Gerda Gemser, College of Business, Department of Economics, Finance and Marketing, RMIT University, Australia
Cees de Bont, School of Design, Hong Kong Polytechnic University, Hong Kong, China

she ji
[ʃə: dʒi:]

Design-Related and Design-Focused Research: A Study of Publication Patterns in Design Journals

Abstract In this paper we examine publication patterns in peer-reviewed journals that publish design research. Our data consists of 4727 articles and their citations as published in 11 journals over a ten-year period (2000–2009). These 11 journals are classified as either design-related or design-focused, depending on whether they specialize in design research or related disciplines. Our research findings suggest that the research community publishing in design-related journals is, for the larger part, made up of different institutions and scholars than the research community focusing on design-focused journals. The design-focused journals seem to be less impactful than the design-related journals. Top authors from the design-focused community tend to publish more papers in the design-related journals than the other way around.

Keywords
Design research
Design journals
Publication patterns

Received February 16, 2016
Accepted May 23, 2016

Emails
Gerda Gemser
(corresponding author)
gerda.gemser@rmit.edu.au

Cees de Bont
cees.debont@polyu.edu.hk

http://www.journals.elsevier.com/she-ji-the-journal-of-design-economics-and-innovation
http://dx.doi.org/10.1016/j.sheji.2016.05.002

Introduction

The discipline of design is relatively young, but has rapidly matured in recent decades. This is evidenced by an increase in the number of design journals and dedicated design conferences since the late 1980s, and by an increase in the amount of attention being paid to design in journals from other academic fields like innovation and marketing.[1]

As the body of design research develops and expands, it is interesting to examine the publication patterns of institutions and researchers publishing in the field of design. In other research fields, studies providing rankings of schools and scholars on the basis of the number of papers published, and the citations of these papers, are relatively common.[2] In this paper we also recognize the performance of those universities and scholars that have made a significant contribution to the academic development of the design discipline. Another major aim of this paper is to provide insight into the publication patterns of leading institutions and scholars.

A recent study provided a list of 14 journals considered to be leading in industrial design research.[3] When examining the nature of these 14 journals, a distinction can be made between so-called *design-relevant* journals and *design-focused* journals. Design-relevant journals focus on a disciplinary area such as ergonomics or human-computer interaction. Design researchers use insights from these fields in their design research, and contribute to these fields when publishing their work in these journals. However, if design research is understood to focus on the development of and human interaction with products and services, as in Gemser et al.'s study, some of the papers being published in these design-relevant journals cannot really be called design research. Design-focused journals, on the other hand, do specifically focus on design research – even though they do cover a broad spectrum of design aspects.

In this paper, we show there is a substantial difference in ranking in terms of top design schools and scholars according to the type of journal – design-relevant or design-focused – they choose. Our data consists of articles and their citations as published in six design-related and five design-focused journals over a ten year-period (2000–2009). In the next three sections of this paper, we will elaborate on the methods used to collect and analyze this data and present our findings. In the concluding section, we will discuss the implications and limitations of our study.

Research Method

In this paper, we examine publication patterns in design research by examining articles published in peer-reviewed journals over a 10-year period (2000–2009). The peer-reviewed journals included in our investigation are a subset of the 14 journals identified as leading in the industrial design field in Gemser et al.'s study in 2012. In that article, the authors defined and delimited design research as "research on developing and interacting with products and services."[4] Because we used this subset as our sampling frame, the present research on publication patterns in design research observes the same delimitation and thus excludes design research on architecture or landscape design, for example. For three of these 14 leading design journals – *Journal of Design History*, *Design and Culture*, and *Journal of Design Research* – there was no reliable information on citations, since these journals are not included in either Scopus or Web of Science.[5] Because citation data is necessary to assess the impact of institutions in the design field, we decided to exclude these journals. The 11 remaining top design journals included in our study are listed in table 1. As noted earlier, we make a distinction between design-relevant and design-focused journals, thus table 1 specifies to which category the different journals belong.

To examine publication patterns in design research, here we build on existing

1 For example, in the *Journal of Product Innovation Management* one editor calls for more papers from the domain of design research, saying "[I] would like to see continued growth in submissions from our colleagues in other functional areas, particularly strategy and design." Wim Biemans, Abbie Griffin, and Rudy Moenaert, "Twenty years of the Journal of Product Innovation Management: History, Participants, and Knowledge Stock and Flows," *Journal of Product Innovation Management* 24, no. 3 (2007): 193–213.

