involved in each study. It may be interesting to monitor these trends in the future.

According to our database, the most HCD+D research was published in 2014 compared to other years. During the peak year for HCD+D publications, the United States published the most research. Others involved include Egypt, Germany, the Democratic People's Republic of Korea, Malaysia, Norway, South Africa, Singapore, and the United Kingdom. Figure 7 identifies the countries where HCD+D research was performed in 2014.

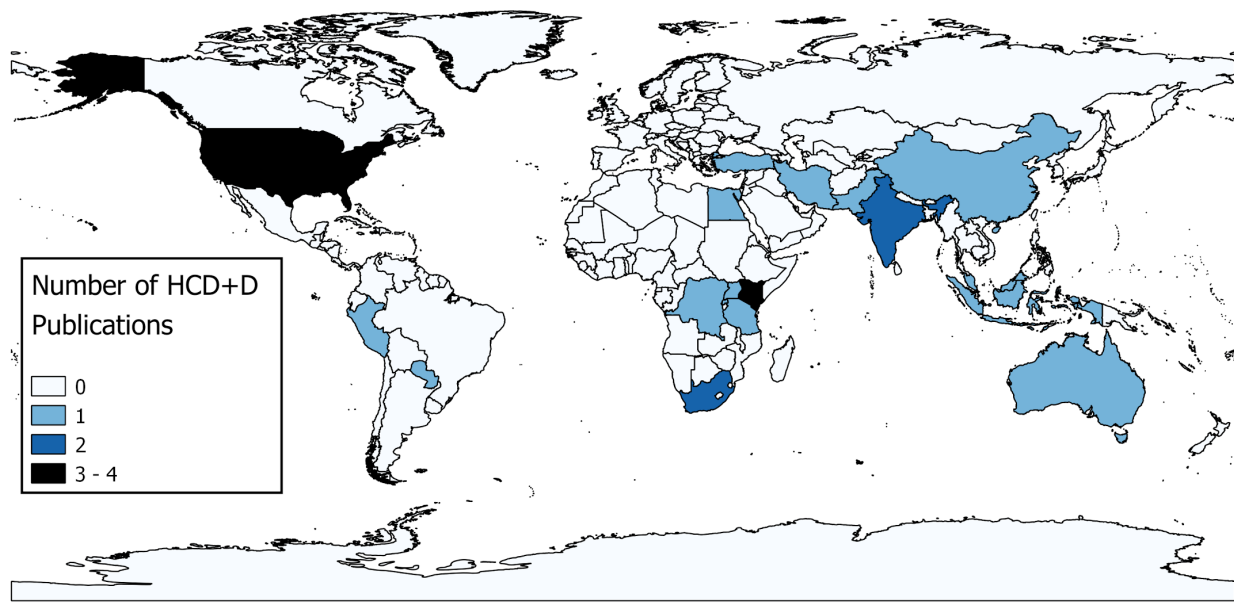


Figure 7. Choropleth of where researchers conducted their research in 2014.

During the peak year for HCD+D publications, the most research was performed in the United States; however, this was less than half of the publications from the United States in that year. Other countries where HCD+D was performed include Australia, the Democratic Republic of the Congo, China, Egypt, India, Islamic Republic of Iran, Kenya, Malaysia, Paraguay, Peru, Pakistan, Rwanda, South Africa, Turkey, the United Republic of Tanzania, Uganda, and Indonesia.

We quantified the frequency in which authors from each country performed HCD+D research outside of their respective region-of-location. Figure 8 displays this information for countries in our database with multiple HCD+D publications.

