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From *Bonehead* to *@realDonaldTrump*: A Review of Studies on Online Usernames

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Abstract

In many online services, we are identified by self-chosen usernames, also known as nicknames or pseudonyms. Usernames have been studied quite extensively within several academic disciplines, yet few existing literature reviews or meta-analyses provide a comprehensive picture of the name category. This article addresses this gap by thoroughly analyzing 103 research articles with usernames as their primary focus. Despite the great variety of approaches taken to investigate usernames, three main types of studies can be identified: (1) qualitative analyses examining username semantics, the motivations for name choices, and how the names are linked to the identities of the users; (2) experiments testing the communicative functions of usernames; and (3) computational studies analyzing large corpora of usernames to acquire information about the users and their behavior. The current review investigates the terminology, objectives, methods, data, results, and impact of these three study types in detail. Finally, research gaps and potential directions for future works are discussed. As this investigation will demonstrate, more research is needed to examine naming practices in social media, username-related online discrimination and harassment, and username usage in conversations.

Keywords: usernames, nicknames, pseudonyms, internet, computer-mediated communication, digital culture, literature review

1. Introduction

The internet has changed human communication in multiple ways, including the use of proper names. Instead of using our official personal names, in many online communities, we are known by self-chosen usernames. The term "username", also known as nickname, pseudonym, display name, and alias (see section 3.1), refers to the name that a user of a certain website or web service uses as their personal identifier on that site.

Usernames have received plenty of scholarly attention. The first study to fully focus on usernames, Haya Bechar-Israeli's article "From <Bonehead> to <cLoNehEad>: Nicknames, Play, and Identity on Internet Relay Chat", was published in 1995. Since then, the Internet has become increasingly important in our daily lives, and the amount of research on usernames has grown rapidly (see figure 1). Currently, more than 100 research articles on usernames have been published in English and dozens in other languages as well. Moreover, numerous works have examined usernames among other issues like online cultures, communication, identity, and anonymity.

Despite the considerable amount of existing research, forming a comprehensive overall picture of usernames as a name category is challenging for several reasons. First, it is not easy to find all the relevant articles, since they use different terminology; often lack references to other relevant research in the field; and have been published in journals from completely different scientific disciplines. Second, the fact that these studies differ in their aims, data, methods, and theoretical backgrounds makes it difficult to compare their findings. Third, going through all of the research is laborious, as it comprises more than 1,500 pages altogether. When taking these challenges into account, it is understandable why so few comprehensive literature reviews or meta-analyses on usernames have been done. Aleksiejuk (2016a, 2016b) and Raátz (2011) have reviewed some of the older studies quite extensively, but their articles do not take into account most of the works published in the 2010s—the time period when most of the investigations into usernames were published. Van der Nagel (2017) has examined the history of online naming practices thoroughly, but her article excludes some relevant sub-categories, like gaming communities.

This article addresses the gap in the extant literature on online usernames by systematically examining and comparing previous studies. According to the typology of literature reviews created by Paré et al. (2015), this contribution could be regarded as descriptive or scoping. It provides an overview of the current state of username research but it does not evaluate its quality due to the limited space and extensive body of literature. The article is targeted both to scholars from various academic disciplines who investigate usernames themselves, as well as more generally to experts in such fields as onomastics, linguistics, and online communication. The review will hopefully benefit both sets of investigators by offering them a larger picture of the research that has been conducted on the topic and suggesting further reading.

The article begins with a brief description on how the review material was collected and analyzed (section 2). Section 3 presents a general categorization of username studies and then examines their terminology, aims, data, methods, and results. The possible research gaps are discussed and possible future directions suggested in section 4. Finally, concluding remarks are offered in section 5.

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2. Study Design

This review analyzes a collection of 103 research articles on online usernames. Those articles are listed in chronological order in table 1, and their full bibliographic details can be found in the list of references. Figure 1 shows the temporal distribution of these publications.

When selecting articles for the collection, a broad definition of the term *username* was applied (see also section 3.3). Studies both on names that are permanently registered for a certain user in an online service, and on unregistered temporary names were accepted in the dataset. Studies on email addresses were included as well, since their optional part preceding the symbol @ can be regarded somewhat similar to usernames by its creation and functions, apart from organizational addresses that are not chosen by the users themselves.

Articles for the collection were sought using various keywords from Google Scholar, Scopus, Web of Science, and Tampere University Library databases. When relevant articles were identified, their reference lists and their citations were closely examined to find more studies on similar themes. The collection includes all the research articles on usernames found following this procedure, with a few exceptions mentioned below. It is possible that some relevant articles remained undiscovered despite these efforts. However, the collection is believed to represent the large variety of studies on usernames quite well.