2 For innovation management, see for example Pianpian Yang and Lei Tao, "Perspective: Ranking of the World's Top Innovation Management Scholars and Universities," *Journal of Product Innovation Management* 29, no. 2 (2012): 319–31; Jeff Thieme, "Perspective: The World's Top Innovation Management Scholars and Their Social Capital," *Journal of Product Innovation Management* 24, no. 3 (2007): 214–29. For marketing, see for example Louis TW Cheng, Kam C. Chan, and Ricky YK Chan, "Publications in Major Marketing Journals: An Analysis of Research Productivity of Asia-Pacific Universities," *Journal of Marketing Education* 25, no. 2 (2003): 163–76; Scott J. Vitell and Gregory M. Rose, "Publications in Major Marketing Journals: An Analysis of Scholars and Marketing Departments," *Journal of Marketing Education* 22, no. 2 (2000): 99–107. For finance, see for example Kenneth A. Borokhovich, Robert T. Bricker, Kelly R. Brunarski, and Betty J. Simkins, "Finance Research Productivity and Influence," *The Journal of Finance* 50, no. 5 (1995): 1691–1717; Kam C. Chan, Carl R. Chen, and Thomas L. Steiner, "Who is Publishing? An Analysis of Finance Research Productivity in the European Region," *Journal of Business Finance & Accounting* 31, no. 3–4 (2004): 401–437; and Elvis Jarnecic, R. Segara, L. Segara, and J.P. Westerholm, "The Scholarly Output of Universities and Academics in the Asia-Pacific Region Who Publish in Major Finance Journals: 2000–2007," *Australasian Accounting Business and Finance Journal* 2, no. 3 (2008): 2. For educational psychology, see for example M. Cecil Smith et al., "Productivity

methodological approaches used in other research fields to rank schools, departments or individual scholars. University rankings are traditionally based on faculty publishing aggregation[6] where all publications are credited to the author's affiliated university at the time of publication. We follow the same method for this paper. If a publication has multiple authors from different affiliations, the publication counts for each author and for each affiliation. This approach cumulates the number of publications each institution or author produced during the period examined.[7] We adopt this 'whole' counting approach – rather than fractional or weighted counting – because it is considered easier to comprehend and interpret.[8]

In prior ranking studies, either the institutional[9] or departmental level[10] is used to provide rankings. We focus on the institutional level. It would be difficult to rank design departments or design faculties, because universities may not have such departments and faculties, or sometimes the department or faculty of design is combined with other related fields. For example, the University of Technology Sydney has a "Faculty of Design, Architecture and Building," while the University of Twente in the Netherlands has a design department that is part of the Faculty of Engineering Technology.

We have examined publication patterns not only by examining the number of papers that institutions and individual scholars publish, but also by examining the number of citations. Citations provide insight into the extent to which highly prolific authors have both contributed to the stock of available design knowledge, and defined – by means of their highly cited articles – part of the research agenda of the field.[11] Information on articles and their citations in the 11 design journals between 2000 and 2009 were extracted from the Web of Science database. We supplemented the Web of Science data with data obtained from Scopus. To be more specific, Scopus was used for *Design Studies* and *The Design Journal*, because the Web of Science data did not cover the entire research period – *Design Studies* was included in the Web of Science database as of 2004, and in the Scopus database as of 2000; *The Design Journal* was included in the Web of Science database starting in 2009, and included in the Scopus database starting in 2005. Because there was no complete coverage of *The Design Journal* in Scopus – coverage began in 2005 – publication data for 2000-2004 on author names, publication year, and authors' affiliations were manually collected for this journal and added to the database. Because of the incomplete coverage in Scopus, citation data for articles published from 2000–2004 in *The Design Journal* are missing, which should be taken into account when interpreting the results. For the *International Journal of Design* we have publication and citation data from 2007 onwards – when the journal was established.

Our focus is on scholarly design articles. We excluded editorials, guest editorials, guest commentaries, corrections, and book reviews. In total, author names, publication year, journal name and author's affiliation were retained for 4727 articles. Of these articles, 3672 are published in design-related design journals, and 1055 articles in design-focused journals. In other words, the design-related journals included in our study published more than three times as many articles as the design-focused journals in the research period covered. This of course affects findings, and provides further rationale to make separate ranking lists for institutions and individuals publishing in design-related versus design-focused journals. Table 1 shows the breakdown of the articles per selected journal from 2000–2009.

Some authors use different names or different initials in different publications. If this was suspected, additional research was undertaken to examine whether the publications belonged to the same author or not. This was done by examining, in-depth, the author's affiliation and searching relevant university websites.

The 4727 design papers included in our sample were from 1999 different universities and non-academic institutions worldwide. There are 1180 affiliations with

of Educational Psychologists in Educational Psychology Journals, 1997–2001," *Contemporary Educational Psychology* 28, no. 3 (2003): 422–430. For system and software engineering, see for example Robert L. Glass, "An Assessment of Systems and Software Engineering Scholars and Institutions," *Journal of Systems and Software* 27, no. 1 (1994): 63–67.