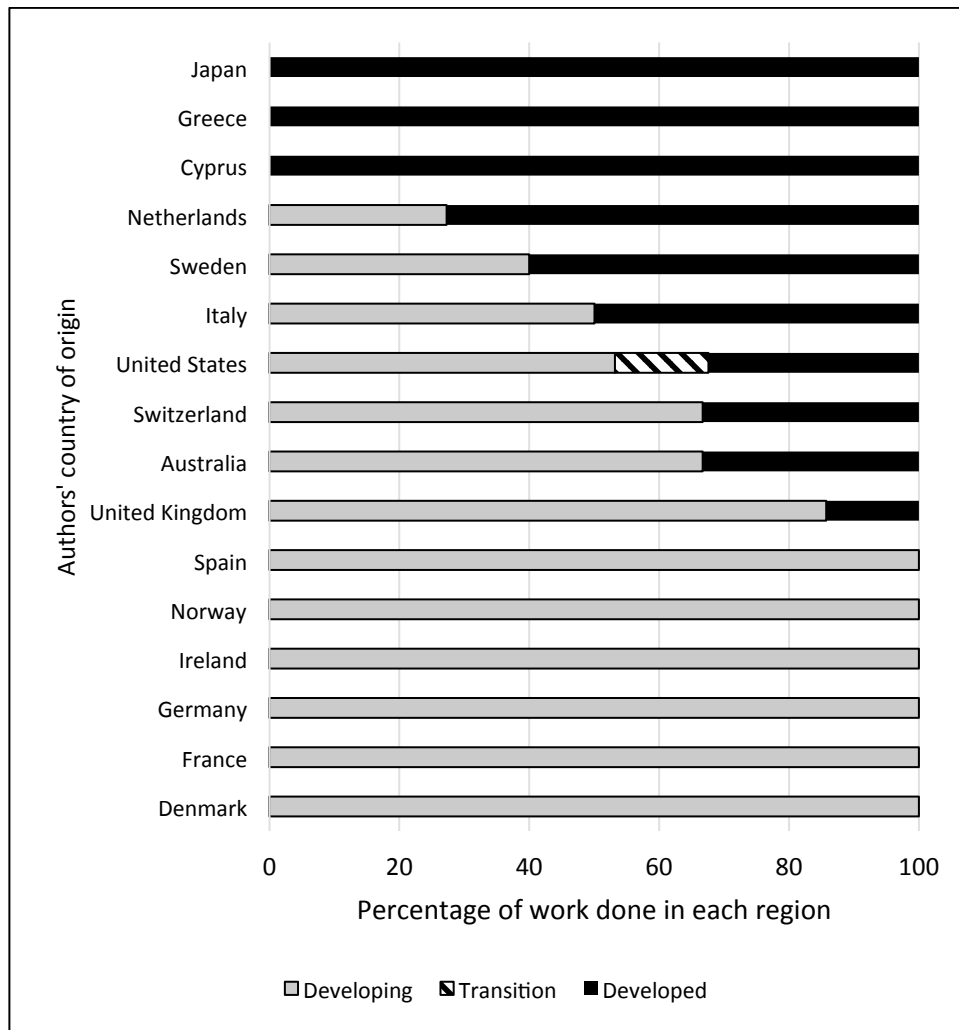


Figure 8. Percentage of HCD+D research done in each region, by developed-country based authors.