The collection only includes articles in which usernames were either the primary target of research or source of data. This selection criterion was instituted for practical purposes. If all studies that made any mention of usernames had been included, the processes of seeking and examining them would have been too laborious. Another limitation of this investigation is that the collection only includes articles written in English. This restriction should not influence the results greatly, however, as most username studies have been written in English, perhaps due to the international nature of the Internet and the status of English as the general lingua franca in online communication. Nevertheless, it is important to note that research on usernames have also been published in Chinese, Dutch, Finnish, French, German, Hungarian, Korean, Polish, Romanian, Russian, and Swedish, and quite likely in other languages as well. An edited collection of articles in German (Schlobinski & Siever 2018) that provides a comparative analysis of usernames in 14 different languages should especially be mentioned here.

The studies used for this investigation include academic journal articles (60), conference proceedings (34), and edited books (9), most of which are openly available online. Most of these works were also peer-reviewed, but this feature could not always be verified. Doctoral dissertations (Hämäläinen 2019a; Aleksiejuk 2017; Martin 2005) were not included because their authors have often also published other works on the same subject. Undergraduate theses were excluded from the sample as well.

As seen in table 1, the dataset includes a gap between 1995 and 2005. The gap is explained by the restrictions of dataset selection. During those years, several notable studies on online communication and culture that discuss usernames were published (e.g., Jacobson 1999; Danet et al. 1997), as well as a few articles on usernames in other languages (e.g., Ziegler 2004; Rutkiewicz 1999; see also Aleksiejuk 2016b). However, English-language studies that focused solely on usernames did not emerge until 2005, aside from the 1995 Bechar-Israeli article.

The analytical process was conducted by reading each article in the collection and listing its key characteristics on a Microsoft Excel spreadsheet. These characteristics comprised the following features: terminology, objective, data source, data size and method of collection, analysis method, key results, publication venue, scientific discipline, and the number of citations the publication had received to date.

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Table 1. A Chronological List of the Studies Included in the Review, with Their Categorization

Authors	Year	Type	Authors	Year	Type
Bechar-Israeli	1995	Qualitative	Lange et al.	2016	Experimental
Markman & Scott	2005	Qualitative	Sachar & Diakopoulos	2016	Computational
Smale & Greenberg	2005	Qualitative	Wang et al.	2016	Computational
Superanskaya	2005	Qualitative	Chapman	2017	Qualitative
Cornetto & Nowak	2006	Experimental	Donlan	2017	Qualitative
Heisler & Crabill	2006	Experimental	Li et al.	2017a	Computational
Stommel	2007	Qualitative	Li et al.	2017b	Computational
Back et al.	2008	Experimental	Mariconti et al.	2017	Computational
Ford & Strauss	2008	Qualitative	McKelvey et al.	2017	Computational
Hagström	2008	Qualitative	Silva et al.	2017	Experimental
Chou & Chen	2009	Qualitative	van der Nagel	2017	Qualitative
Chyrzynski	2009	Qualitative	Andreev et al.	2018	Computational
Guitton	2010	Qualitative	Dimitrov	2018	Qualitative
Malachowski	2010	Qualitative	Felecan	2018	Qualitative
Rodan et al.	2010	Qualitative	Li et al.	2018	Computational
Whitty & Buchanan	2010	Experimental	Nhongo	2018	Qualitative
Blackhurst et al.	2011	Experimental	Ross et al.	2018	Computational
Ecker	2011	Qualitative	Shi	2018	Computational
Gatson	2011	Qualitative	Silva & Topolinski	2018	Experimental
Pal & Counts	2011	Experimental	Aldrin	2019	Qualitative
Perito et al.	2011	Computational	Fandakly & Caporusso	2019	Experimental
Raátz	2011	Qualitative	Garrido et al.	2019	Experimental
Thurau & Drachen	2011	Computational	Hamidah	2019	Qualitative
Bughesiu	2012	Qualitative	Hassanein	2019	Qualitative
Graham & Gosling	2012	Experimental	Hooker	2019	Experimental
Hassa	2012	Qualitative	Hämäläinen	2019	Qualitative
Yu	2012	Experimental	Kao	2019	Experimental
Aleksiejuk	2013	Qualitative	Kersten & Lotze	2019	Qualitative
Astori	2013	Qualitative	Lange et al.	2019	Experimental
Felecan & Bughesiu	2013	Qualitative	Li et al.	2019	Computational
Hogan	2013	Qualitative	Lindsey	2019	Qualitative
Hämäläinen	2013	Qualitative	Nobis	2019	Qualitative
Johansson et al.	2013	Computational	Arabnezhad et al.	2020	Computational
Lindholm	2013	Qualitative	Azhar & Hikmah	2020	Qualitative
Liu et al.	2013	Computational	Boustani et al.	2020	Qualitative
Martin	2013	Qualitative	DeAngelo & Feng	2020	Experimental
von Essen & Karlsson	2013	Experimental	Donlan	2020	Qualitative
Aleksiejuk	2014	Qualitative	Hämäläinen	2020	Qualitative
Crenshaw & Nardi	2014	Qualitative	Kaziaba & Vereshchagina	2020	Qualitative
Drachen et al.	2014	Computational	Marcondes et al.	2020	Computational
Kytölä	2014	Qualitative	Xu et al.	2020	Qualitative
Olivier	2014	Qualitative	Chibuwe et al.	2021	Qualitative
Szymański	2014	Qualitative	Çoban et al.	2021	Computational
Algharabali	2015	Qualitative	Garrido & Godinho	2021	Experimental
Jaech & Ostendorf	2015	Computational	Hämäläinen et al.	2021	Qualitative
Krüger	2015	Qualitative	Perelmutter	2021	Qualitative
Aleksiejuk	2016a	Qualitative	Tally et al.	2021	Qualitative
Aleksiejuk	2016b	Qualitative	Yuan et al.	2021	Qualitative
Aleksiejuk	2016c	Qualitative	Zhou et al.	2021	Computational
Jain & Kumaraguru	2016	Computational	Jiang et al.	2022	Qualitative
Kokkinakis et al.	2016	Computational	Kersten & Lotze	2022	Qualitative
Landa	2016	Qualitative			