3 Gerda Gemser, Cees de Bont, Paul Hekkert, and Ken Friedman, "Quality Perceptions of Design Journals: The Design Scholars' Perspective," *Design Studies* 33, no. 1 (2012): 4–23.

4 Ibid., 6.

5 Web of Science (provided by Thomson Reuters) and Scopus (provided by Elsevier) are both multidisciplinary databases with citation indexing. Research on social sciences literature has shown that Web of Science and Scopus have significant advantages relative to other databases such as Google Scholar or CSA Illumina in terms of coverage (at journal, article and cited reference level) and the quality of record processing. Michael Norris and Charles Oppenheim, "Comparing Alternatives to the Web of Science for Coverage of the Social Sciences' Literature," *Journal of Informetrics* 1, no. 2 (2007): 161–69; Chris Neuhaus, Ellen Neuhaus, Alan Asher, and Clint Wrede, "The Depth and Breadth of Google Scholar: An Empirical Study," *portal: Libraries and the Academy* 6, no. 2 (2006): 127–41.

6 Jonathan D. Linton, "Perspective: Ranking Business Schools on the Management of Technology," *Journal of Product Innovation Management* 21, no. 6 (2004): 416–30; Vitell and Rose, "Publications in Major Marketing Journals, Scholars;" Kam C. Chan, Hung-Gay Fung, and Wai K. Leung, "International Business Research: Trends and School Rankings," *International Business Review* 15, no. 4 (2006): 317–38; John B. Ford, Micheal S. LaTour, and Tony L. Henthorne, "Author and Institution Productivity in Industrial Marketing Management from 1971 to 1998," *Industrial Marketing Management* 30, no. 5 (2001): 441–52.

7 For example, see Lorelei R. Vinluan, "Research Productivity in

Table 1. Number of publications per journal title per year.[a]

Journal	Type of journal		Number of articles included per publication year												
	D-related	D-focused	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total articles	Total citations	Cit./artc.
Ergonomics	x		138	88	68	89	100	118	97	130	127	130	1085	10009	9.2
Computer-Aided Design	x		61	83	83	108	106	116	96	98	94	96	941	10930	11.6
Applied Ergonomics	x		66	63	58	68	66	78	76	84	88	124	771	6254	8.1
Human Factors	x		47	51	52	47	56	59	65	88	89	64	618	5716	9.2
Human-Computer Interaction	x		10	19	8	10	12	11	10	11	10	10	111	2581	23.3
Research in Engineering Design	x		19	4	15	20	12	15	14	11	15	21	146	1726	11.8
Design Studies[b]		x	29	29	27	32	30	28	31	31	30	36	303	3864	12.8
Journal of Engineering Design		x	24	24	25	26	34	32	32	37	32	33	299	1613	5.4
Design Issues		x	20	28	24	28	23	28	23	23	26	28	251	372	1.5
The Design Journal[c]		x	13	15	15	15	13	15	13	15	15	16	145	38[d]	0.5[d]
International Journal of Design		x								18	19	20	57	133	2.3
Total													4727	43236	

[a] Record count based on Web of Science, unless indicated otherwise.

[b] Record count based on Scopus.

[c] Record count based on Scopus and author research.

[d] *The Design Journal* has no complete citation count; only citations from papers published from 2005 are taken into account (year in which the journal was included in the Scopus database). To calculate the average number of citations per paper, we divided the total number of citations by the total number of papers in the period 2005-2009 (n=74).

only one publication. Since in this paper we focus on ranking academic institutions, non-academic research organizations such as TNO or NIOSH were eliminated from our rankings.

We combined publications from different campuses of universities if it was clear that these campuses were part of one university system: the University of Illinois, for example, has campuses in Urbana-Champaign, Chicago, and Springfield, so the publications of these three campuses were combined under the heading "University of Illinois."

For the citation analysis, we used citations to the articles included in our database from 2000 to August 2011 (start of our data collection). This allowed us to include some of the references published in the last two years of our timeline – 2008 and 2009. In spite of this, we acknowledge that those authors who published in the early days of the decade have had more time to amass citations than those who published at the end of the decade. In table 1, an overview is given of the total number of citations to the articles as published in the different journals sampled in this research. In total, the articles included in our database have 43,236 citations. Of the total number of papers included in our database (n=4727), n=495 were never cited and n=515 were cited only once in the period under review. In general, the articles published in the design-focused journals are cited with far less frequency than the articles in the design-related journals. In the period 2000-2009, there were