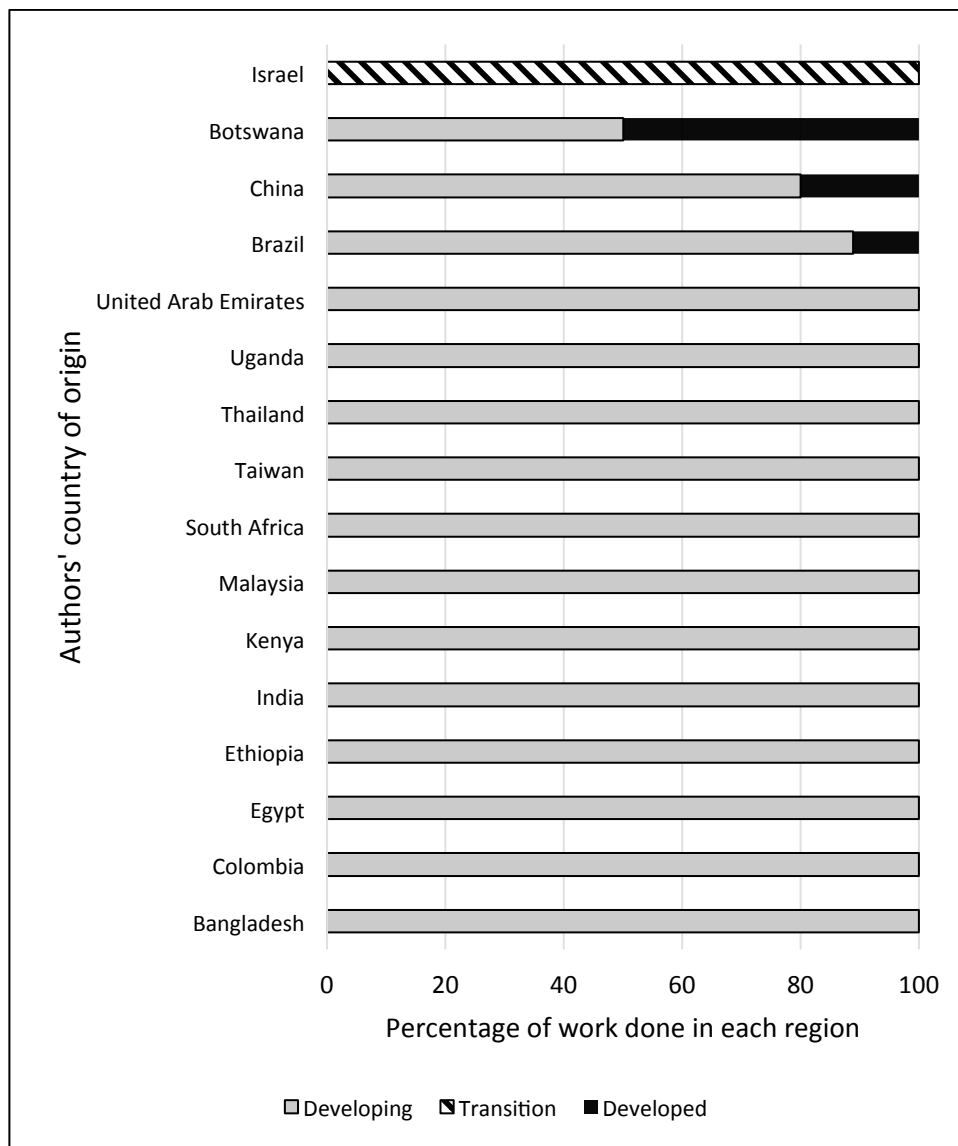


Figure 9. Percentage of HCD+D research done in each region, by developing-country based authors.

Figures 8 and 9 illustrate the aforementioned regions where authors from certain countries conduct their research; in developed, transition, or developing countries. Figure 8 illustrates countries in the dataset from 'developed' countries, and Figure 9 from 'developing' countries

As can be seen, developed country-based authors work outside their regions frequently. Spain, Norway, Ireland, Germany, France, and Denmark actually work completely in the 'developing' regions. The data show 47% of the HCD+D research from authors in developed countries published work sited in a developed country. However, Only 5% of authors from developing countries were involved in studies outside their 'development' category; outside the 'developing region-of origin. In short, the HCD+D field may not be exempt from the broad influence that developed countries have on the global community, and

this must be taken into consideration when understanding the influence of HCD+D methods on research outcomes. Moreover, a very interesting finding is that no researchers in the dataset were found from the ‘transitioning’ countries. Learning about development-centric HCD research could reveal particularly why this is the case.

Limitations

This project focused upon understanding the current state of research for design thinking for development, by answering questions about who engages in the research, what type of projects they engaged in, where they research and hail from, and the dates of the research. However, we must mention certain limitations of our chosen methods, in hopes that future researchers will improve upon them.

Systematic Deselections Limit the General Applicability of the Findings

In assembling the dataset for analysis, we made a systematic series of deselections to the set of papers resulting from a Google Scholar search. Though these deselections were made to assemble a representative dataset, each round simultaneously limited the broader claims we could make of our analysis. We are only able to generalize our findings to a very specific subset of papers: those that are written in English, peer-reviewed, readily available online, and discuss a relevant first-person account of a design for development project. Our analysis is also limited by the fact that it only considered peer-reviewed publications. Developing more generalizable findings will require more generalizable deselections – and more systematic reviews.