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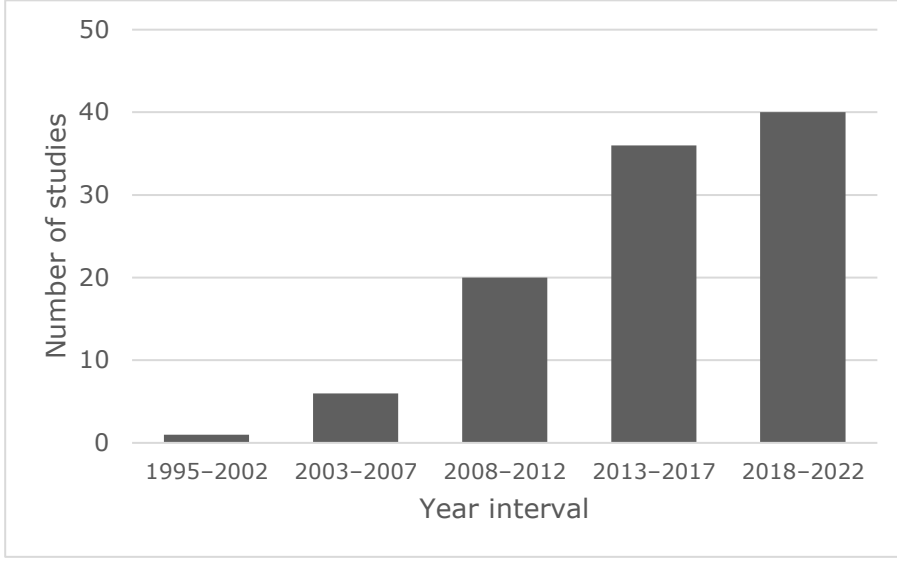
Figure 1. Number of Studies Included in the Review, with Five-Year Intervals (Except 1995–2002)



3. Analysis

3.1 Three Main Categories: Qualitative, Experimental, and Computational Studies

When analyzing the articles in the dataset, it became evident that they could be divided into three main categories: (1) qualitative, (2) experimental, and (3) computational. These categories differ quite distinctly from one another with regard to their disciplines, objectives, data, methods, and results. Some studies included features from different categories, but most of them could easily be placed in one of the three categories. The purpose of this simple categorization was to make it easier to view the big picture of the research field. The articles included in each category are listed in table 1.

The most common of the three types are qualitative studies: 61 articles (59.22%) belonged to this category. They usually analyzed username semantics and the motivations behind the name choices, as well as their connection to the identity of their owner and to the culture of the online community. Their authors and publishing channels typically came from onomastics, linguistics, or other branches of the humanities. The research data they used were quite moderate in size, usually a few hundred usernames, and relied on information collected either via interviews and online surveys or by manually going through user lists on websites. As the category name implies, the investigations in this group mainly used qualitative methods, although they also included some quantitative notes on, for example, the frequencies of different username types.

The category of experimental studies is represented by 19 articles (18.45%). They used research data that had been collected through empirical experiments. Their authors and publications typically came from the behavioral, psychological, and cognitive sciences. The studies tended to focus on the communicative functions of usernames. They investigated what types of assumptions can be made regarding users' personalities on the basis on their usernames or what kinds of usernames are successful in different contexts of online communication. The collected experimental data were primarily analyzed with statistical tests.

The category of computational studies includes 23 articles (22.33%). Their authors and publications came from the fields of computer and data sciences. These studies typically assessed usernames as a way of achieving certain research goals, such as providing information for the web service developers, rather than as a subject of research in itself. They used corpora up to millions of usernames that were processed with computational methods.