Education and Psychology in the Philippines and Comparison with ASEAN Countries," ***Scientometrics*** **91, no. 1 (2011): 277–94 for a similar approach.**

8 Yoshiko Okubo, "Bibliometric Indicators and Analysis of Research Systems: Methods and Examples," ***OECD Science, Technology and Industry Working Papers*****, no. 1997/01 (January 1997): 71.**

9 For example, see Cheng et al., "Publications in Major Marketing Journals, Research."

10 For example, see Vitell and Rose, "Publications in Major Marketing Journals, Scholars."

11 Compare with Okubo, "Bibliometric Indicators."

6020 citations in 984 articles in design-focused journals – an average of 6.12 citations per article[12] – whereas in design-related journals, there were 37216 citations in 3672 papers – an average of 10.14 citations per article.

12 This calculation excludes n=71 papers of *The Design Journal* as published in 2000–2004, since we had no citation data for these years.

Results

Publication Patterns of Institutions

Tables 2a and 2b show the most productive academic institutions in the world, according to either publications in design-related journals (table 2a) or design-focused journals (table 2b) from 2000–2009. To be included in table 2a (design-related journals), we used a cut-off of 30 or more papers. For table 2b, however, we used

Table 2a. Number of publications and citations per academic institution: *Design-related* journal publications.

			***Productivity* (*articles*)**	***Impact* (*citations*)**	
Rank	*Institution name*	*Country/Region*	*Total*	*Rank*	*Citations*
1	University of Illinois	US	75	2	1067
2	University of Michigan	US	74	3	840
3	University of Waterloo	Canada	61	5	701
4	Delft University of Technology	Netherlands	60	10	518
5	University of Central Florida	US	58	4	727
6	Georgia Institute of Technology	US	53	1	1115
7	VU University Amsterdam	Netherlands	52	9	562
8	Indiana Univ. - Purdue Univ. Indianapolis	US	50	15	487
8	Tsinghua University	China	50	23	383
10	Ohio State University	US	49	7	611
11	Loughborough University	UK	48	20	411
12	University of Wisconsin	US	45	11	513
12	Virginia Tech	US	45	26	337
14	Hong Kong Univ. of Science & Tech.	Hong Kong	44	12	511
14	Liverpool John Moores University	UK	44	14	497
14	University of Hong Kong	Hong Kong	44	16	460
14	University of Nottingham	UK	44	17	442
18	University of Cincinnati	US	41	13	506
19	Massachusetts Institute of Technology	US	37	6	645
19	North Carolina State University	US	37	19	414
19	University of Toronto	Canada	37	21	399
22	Brunel University	UK	35	23	383
22	National University of Singapore	Singapore	35	8	607
22	University of Washington	US	35	22	386
25	Korea Adv. Institute of Science & Tech.	South Korea	32	25	351
26	Hong Kong Polytechnic University	Hong Kong	31	29	249
27	Carnegie Mellon University	US	30	18	436
27	City University of Hong Kong	Hong Kong	30	28	286
27	University of Queensland	Australia	30	27	303

a much lower cut-off rate of 7 or more papers, considering the lower number of papers being published in design-focused journals overall. As shown in table 1, the number of publications published in design-related journals is much larger compared to those published in design-focused journals – 3672 versus 1055 in the period 2000–2009. Thus, a ranking procedure using a combination of design-related and design-focused journals would lead to a distorted picture.

According to table 2a, the 5 universities that were most productive in terms of publications in design-related design journals are the University of Illinois, the University of Michigan, the University of Waterloo, Delft University of Technology, and the University of Central Florida. With the exception of Delft University of Technology, these universities are all located in North America. When comparing

Table 2b. Number of publications and citations per academic institution: *Design-focused* journal publications.

			***Productivity* (*articles*)**	***Impact* (*citations*)**	
Rank	*Institution name*	*Country/Region*	*Total*	*Rank*	*Citations*
1	Delft University of Technology	Netherlands	43	1	419
2	Loughborough University	UK	23	8	128
2	University of Cambridge	UK	23	2	327
4	Carnegie Mellon University	US	20	7	140
5	Massachusetts Institute of Technology	US	18	5	243
6	Chalmers University of Technology	Sweden	17	11	99
7	Open University	UK	16	4	312
7	University of Technology Sydney	Australia	16	16	66
9	University of Illinois	US	15	24	28
9	University of Sydney	Australia	15	3	317
11	Eindhoven University of Technology	Netherlands	14	12	92
12	Cranfield University	UK	13	17	65
12	Georgia Institute of Technology	US	13	14	78
12	Penn State University	US	13	13	88
15	Hong Kong Polytechnic University	Hong Kong	12	25	27
15	Nanyang Technological University	Singapore	12	10	118
15	Swinburne University of Technology	Australia	12	27	17
15	University of Bath	UK	12	9	119
19	Sheffield Hallam University	UK	11	26	21
20	Brunel University	UK	10	15	73
20	Lancaster University	UK	10	19	57
20	National Cheng Kung University	Taiwan	10	6	196
20	University of Calgary	Canada	10	29	8
20	Istanbul Technical University	Turkey	10	23	29
25	National Taiwan University of Science & Tech.	Taiwan	9	20	42
25	University of Art & Design Helsinki	Finland	9	28	12
27	Middle East Technical University	Turkey	8	22	36
27	Nottingham Trent University	UK	7	30	1
27	University of Sheffield	UK	7	18	64
27	University of Wales	UK	7	20	42