Geographic Analysis of HCD+D Cannot Holistically Interpret the Participatory Reach of HCD+D Research

Though we add geographical analysis to our data methods and visualization capabilities through the choropleths we depict here, we cannot fully represent the HCD+D principle we aim to represent here: designer-user distance. implicates a rough approximation for the designers to be geographically, culturally, institutionally, and otherwise separate from the communities they aim to impact. We see this reality theorized by Donaldson earlier in this paper and represented through our data, as many designers work in countries far from their own. However, designer-user distance should not only be represented by physical distance; the scale of cultural competence of designers, and the level of participation of the eventual target users in design decisions, should be analyzed more deeply as well. We leave such analysis for future researchers.

Conclusions

The research conducted in this manuscript contributes to a broader understanding of what the current landscape of research in human-centered design for development looks like. This work resulted in several conclusions, discussed in detail in the subsections below. In this section, we highlight specific conclusions for each of the analytic lenses we applied to the dataset. Each of these conclusions points to the areas where the HCD+D field can improve in the future. Future researchers are encouraged to leverage these conclusions as starting points for further investigation.

HCD+D, and a large majority of the authors have not published before their contributions in the discourse. Inclusive infrastructure and global health were the foci

mentioned the most, and gender equality was not a specific focus area in any of the HCD+D papers. Additionally, information and communication technologies (ICTs) comprise a major portion of all the inclusive infrastructure projects. The other categories have not increased at nearly the same rate.

Only 48 countries represent the current landscape, which is less than a quarter of the countries in the world.¹⁸ Moreover, we note a burgeoning interest in geographically broadening HCD+D practice across the globe. The vast majority of research is coming from the United States (145 author mentions) and the set of authors come from only 37 countries. However, we also note an increase in researchers from Non-Western countries; particularly, South Africa, India, Kenya, Brazil, and China. We also note a large majority of research from, and being conducted in the United States, with thirteen papers mentioning the country as a research site. This country has the most diverse places where it conducts research, has the most authors, and has the most research conducted within its borders. We also note that most of the community members who research across country lines are from western countries, such as the North America, Europe, and Australia. As the field grows in popularity over the years, it grows in diversity of researcher location, area of study, and topic of interest. We hope these trends towards further diversity of HCD+D use will continue over the coming years.

Development work is currently in a “Mixed Response” wave,^{17,19} where we are seeing a divergent exploration of design in development along with a set of cautious critiques on design in development.^{5,6,17} The increasing numbers of authors and papers in the dataset each year suggest a burgeoning desire to engage in meaningful design work. To leverage the talents and resources of motivated researchers effectively, we must continue to engage in critical conversations around the appropriateness and the use of design in development efforts. As mentioned in the introduction, design practice in general follows a similar tendency of external designers intervening in spaces they do not belong to, and therefore the design methods adapted for development practice require nuanced thought and consideration. We must ensure that our intentions are aligned with our methods, and therefore we must seriously consider the use of methods in our design work.

At the moment, the findings give pause to the notion that HCD+D is currently a globally interconnected field. The research being done in HCD+D is still strongly biased towards a small number of countries around the world. Going forward, HCD+D must encourage, support, and fund designers living and researching around the world in order to foster a more representative community.

The first HCD+D papers were published only 12 years ago in 2004. 2009 saw the first spike in interest and, since then, between six and twenty papers have been published each year. The largest set of papers (20) was in the last full year of our study 2014 and this upward trend is likely to continue, given the continued increase in HCD+D interest across universities and industries. The upward trend of new publications, and new authors, is optimistic and suggests that the field is likely to continue to not only grow but to mature. This research aims to support HCD+D researchers and practitioners in creating effective solutions to issues of

¹⁸“Independent States in the World.” *State.gov*, 2016. Available at <http://www.state.gov/s/inr/rls/4250.htm>.

¹⁹ Fathers, J. W. R. “The role of design in development since 1945,” *Proceedings of the Gregynog Development Colloquium*, (2004).

global relevance. With its multi-faceted approach, human-centered design and design thinking offer a unique toolset to address issues of poverty, deprivation, and underdevelopment. In order to drive the field forward, however, we must continue to engage in a critical reflection of HCD and its use in development. Below are a collection of potential future directions for suggested research.