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Figure 2. Temporal Distribution of Qualitative, Experimental, and Computational Studies on Usernames

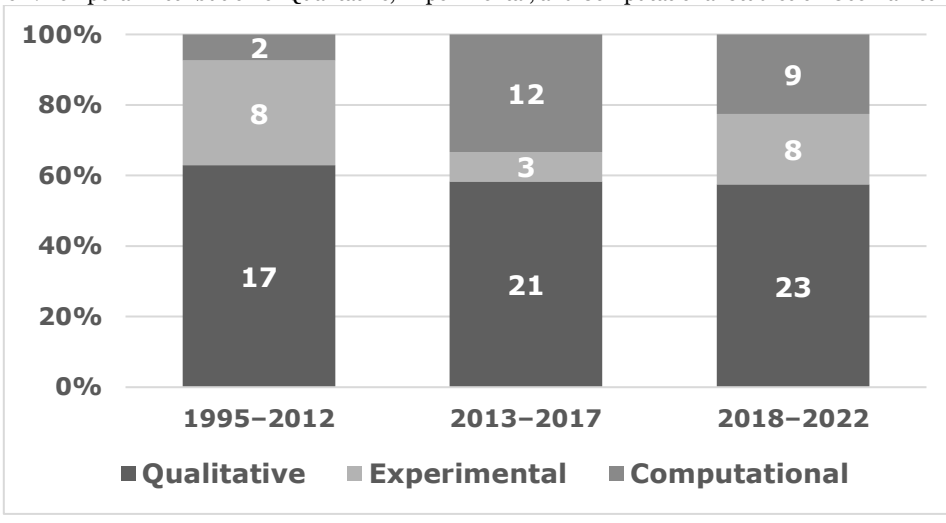

Figure 2 illustrates the temporal distribution of the three categories. As the figure shows, qualitative studies have made up the majority of username research throughout the history, even though their percentage has dropped slightly over time. In the 2000s and early 2010s, experimental studies represented a considerable proportion in the dataset, whereas computational studies have become more common during the last decade, thanks to technological and methodological developments in computer and data sciences.

3.2 Scientific Disciplines

Differences between the three main study categories presented above relate to the scientific disciplines of the publications. Many publications are multidisciplinary in focus, but most concentrate on a primary branch of science that is usually specified on their website and often indicated in their official name (as in *Names: A Journal of Onomastics*). During the review process, the primary discipline of each article's publication was recorded, and the distribution of the disciplines is presented in table 2. However, it must be noted that the categorization of disciplines used here is somewhat ambiguous; for example, media and communication studies, and linguistics have much in common and the line between them is often thin. A portion of work in onomastics could also be regarded as a sub-discipline of linguistics, but it is presented as its own category here due to the high frequency with which such articles appear in the dataset.

Table 2. Publications Categorized by Their Primary Scientific Discipline

	Qualitative		Experimental		Computational		**Overall**	
Scientific discipline	Freq	%	Freq	%	Freq	%	**Freq**	**%**
Computer & data science	2	3.28	1	5.26	20	86.96	**24**	**23.30**
Onomastics	21	34.43	0	0.00	0	0.00	**21**	**20.39**
Media & communication	10	16.39	4	21.05	2	8.70	**16**	**15.53**
Linguistics	14	22.95	1	5.26	0	0.00	**15**	**14.56**
Behavioural sciences	3	4.92	10	52.63	1	4.35	**13**	**12.62**
Other	11	18.03	3	15.79	0	0.00	**14**	**13.59**
Sum Total	**61**	**100**	**19**	**100**	**23**	**100**	**103**	**100**

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Table 2 shows that the most common scientific discipline represented by the publications of the collection articles is computer and data sciences. However, onomastics, media and communication studies, linguistics, and behavioral sciences are also well represented. The category "Other" includes a wide variety of disciplines, such as social sciences, cultural studies, game studies, law, and marketing sciences. The disciplinary differences between qualitative, experimental, and computational studies are rather striking. For example, all 21 articles appearing in onomastic publications and 14 out of 15 (93.33%) of the articles in linguistic publications belong to the category of qualitative studies, whereas 21 out of the 24 (87.50%) computational studies appeared in publications of computer and data sciences.

3.3 Terminology

Usernames are discussed using several different terms both in academic research and in everyday online conversations. In addition to *username*, common terms include *nickname*, *nick*, *pseudonym*, *alias*, *handle*, *login* (*name*), *display name*, *account name*, and *screen name* (see Aleksiejuk 2016a, 2014). The diversity in terminology might be partly because usernames appear in a wide diversity of online environments. While on some websites they are registered and stable, on others, they are temporary and easily alterable. The roles and communicative functions of usernames also vary in different contexts.

When conducting the analysis, the most frequently used term in each study was recorded. Most articles used the same term consistently, but some of them switched between different terms without clearly explaining why. Table 3 shows the distribution of the primary terms. The most commonly used term was *username* (or *user name*), followed by *nickname* (or *nick*). A temporal shift between the two terms was detected: *nickname* was used especially in earlier works (e.g., Stommel 2007; Superanskaya 2005; Bechar-Israeli 1995), whereas *username* became more common since the 2010s. Terminological differences between the three main study categories were evident. Researchers in the compilation preferred *nickname* and *pseudonym* in qualitative studies, whereas the terms *display name*, *alias*, and *character name* were used mostly in computational studies. However, *username* was the most used term for all three types.