productivity with impact (in terms of number of citations), we find that there are examples where there is a relatively large mismatch. When examining, for example, the top 15 universities in terms of productivity, examples of universities where there is a relatively large mismatch are Indiana University-Purdue University Indianapolis, ranked 8th in terms of productivity but ranked 15th in terms of impact; Tsing Hua University, ranked 8th in terms of productivity but 25th in terms of impact; Loughborough University, ranked 11th terms of productivity but 21st in terms of impact; and Virginia Tech, ranked 12th terms of productivity but 28th in terms of impact. There are two universities that ranked much higher in terms of impact than in terms of productivity: MIT, ranked 19th in terms of productivity but 6th in terms of impact; and the National University of Singapore, ranked 22th in terms of productivity but 8th in terms of impact.

The 5 universities that were most productive in terms of publications in design-focused journals are, respectively: Delft University of Technology, Loughborough University, the University of Cambridge, Carnegie Mellon University, and Massachusetts Institute of Technology. Of the top 5 institutions listed in table 2b, 3 are located in Europe and 2 in the U.S. Table 2b shows that there is a relatively large gap between productivity and impact for some universities. With regards to the top 15 in terms of productivity, for example, relatively large differences are present for University of Technology Sydney, ranked 7th in terms of productivity but 18th in terms of impact; the University of Illinois, ranked 9th in terms of productivity but 28th in terms of impact; and Hong Kong Polytechnic University, ranked 15th in terms of productivity and 30th in terms of impact. An example of a university for which impact is much higher than productivity would suggest is National Cheng Kung University, ranked 20th in terms of productivity and 6th in terms of impact. Finally, it is noteworthy that of the top-30 universities publishing in multidisciplinary design journals, three universities are cited less than 15 times, of which one was cited only once – Nottingham Trent University.

When comparing the list of universities in tables 2a and 2b, there is not much overlap – only eight universities appear in both lists. This suggests that, in general, universities seem to focus on either one or the other type of journal outlet.

Publication Patterns of Prolific Scholars

In total, our database contains 8585 authors, of which 6482 have only one publication. In this section we provide a list of the five scholars scoring highest in terms of productivity in the design-related and design-focused journals in the period 2000–2009. Our objective is not to provide a ranking of top "design" scholars but, instead, to examine more in-depth the publication patterns of prolific scholars who have published extensively in the journals included in our database. Indeed, as our results show, some of the scholars listed in tables 3a and 3b publish the majority of their work in other journals than the journals identified as the top design journals in Gemser et al.[13] These scholars may not position themselves and/or may not be recognized by others as 'design scholars' but rather as experts in the field of, for example, occupational health (Monique Frings-Dresen) or biomechanics (Jaap van Dieën).

The five authors scoring highest in terms of productivity in the period 2000–2009 are listed in tables 3a and 3b. Note that the institutions for some scholars may have changed. We report the institution with which the scholar is currently affiliated (July 2012),[14] and with which they were affiliated from 2000–2009.[15]

The first interesting finding is that there is no overlap between those scholars ranked highest in terms of publications in design-related journals and those ranked highest in terms of design-focused journals. Indeed, out of the top five authors in design-related journals, only Neville Stanton has published in both design-related

13 Gemser et al., "Quality Perceptions."

14 See column 4, tables 3a and 3b.

15 See column 3, tables 3a and 3b.

and design-focused journals.[16] As regards to the top authors in design-focused journals, there seems more cross-fertilization – three out of five top authors have published in both types of journals.[17]

Furthermore, consistent with the earlier findings at the level of institutions, the five top scholars in the field of design-related journal publications are much more prolific in terms of output than the top 5 scholars in design-focused journals.[18] Indeed, three out of five of the authors listed in table 3b have published less than one article a year in the top design-focused journals. These authors would not be included as top scholars in table 3a, in which the average number of papers per scholar in the design-related journals is 12 a year. All but one of the top scholars listed in tables 3a and 3b write papers that in general have a high impact on the field, considering their number of citations.[19]

Contrary to the results reported earlier, for this analysis we only used the Web of Science as our data source. Using Web of Science as our sole database was deemed acceptable considering that we sought to obtain only a broad picture of the publication outlets used by the top scholars, rather than conduct an extensive overview as we had for the ranking tables reported earlier.