More on Who is Working in HCD+D

To further understand who is researching in HCD+D, we plan to use techniques of social network analysis to understand what the “community” of HCD+D practitioners looks like. Who is publishing together? Are communities of practitioners defined by geographic boundaries? How has the HCD+D community changed over time?

To begin to answer these questions, we can consider the set of authors in this dataset as a community of HCD+D practitioners. We know the countries these authors are affiliated with, we know when they publish, and we know the co-authors they publish with. We can also use these methods to develop tracking mechanisms to understand the research communities over time. “We centered the ‘where’ section of the analysis around the prevalence of remote design. Extending this research to investigate further manifestations of designer-user distance, or ways that the researchers/designers are geographically, culturally, institutionally, and otherwise separate from the communities they aim to impact, also demands further investigation.

More on How is HCD+D Being Done

To further understand how HCD+D research is being conducted, we can perform a more in-depth dive into understanding the contextual use of design methods. Are there particular methods that pair well together? Are there particular methods that match well to certain contexts? This research is critical to understanding how design methods can be most effectively taught to aspiring, novice, and practicing HCD+D practitioners. By providing HCD+D practitioners with an appropriate set of methods for different design contexts, we hope to increase the prevalence of successful outcomes of design research.

Related to the question of success, we also plan to explore what marks the success or failure of a design method. Many different design methods suggest a wide variety of design methods which designers can use to understand, prototype, or test their interventions. A critical repository, and ontology, of design methods is available in the Design Exchange and Celeste Roschuni²⁰. How do design methods contribute to successful or unsuccessful design outcomes? What support is needed for designers to use design methods effectively? We can also learn which methods of the research community are preferred, which methods are used less, and which methods are not currently in the repository. This search would give us an understanding of which practices should be applied to which contexts.

We also can extend the ‘remote design’ insights adapted from the data. Because interesting insights concerning where HCD+D researchers come from, and where they

²⁰Celeste Roschuni, “Communicating Design Research Effectively,” (Berkeley, California: University of California Berkeley, 2012).

conduct their research, were collected, we can further extend this research towards understanding the level of inclusion of the target community. To do this, we can investigate contextual differences between the designated ‘designers’ and ‘users,’ and analyze ways that these differences influence how they design. Additionally, we can apply ladders of participation to the paper set²¹: by investigating the level of involvement of the target users, the similarities and differences between the stakeholder profiles of the communities involved in the design process, and the level of design decision-making between these stakeholders, we can learn how involved the target communities actually are in innovation practice.

HCD+D: Why, for the future

There are many dimensions to the question of *why* HCD+D research is being done: (1) why does a person choose to conduct an HCD+D project? (2) why does a person choose to conduct a particular HCD+D project? (3) why does a person choose to approach their HCD+D project in a particular way?

We found attempting to answer these questions requires a more nuanced and holistic understanding of the authors themselves. In particular, question 1 also requires a deeper understanding of the historical relationship between design and development. Given the limitations of our dataset, we were not able to address these questions, and leave these analyses to future research.

However, answering these questions is critical to better understand the methodological place that design practice holds in addressing development issues. If design research is truly novel to the current context of global poverty issues, what advantages does it bring as a tool set, methodology, or mindset over other approaches? As expressed before, though the current iteration of HCD+D has recently exploded, designers who address international development issues, have been present since at least the close of World War II. “Human-centered design” is a relatively recent term, and many researchers and designers are beginning to develop their own HCD+D projects, as shown by the growing number of papers and authors publishing HCD+D papers yearly. Globalization also likely drives the adoption of the methods, both as a way that the methods become more available to decentralized network of actors and how those actors learn about problems which could potentially be addressed with the methods. It is critical, however, that the emerging excitement around HCD+D and its role in contributing to global poverty issues must be couched in consistent reflection and critique. The research illustrated here is a first step in broadly characterize HCD+D towards that reflection. We invite the growing community of HCD+D practitioners to reflect upon their practice and values to ensure the field approaches the complex problems of today equitably, justly, and with merit.

²¹ Harder, Marie K., Gemma Burford, and Elona Hoover. "What Is Participation? Design Leads the Way to a Cross-Disciplinary Framework." *Design Issues* 29.4 (2013): 41-57. Web. 24 Apr. 2016.

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