Table 3. The Primary Terms Used in the Studies

	Qualitative		Experimental		Computational		**Overall**	
Term	Freq	%	Freq	%	Freq	%	**Freq**	**%**
Username	24	39.34	11	57.89	12	52.17	**47**	**45.63**
Nickname	17	27.87	2	10.53	0	0.00	**19**	**18.45**
Pseudonym	11	18.03	1	5.26	0	0.00	**12**	**11.65**
Display name	1	1.64	0	0.00	5	21.74	**6**	**5.83**
Name	5	8.20	1	5.26	0	0.00	**6**	**5.83**
Email address	1	1.64	3	15.79	0	0.00	**4**	**3.88**
Alias	0	0.00	0	0.00	3	13.04	**3**	**2.91**
Character name	1	1.64	0	0.00	2	8.70	**3**	**2.91**
Internet name	1	1.64	0	0.00	0	0.00	**1**	**0.97**
Profile name	0	0.00	0	0.00	1	4.35	**1**	**0.97**
Screen name	0	0.00	1	5.26	0	0.00	**1**	**0.97**
Sum Total	**61**	**100**	**19**	**100**	**23**	**100**	**103**	**100**

There are several reasons why *username* may have become the most frequent term in the article collection. Unlike many of its competitors, *username* only refers to online contexts. It therefore may cause less confusion than *nickname* and *pseudonym,* which appear in non-virtual contexts as well. In my opinion, it is also the term that most precisely describes its referent (i.e., a user's name in an online service). In this article, it refers both to registered and to unregistered online names.

3.4 Research Objectives and Questions

The studies on usernames have various research objectives and questions. Some have a restricted focus and aim, whereas others discuss several topics related to usernames. In this subsection, the most common themes and questions in the article collection are discussed.

One of the most important characteristics of usernames is that they are commonly chosen by the name bearers themselves. This is a major difference from the non-virtual world, where our personal names are often chosen by other people. Therefore, autonymic usernames may offer people an opportunity to express their identity or even to create an online identity that is separate from their offline identity (see also Aldrin 2016). The importance of this aspect of usernames may help to explain the high frequency of qualitative studies that

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seek to categorize the semantic contents of usernames or identify the motivations behind usernames to determine what these names may reveal about the users (e.g., Stommel 2007; Bechar-Israeli 1995) or the nature of the online communities involved (e.g., Hämäläinen et al. 2021; Donlan 2017).

Even though usernames can often be selected quite freely, their composition is not always completely free from limitations. Name length may be restricted and the use of special characters may be either forbidden or required. In addition, each username must be unique on the website where it is registered. These restrictions may pose significant challenges when choosing a username, especially in large online communities. Some qualitative studies investigate what strategies users utilize to overcome these challenges, and what the most typical linguistic structures of usernames are. These issues are extensively discussed by Boustani et al. (2020), Donlan (2020), Hämäläinen (2020), Szymański (2014), and Ecker (2011).

Usernames can also potentially give clues about users' personality, age, gender, nationality, ethnic or other cultural background, hobbies, and interests. The features of these names may influence the interaction between users on the website—for example, by bringing together users with similar interests (e.g., Lange et al. 2019; Rodan et al. 2010). This communicative function may have helped to motivate experimental research that has investigated what kinds of inferences can be made about users based on their names and the accuracy of such assumptions (e.g., Graham & Gosling 2012; Back et al. 2008; Cornetto & Nowak 2006). Other experimental studies, in turn, tested what kinds of usernames are successful in online marketing or dating (Lange et al. 2019, 2016; Silva & Topolinski 2018; Silva et al. 2017).

In the qualitative and empirical studies examined for this investigation, usernames were typically seen as a valuable research subject in their own right. Computational studies, however, tend to investigate usernames to achieve other research goals. Many articles within this category utilized usernames to link together user accounts created by the same person for different online services (e.g., Arabnezhad et al. 2020; Li et al. 2019, 2017a; Perito et al. 2011). Other studies used large corpora of usernames to analyze the users' behavior and thereby provided information to the service developers (e.g., Kokkinakis et al. 2016; Drachen et al. 2014).

3.5 Data and Methods

Qualitative studies in the dataset collected data using two different methods: (1) contacting username owners to ask them to complete interviews or online surveys about the backgrounds of their usernames, and (2) picking randomized samples of usernames without contacting the name owners. Studies using interview data often have small sample sizes. For example, Boustani et al. (2020) had 30 interviewees, Crenshaw & Nardi (2014) had 20, and Aldrin (2019) only four. Randomized samples typically range between 100 and 1,000 usernames, although Ecker (2011) has 7,936, Hämäläinen (2020) 7,600, and Szymański (2014) 7,456 usernames. The data collected via these surveys, interviews, and random sampling have been analyzed with various methods. A categorization model created by Bechar-Israeli (1995) has been used by a few other scholars as well (e.g., Dimitrov 2018; Algharabali 2015; Chyrzynski 2009). However, most scholars create their own categorizations based on the objectives of their research and the characteristics of the web service they are investigating. Various existing theoretical frameworks and methods of analysis have been used to support the analyses as well—for example, gender theory (Stommel 2007) and critical discourse analysis (Landa 2016).