One or two prolific individuals could potentially affect one institution's performance. As such, shifts in performance may be attributed to gaining or losing certain staff. For the scholars listed in tables 3a and 3b, we examined how much each of these scholars contributed to the total output of the university. We assumed that if one and the same academic institution in the period 2000–2009 employed an author, all publications of the author would be ascribed to this affiliation. If an author changed affiliation between 2000–2009, we checked which publications could be ascribed to which affiliation. The results are reported in the last column of tables 3a and 3b. Sometimes institution rankings are clearly driven by the prolific authors listed in tables 3a and 3b – productivity figures of Brunel University, the University of Amsterdam, the University of Calgary, the University of Cambridge, the University of Sydney, Open University and Penn State University were up 50%, or more, thanks to the contributions of their leading design scholars. This result indicates that some institutions may have been included in the list primarily due to the research efforts of a single active staff member employed by that institution.

Table 3a, column 5 shows that the top scholars – ranked based on their publications in design-related journals – publish above all in ergonomics journals. Related to this, it is interesting to observe that some top scholars focus on one specific journal. When we only take into account the publications in the 11 journals sampled in this study, in the period 2000–2009, Christopher Wickens published 92% of his work in *Human Factors*; 79% of Jaap van Dieën's publications were published in Ergonomics; and 78% of Stuart Walker's publications were published in *The Design Journal*.[20] John Clarkson is the top scholar who is most diverse in terms of journal outlets, having published in 7 of the 11 journals included in our analyses.[21]

With regards to the top 5 scholars ranked according to their number of publications in design-related journals, we find that two scholars – Van Dieën and Frings-Dresen – publish less than 25 percent of their work in the journals included in our research, while the other three scholars – Wickens, Stanton and Mirka – publish between 46 to 59 per cent of their work in the journals included in our research. With regards to the top 5 scholars ranked according to their publications in design-focused journals, we find that three scholars – Clarkson, Gero and Simpson – publish only 20 to 36 per cent of their work in the design-focused and design-related journals sampled, while the other two scholars seem to publish the majority of their work in these journals.

16 See columns 5–7, table 3a.

17 See columns 5–7, Table 3b.

18 See columns 6 and 7, tables 3a and 3b.

19 The only exception is the work of Stuart Walker. This result may be due in part to missing citation data, considering that this author has published a relatively significant amount in The Design Journal, for which we lack citation data for the period 2000–2004. However, the difference between the number of citations between the work of Stuart Walker and the other top scholars is sufficiently large that correcting for this would probably not dissolve the gap.

20 See column 5, tables 3a and 3b.

21 See table 3b.

Table 3a. Publication patterns of prolific scholars: Design-related journals.

				***Productivity* (*articles*)**					***Impact* (*citations*)**	
Rank	*Author*	*Academic affiliation 2000–2009*	*Current affiliation (July 2012)*	*Top design journal*		*Total related*	*Total focused*	*Other*	*Contr. Acad. Inst.*[a]	*Rank*	*Cit.*
1	Stanton, Neville A.	Brunel Univ. (UK); Univ. Southampton[b] (UK)	Univ. Southampton (UK)	Ergonomics: Applied Ergonomics: Human Factors: Design Studies:	22 8 1 2	31	2	23	85.7% Brunel Univ.; unknown Univ., Southampton.	2	319
2	Wickens, Christopher D.	Univ. Illinois (US);	Univ. Illinois (US)	Human Factors: Ergonomics:	24 2	26		18	28%[c]	1	370
3	van Dieën, Jaap H.	VU Univ. Amsterdam (Neth.)	VU Univ. Amsterdam (Neth.)	Ergonomics: Applied Ergonomics: Human Factors:	19 4 1	24		89	46%	3	247
4	Frings-Dresen, Monique H.W.	Univ. Amsterdam (Neth.)	Univ. Amsterdam (Neth.)	Ergonomics: Applied Ergonomics: Human Factors:	13 8 1	23		82	79.3[d]	4	161
5	Mirka, Gary A.	N. Carolina State Univ. (US); Iowa State Univ.(US)	Iowa State Univ. (US)	Ergonomics: Applied Ergonomics: Human Factors:	5 9 6	20		23	48.6% N. Carolina State Univ.; 4% Iowa State Univ.[e]	5	144

[a] The scholar's contribution to a particular academic institution is calculated according to the figures given in table 2a (column 4) and table 3a (column 6) and based on the number of publications in design-related journals only.