Experimental studies used for this review collected data by recruiting informants, typically university students (e.g., Cornetto & Nowak 2006; Heisler & Crabill 2006) or members of online communities (e.g., Kao 2019; Lange et al. 2019) to carry out username-related questionnaires or other such tasks. The number of informants ranged from 25 (Blackhurst et al. 2011) to 1,876 (Kao 2019), with the average being 409. The complete data sizes are remarkably larger, however, as each informant produces multiple data points. Back et al. (2008), for instance, first asked 599 username owners to complete two short personality questionnaires, after which 100 observers evaluated 150 of those usernames with an 11-item evaluation sheet. Consequently, the second phase alone produced 165,000 single data points. Experimental studies analyzed their data mostly with statistical methods.

The computational studies examined in this review employed large corpora of usernames that were compiled and analyzed automatically. For example, Perito et al. (2011) investigated approximately 10 million usernames; Thurau & Drachen (2011) nearly 8 million usernames; and Jaech & Ostendorf (2015), 3.5 million usernames. In some cases, smaller sub-samples are extracted from a corpus for closer investigation. For example, Jain & Kumaraguru (2016) detected more than 850,000 username changers among their data of 8.7 million Twitter users, but randomly sampled 10,000 of those name changers to be monitored more frequently during the period of their research.

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3.6 Data Sources

Research on usernames covers a wide range of websites and e-services. Table 4 below shows the frequencies of different service types identified in this review. The term *social media* used in the table has been largely debated, as there are different opinions on what services can be categorized under this term (see Carr & Hayes 2015). Here, the term refers to services to which users post pictures, videos, and textual information about themselves, and thereby make their offline identities accessible to other users. Well-known examples of such services are Facebook, Twitter, YouTube, Instagram, and TikTok.

Table 4: Types of Online Websites or Communities Used as Data Sources

	Qualitative		Experimental		Computational		**Overall**	
Website type	Freq	%	Freq	%	Freq	%	**Freq**	**%**
Social media	9	14.75	2	10.53	11	47.83	**22**	**21.36**
Games and gaming	9	14.75	2	10.53	4	17.39	**15**	**14.56**
Discussion forum	9	14.75	0	0.00	2	8.70	**11**	**10.68**
Chatroom	9	14.75	0	0.00	0	0.00	**9**	**8.74**
Email	2	3.28	6	31.58	0	0.00	**8**	7.77
Online newspaper	4	6.56	0	0.00	1	4.35	**5**	**4.85**
Online shop/market	2	3.28	3	15.79	0	0.00	**5**	**4.85**
Dating service	1	1.64	3	15.79	1	4.35	**4**	**3.88**
Other	4	6.56	1	5.26	2	8.70	**7**	**6.80**
Mixed types	7	11.48	0	0.00	1	4.35	**8**	7.77
Not specified	1	1.64	2	10.53	1	0.00	**5**	**4.85**
No empirical data	5	8.20	0	0.00	0	0.00	**5**	**4.85**
Sum Total	**61**	**100**	**19**	**100**	**23**	**100**	**103**	**100**

As seen in table 4, social media are the most frequent service type investigated in the article collection. However, studies analyzing traditional online services where user identities are not transparent to other users by default (e.g., gaming sites, discussions forums, and chatrooms) are common data sources as well. If works on these traditional services had been added, they would have outnumbered the studies on social media usernames. Again, there are also notable differences between the three study categories. The traditional communities were mainly analyzed from qualitative perspectives, whereas social media services were particularly investigated with computational methods.

Also worth mentioning is that there are temporal changes between the service types. The earliest articles in the dataset focused especially on chatrooms (e.g., Smale & Greenberg 2005; Bechar-Israeli 1995) and email (e.g., Heisler & Crabill 2006; Markman & Scott 2005), whereas 19 out of 23 (82.61%) studies on social media were published after 2016. In addition to social media, data sources that have become popular only quite recently are online newspapers, shops, and markets. The earliest articles in these groups are authored by Krüger (2015) and von Essen & Karlsson (2013). Within these contexts, usernames may not only express the identities of their bearers, but they also may have political and commercial influence (see also Sjöblom 2016).

Many websites and online communities are based on a certain specific theme. Examples of the themes of the websites investigated in the article collection include immigration (Perelmutter 2021), soccer (Kytölä 2014), eating disorders (Stommel 2007), fanfiction (Donlan 2020, 2017), crowdfunding (Jiang et al. 2021), and illegal drug trade (Hämäläinen et al. 2021; Hämäläinen 2019b). Research into usernames may provide valuable information about the specific cultures in these online communities.

In 31 (30.10%) of the studies in the article collection, the researchers collected data from an international, multilingual pool of users, whereas in 62 (60.20%) studies the users were predominantly drawn from a singular language group or nationality. The diversity of languages and nationalities covered by national-level communities in the article collection is extensive, including for example Australia, Bulgaria, China, Finland, Germany, Italy, Kuwait, Morocco, Romania, Russia, Sweden, the U.S., and Zimbabwe. There are also works in which a national user pool within an international service is investigated. For example, Olivier (2014) analyzed the usernames of South African Twitter users, and Smale & Greenberg (2005) the names of Canadian MSN Messenger users.

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3.7 Findings

Qualitative studies have shown that usernames comprise an exceedingly heterogeneous category of names. Naming practices vary greatly both within and across online communities (e.g., Hämäläinen 2020; Schlobinski & Siever 2018; Bugheşiu 2012). For example, given names are frequent username elements on many websites (e.g., Xu et al. 2020; Olivier 2014; Chyrzyński 2009; Stommel 2007) but rare on others (Hämäläinen 2019b; Crenshaw & Nardi 2014). However, some general tendencies can be detected. English has a notable influence on username choices even in national-level communities where the primary language is not English (Xu et al. 2020; Bugheşiu 2012; Hassa 2012). Many users find the motivation for their name choice from popular culture such as movies, television series, music, or video games (Crenshaw & Nardi 2014; Hämäläinen 2013; Gatson 2011). Usernames are typically relatively short, and their uniqueness is achieved by modifying name elements with additional numbers, letters, or special characters (Boustani et al. 2020; Donlan 2020; Hämäläinen 2020; Szymański 2014; Ecker 2011).

The results of experimental studies are contradictory as to whether personality features can be inferred from usernames. Lange et al. (2019) and Back et al. (2008) take the position that username-based personality assumptions are fairly accurate, whereas Graham & Gosling (2012) and Cornetto & Nowak (2006) are more skeptical about the accuracy of such inferences. However, experimental studies unanimously highlight the importance of username choices for various online communication situations. An appropriate, professional-looking email address increases the probability of users' finding employment (Blackhurst et al. 2011) and of their email messages being opened (DeAngelo & Feng 2020). Usernames on Twitter have been found to affect how trustworthy tweets are perceived (Pal & Counts 2011). In online dating, usernames have been found to influence the extent to which their bearers are considered attractive and the probability of them being contacted by other users (Lange et al. 2019, 2016; Whitty & Buchanan 2010). On online markets, short and easily pronounced usernames have been shown to be helpful in creating a trustworthy seller image (Silva et al. 2017). Even the phonetics of usernames can influence our impressions of users (Garrido & Godinho 2021; Garrido et al. 2019).

Computational studies have shown that large corpora of usernames can be utilized for many purposes. The same person's user profiles in different online services can be linked even when little or no other information about the users other than their usernames is available (e.g., Li et al. 2019, 2017a). An artificial intelligence programme can be employed to recognize the language and gender of users (Jaech & Ostendorf 2015), or to detect automatically generated, potentially malicious, user accounts (Andreev et al. 2018). Automatized username analysis can also produce information for the service developers that enables them to create richer and more personalized user experiences (Kokkinakis et al. 2016; Drachen et al. 2014).

3.8 Impact

While evaluating the quality of the studies is beyond the scope of this review, the number of citations the articles in this compilation have received may well serve as a possible indicator of their scientific impact. It must be noted, however, that the citation count is influenced not only by the quality of the study and attractiveness of its topic, but also by numerous other factors, such as the prominence of the authors, the importance and impact of the publication, and the availability of the research in different databases and repositories. Therefore, caution is needed when drawing conclusions about the significance of either single articles or the three main study categories based on the number of citations.

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Table 5. The Five Qualitative, Experimental, and Computational Studies with the Most Citations Per Year in the Dataset (According to Google Scholar, November 29, 2021)

			Citations	
Authors	Year	Study Type	Overall	Per Year
Bechar-Israeli	1995	Qualitative	523	20.12
Hogan	2013	Qualitative	95	11.88
van der Nagel	2017	Qualitative	32	8.00
Gatson	2011	Qualitative	69	6.90
Aldrin	2019	Qualitative	11	5.50
Average		**Qualitative**	**21.98**	**2.19**
Back, et al.	2008	Experimental	172	13.23
Silva & Topolinski	2018	Experimental	28	9.33
Silva, et al.	2017	Experimental	31	7.75
Garrido et al.	2019	Experimental	14	7.00
Heisler & Crabill	2006	Experimental	90	6.00
Average		**Experimental**	**27.05**	**3.47**
Liu et al.	2013	Computational	227	28.38
Perito, et al.	2011	Computational	265	26.50
Li, et al.	2019	Computational	26	13.00
Li, et al.	2017a	Computational	38	9.50
Johansson, et al.	2013	Computational	64	8.00
Average		**Computational**	**34.09**	**5.32**

As the averages in table 5 show, computational studies have been cited more frequently than experimental and qualitative studies. The five most frequently cited computational studies all work with linking the same person's user accounts from different online services, which might signal the importance of this research objective for computer science and the significant role usernames play in helping researchers meet this objective. The groups of empirical and qualitative studies, on the contrary, do not have one such predominant research objective. Back et al. (2008) and Heisler & Crabill (2006) examine username-based assumptions on user personality, whereas Silva et al. (2017) and Silva & Topolinski (2018) investigate usernames' influence on success on online marketplaces. The most cited qualitative study—both overall and per year—is one by Bechar-Israeli (1995). The popularity of this piece of research is probably not only due to the fact that it was one of the first publications on usernames. This work is also exemplary in that it provides an extensive discussion of several important questions related to usernames at the same time that it provides a multifaceted overall depiction of the name category. It thereby helped to create a solid foundation for the research to follow.