[b] Neville Stanton had n=30 publications in design-related journals in which the affiliation was Brunel University and n=1 ascribed to University of Southampton (not included in table 2a).

[c] Christopher Wickens had n=21 publications in design-related design journals for which the affiliation was University of Illinois and n= 5 publications ascribed to Alion Science Corporation – the latter affiliation is not included in the table above since we focus on academic affiliations here.

[d] The University of Amsterdam is not included in table 2a. In the period 2000–2009, this university had n=29 publications in design-related journals and 301 citations.

[e] Gary Mirka had n=18 publications in design-related journals for which the affiliation was N. Carolina State University and n=2 ascribed to Iowa State University.

Table 3b. Publication patterns of prolific scholars: Design-focused journals.

				Productivity (articles)					*Impact (citations)*	
Rank	*Author*	*Academic affiliation 2000–2009*	*Current affiliation (July 2012)*	*Top design journal*		*Total related*	*Total focused*	*Other*	*Acad. Contr.*[a]	*Rank*	*Cit.*
1	Clarkson, John P.	Univ. Cambridge (UK)	Univ. Cambridge (UK)	Applied Ergonomics: Human Factors: Design Studies: Journal of Eng. Design: Research in Eng. Design: The Design Journal: Intern. Journal of Design:	1 1 3 7 2 2 1	4	13	34	56.5%	2	240
2	Gero, John S.	Univ. of Sydney (AUS)	George Mason Univ. (US)	Computer-Aided Design: Design Studies:	1 9	1	9	18	60%	4	204
3	Walker, Stuart	Univ. Calgary (CAN) Univ. Lancaster (UK)	Univ. Lancaster (UK)	Design Issues: The Design Journal:	2 7	0	9	1	70% Univ. Calgary; 30% Univ. Lancaster[b]	5	5
4	Cross, Nigel	Open Univ. (UK)	Open Univ. (UK)	Design Studies: Journal of Eng. Design: Design Issues: The Design Journal:	4 1 2 1	0	8	0	50%	1	268
5	Simpson, Timothy W.	Penn State Univ.(US)	Penn State Univ. (US)	Computer-Aided Design: Design Studies: Journal of Eng. Design: Research in Eng. Design:	2 4 3 4	6	7	51	53.8%	3	230

[a] The scholar's contribution to a particular academic institution is calculated according to the figures given in table 2b (column 4) and table 3b (column 6) and based on the number of publications in design-focused journals only.

[b] Stuart Walker had n=7 articles with University of Calgary as an affiliation; and n=2 with University of Lancaster (one publication had both affiliations mentioned).

Discussion

In this paper, we examined publication patterns in peer-reviewed journals that publish design research. Our data consisted of 4727 articles and their citations as published in 11 journals over a ten-year period (2000–2009) and reflects the work of 8585 scholars from 1999 institutions worldwide. The peer-reviewed journals included in our investigation are a subset of the 14 journals identified by Gemser et al.[22] as high quality and relate to either "design-relevant" or "design-focused" journals, depending on whether they specialize in design research or in related disciplines.

Our research findings suggest that the research community publishing in design-related journals is, for the larger part, made up of different institutions and scholars than the research community focusing on design-focused journals. The institutions focusing on design-related journals are often based in North America, whereas the institutions concentrating on design-focused journals have a stronger presence in Europe. This may be a reflection of a more robust tradition in design research in Europe compared to other regions in the world. However, some highly respected design nations such as Denmark, Germany, and Italy do not have any universities listed in table 2b (design-focused journals) nor in table 2a (design-related journals). This finding raises the question as to what extent academic research and design practice positively stimulate each other. It may also indicate that design scholars in these countries focus on disciplines and accompanying journals not included in our dataset, such as engineering (Germany), architecture (Italy) or art (Denmark) and/or journals that are produced in their local languages.

Our research further indicates there is a relatively large number of universities and individuals who published only one article in the 11 design journals included in our sampling frame from 2000–2009. This finding does not allow for any conclusions as regards the 'design research prolificacy' of these universities and their affiliated scholars, as they may have published in design journals not included in our sample frame. However, since the 11 journals included in our sample frame have been acknowledged as leading in the field of design, we can deduce that these institutions and scholars may not have had much impact on the development of design as an academic discipline in the period 2000–2009.

A related topic is that some universities do not seem to have a sustainable design research culture, given that their design research outcomes seem predominantly the result of one prolific, impactful staff member. Performance in design research may thus decline substantially if that staff member leaves the institution. To reduce this type of vulnerability, universities should invest in creating a 'critical mass' of design researchers.

Furthermore, it is important to recognize that authors who publish in the journals identified as being top tier based on their academic contribution to the design discipline, may do so only occasionally, as part of an overall research agenda that may include other areas as well. This is also evidenced by our study on publication patterns of some of the highly prolific scholars – only a few of them publish solely or predominantly in the journals identified as top-tier design journals. Perhaps this is due to the fact that some scholars publishing in these journals are not embedded in a specific design school or design department. As a result, they may be expected and encouraged to publish primarily within their specific teaching field rather than under the heading of design. Another reason may be that these prolific scholars prefer to publish in academic journals with higher ISI impact factors. However, prior research suggests that ISI impact factors are not of predominant importance to design researchers when deciding on journal quality.[23]

Our results also suggest that, when comparing institutions and scholars from the community of the design-related journals with those from the community of the design-focused journals, the latter group is less prolific and less impactful – they

22 Gemser et al., "Quality Perceptions."

23 Gemser et al., "Quality Perceptions."

publish fewer articles, and these articles are cited less. The design discipline as a field of academic research is relatively young, and as such still seems to lack in academic stature compared to more established fields. This raises the question of stewardship of the academic design discipline. Such stewardship may require a focus on the leading design-focused journals, rather than a focus on other journals, because it is expected that design thought development advances more rapidly by publication within the discipline's leading journals, rather than by publication outside the discipline. It is promising to see that the *International Journal of Design* is picking up promising numbers of citations per paper, considering its youth. However, there is still an important task for academic institutions and design communities – not only foster design research in general, but also motivate scholars to publish their research in design-focused journals, for example by acknowledging the high quality of these journals. At the same time, to obtain recognition of the design discipline in general, publishing in journals outside the design discipline may be advisable. For example, journals and conferences focused on new product development have increasingly been publishing and accepting papers on design over the last two decades, which in turn has resulted in acknowledgement of design as an important part of the NPD process, both in academic and industry circles.[24]

24 Marina Candi and Gerda Gemser, "An Agenda for Research on the Relationships Between Industrial Design and Performance," *International Journal of Design* 4, no. 3 (2010): 67–77.

Limitations and Future Research

This study gives credit to and recognizes the performance of those universities and scholars that made a significant contribution to the academic development of the design discipline. However, to rank universities we only focused on articles and their citations as published in academic journals. However, articles published in academic journals and their citations are certainly not the only performance metrics available for design scholars and institutions. There are many kinds of valuable output from design research – presentations, artifacts, patents, or monographs. Beyond citations, other types of valued recognition in the design field include exhibitions in museums, or awards received. Future research may incorporate these types of acknowledgements to measure the contribution of research institutions and individual academics to the design discipline.

To collect our data we focused on articles as published in 11 peer-reviewed journals publishing design research. Prior research identified these journals as important outlets to disseminate research on developing and interacting with products and services. However, these journals are not representative of the entire design field – they exclude important design areas such as architecture or landscape design. Even though we acknowledge that this is problematic, using a previously validated journal – constructed on the basis of responses from 316 design scholars – made the choice for journals to be sampled less arbitrary. Still, future research is needed to assess productivity and impact of universities and individuals in these other design areas.

One of our major findings is the 'separation' between design-focused and design-related communities. Whether or not such a separation is problematic is dependent on the cross-fertilization between the two types of communities – do scholars publishing in design-related journals build on knowledge published in design-focused journals, and vice versa, or do they operate as separate communities? To provide an answer to this question, future research may examine citation patterns of the scholars publishing in these journals. Research on citation patterns may also examine whether scholars or universities tend to cite their own work.

Another avenue for future research is to examine the degree to which articles are single or multiple-authored. In this paper, we did not make this distinction. However, single- or multi-authorship may have an impact on an individual's productivity. Related, future research on multi-authored articles may examine

collaboration patterns – do certain individuals or universities work with each other more than others? Collaboration may, for example, be dependent on geographic distance; Europe-based individuals/universities may specifically work with each other, as may US-based or Asian-based individuals and universities.

Our quantitative study shows some interesting publication patterns. It is worthwhile investigating these publication patterns more in-depth, through a qualitative research approach in which scholars are interviewed about their publication strategies and university administrators questioned about the strategies they use to stimulate design research. Such qualitative research could provide answers to relevant 'why' and 'how' questions – for example, how to create or sustain an environment that supports a design research culture? This is particularly relevant as there seems to be a kind of vicious circle for those lacking such a design research culture, and a virtuous circle for those having such a culture – universities lacking/having such a culture may find it difficult/easy to attract good design researchers, good master's/PhD students, and external funding. Another question that could be answered by means of qualitative research is why design scholars choose to publish in particular academic journals and not in others.