4. Research Gaps and Future Directions

As demonstrated in section 3.6, username research has mainly focused on traditional online communities such as gaming websites, chatrooms, and discussion forums where the non-virtual identities of users are usually not known to other users. However, nowadays, a great deal of online communication takes place on social media services like Facebook, Twitter, Instagram, YouTube, and TikTok, where users make their non-virtual identities known to others by uploading photographs, videos, or textual information about themselves. Initial qualitative studies on social media usernames (e.g., Hamidah 2019; Nobis 2019; Olivier 2014) suggest that the transparency of real-life identities might make usernames based on official personal names more common. However, more research is required to confirm whether these early remarks apply to different countries (see Chibuwe et al. 2021) and the wide variety of different social media services.

Social media usernames also contain enormous potential for scholars interested in the commercial, political, and power-related aspects of names. Even though most people use social media mainly for recreation, many also use these platforms for professional purposes. Public figures, such as politicians, journalists, artists, athletes, or scientists, are commonly expected to be active and visible on social media. Moreover, a rapidly growing number of people earn a considerable income by creating content on social media. A few examples include videobloggers on YouTube, e-sports athletes on Twitch, and pornography actors and actresses on

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Pornhub and Onlyfans. For such persons, their social media usernames are an essential part of their professional image, and, therefore, these online names have considerable financial value. Nevertheless, they face the same challenges in choosing usernames as any other user. Each username must be unique, and a username is granted to the first person who registers it, regardless of their societal status. The repercussions of this policy were experienced by, for example, former U.S. President Donald Trump, who was known as *@realDonaldTrump* on Twitter. The use of the word "real" in his username was reportedly motivated by the fact that another person had registered the name *@DonaldTrump* before him (Weisberg 2016).

The fight against the inequalities and discrimination based on prejudices against people's gender, ethnicity, religion, age, or other such characteristics is among the most pivotal challenges of the contemporary society. The importance of this struggle is highlighted, for example, in the United Nations' Sustainable Development Goals and in the recent global campaigns of the Me Too and Black Lives Matter movements. Online communities are not free of discrimination or other inappropriate behavior, even if the identities of users may not always be readily transparent. For example, the Gamergate campaign highlighted the harassment experienced by female gamers (see, e.g., Mortensen 2018). As usernames often include clues about the identities of users, they might potentially expose their bearers to online discrimination, harassment, or hate speech. Preliminary research has shown, for instance, that women and minorities are sometimes unwilling to choose usernames that might reveal their identity or background (e.g., Boustani et al. 2020; Cote 2017). This issue should be investigated in much more detail, for example, by collecting instances of username-related online harassment and discrimination via user interviews and online surveys or by conducting experiments in real online environments (see also Meyer & Cukier 2006).

Username research has almost exclusively focused on the official forms of usernames, (i.e., the forms in which they are registered at online services). Some scholars, however, have noted that official usernames are not always used in the informal discussions within the online communities; rather, various hypocorisms and other variations are used instead (Aldrin 2019; Ecker 2011). For instance, it was found that a user with the name *Jeppe-82* was called *Jeppe* and another person with the username *Haamukirjailija* 'ghost writer' was simply called *Haamu* 'ghost' (Hämäläinen 2019c). There is also some evidence that usernames are sometimes used in non-virtual contexts as well (Hämäläinen 2019c; Crenshaw & Nardi 2014). Investigating the usage of usernames in actual online and offline discussions more closely would be fruitful not only for username research, but also for socio-onomastics, sociolinguistics, computer-mediated communication, conversation analysis, and digital culture.

5. Conclusion

The aim of this review was to provide a relatively comprehensive overall image of the current state of username research. Due to the limited length of the review, numerous interesting notes and perspectives had to be left out. It was not possible to dive into the details of each individual article included in the dataset, or to categorize the main groups of qualitative, experimental, and computational studies further on the basis of their research objective, data sources, method of data collection or such. Moreover, the review could only include those articles that focus primarily on usernames; meanwhile there are at least several hundred other studies that do not focus on usernames but nevertheless provide valuable information about them. A task for future research might be to examine those as well, thus expanding and sharpening our knowledge of online usernames.

Even though section 4 highlights a few themes of special importance for future research, these recommendations do not constitute a comprehensive list of potential directions. Many more pathways than those mentioned here need to be explored. Contributions on many other aspects of username research are important and welcomed. Usernames are a valuable and relevant subject of scientific exploration across several academic disciplines. It will be interesting to see how the research field develops in the future.

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