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MEDIA & COMMUNICATION STUDIES | REVIEW ARTICLE

A systematic review of trends and gaps in the production of scientific knowledge on the sociopolitical impacts of emojis in computer-mediated communication

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Abstract: This systematic literature review analyses trends in original research on emoji use in computer-mediated communications (CMC) published between 2011 to 2021. In total, 823 articles were identified that met the search criteria. The mixed-method approach included qualitative coding of articles and frequency analysis by year, impact quartile, research topic and multidisciplinarity, as well as a cluster analysis to examine trends in sociopolitical research. The results show that Computer Science, Communications and Social Sciences disciplines accounted for largest proportion of original research on emojis and CMC in the time period analysed and that the degree of scientific impact increased significantly across the time series. In recent years, sociopolitical research has had higher than average growth and can be clustered into various groups based on two broad objects of study: "culture-identity" and "social exclusion". The study also identified significant knowledge gaps, particularly in relation to emoji standardization and its sociopolitical implications. Overall, multidisciplinary approaches are epistemologically constrained, Spanish-language production is low, and there is an almost complete absence of context appropriate methodologies. The study concludes that there is a need to for more sociopolitical research on emoji use in CMC and multidisciplinary approaches, a shift away from the hegemony of Anglocentrism, and greater questioning of the structural influences of standardization process on questions of cultural, identity and social exclusion.

Subjects: Sociology of Media; Nonverbal Communication; Visual Communication

Keywords: mobile communication; new media; social media; sociolinguistics; virtual communities

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In the framework of computer-mediated communication (CMC), the phenomenon of emoji use in text messages is increasing exponentially. Driven by the widespread use of social networks and chat applications, especially on mobile devices, emojis and other symbols have become fundamental to CMC and a clear manifestation of digital visual culture (Alshenqeeti, 2016; Hjorth & Richardson, 2014). It is of little surprise therefore that the impact of emojis and other pictographic images on communication, culture and even political struggle is arousing growing interest in research disciplines as diverse as engineering, psychology, marketing, linguistics, and social sciences, amongst others (Bai et al., 2019). Significant controversy has also revolved around emojis, in particular the standardization processes for global CMC alphabets controlled by the Unicode Consortium, linguistic debates on the definition of emojis and the merit as "language", as well as the role of emojis in social discrimination and marginalization, amongst others.

As an emerging field of study, scientific knowledge is at a very early stage of development. Previous review studies have undertaken an analysis of the type of research carried out in different areas of knowledge (Bai et al., 2019) and a review of the main theoretical frameworks applied in articles focused on the use of emojis and stickers in CMC (Ying, 2019). However, the interest of this study lies in the socio-cultural and political dimension of emoji use and development. In other words: a critical view of emojis in cross-cultural communication and as a materialization of power in social relations. From this perspective, the study aims to provide a general overview of the historical evolution of studies linked to emojis in CMC, the scientific disciplines involved, and the degree of multidisciplinarity in different approaches and theories.

The paper begins by providing some historical context, definitions, and an overview of the key debates and issues that we have already mentioned above. Subsequently, we detail the objectives and systematic review methodology. This is followed by a presentation of the research results and a discussion.

1. Background to the study: definitions, debates and controversies

Emojis were developed in 1999 by the Japanese designer Shigetaka Kurita (Hurlburt, 2018) and are now the most common form of non-text communication, acting as standalone messages or in combination with written text (Chen et al., 2018; Cramer et al., 2016; Kimura-Thollander & Kumar, 2019). However, emoticons, typographic signs created through the combination of keyboard characters, were the first symbols to be used in CMC text conversations and remain popular today. As bitmap representations of emoticons, emojis represented a huge step forward in the communicative capacity of CMC and they now share a communicative space with other visual formats such as stickers and animated gifs (Zhou et al., 2017). The main difference to these other three forms of graphic images is that emojis are a standardized form of CMC, allowing their use across multiple platforms and devices, a process controlled by the Unicode Consortium—an issue we will return to shortly.

In CMC, the use of graphics replicates the function of body language as a means of clarifying, qualifying or modifying orally transmitted face-to-face messages (Goffman, 1997). In this respect, they are not just emotional adornment but constitute fundamental and expressive support to written texts in order to avoid ambiguity in communication and respond directly to the needs of specific circumstances. At a transcultural level, emojis have additional capacities because their universality can make them particularly useful in conversations with speakers of different languages (Kaye et al., 2016). Emoji use, however, goes beyond such functionality to intentional expressions of creativity, particularly in local contexts. Research points to the role of emojis in emergent cultures (Pearce, 2009) and the use of emojis and emoticons as a form of exhibitionism in the construction of phrases and meanings within specific subcultures (McGrath, 2006). In this respect, emojis appear to have a direct relationship with the pictographic beginnings of early

writing or the contemporary pictogram-based writing systems that use ideograms, such as traditional Chinese and Japanese kanji (Hurlburt, 2018). An important shared characteristic, therefore, is communication independent of written text—at least in certain situations (Zhou et al., 2017).

The adoption of emojis and other symbols takes place in a broader context of the gradual abandonment of manual writing in favour of writing interfaces. Dependence on digital media is so great that, in social contexts where basic technology is available, younger generations no longer write by hand (Karavanidou, 2017). This is a phenomenon that is entirely new in the history of language and is relevant to the inheritance and transmission of knowledge through codified systems and has some important implications.

The process of coding in the communicative process could be said to involve three relevant aspects: a need to learn new rules to decode and understand messages; a loss of interpretative and poetic message information, but a gain in precision; a loss of universality in proportion to the complexity of the rules that must be learned (Puente et al., 2021). However, technological advances and the intensive use of digital devices means an inevitable abandonment of the processes of internalizing the rules used to encode information, as electronics do the complex work. On this basis, all languages suffer drastic changes when encoded through digital machine systems (Evans, 2017), as the human brain is not capable of encoding at the speed required for fluid communication. Pictogram-based linguistic systems, therefore, have an ability to cause lexical-semantic changes, depending on the context of the communication (Puente et al., 2021).

Despite their ubiquity, utility and influence on language, some authors downplay the status of emojis in comparison to other languages. Mainly, they argue that, at present, emojis are not sufficiently independent of text for some forms of communication or that such communication is so complex as to be inefficient (Danesi, 2019; Hurlburt, 2018). This debate, however, is largely dependent on the definition of language. Taking the European Council's proposals, pragmatic competence relates to the communicative use of a language, not just the relationship between linguistic signs and their referents but all relationships within the language system and those between interlocutors and context (Council of Europe, 2001). On this basis, and the aforementioned pragmatic capacities of emojis and the ability of pictogram-based languages to cause lexical-semantic changes, there is little doubt that emojis are now an essential component of contemporary language. In many settings, they provide an efficient means for the expression of complex meaning and often without accompanying written text (An et al., 2018; Zhou et al., 2017). In fact, on the basis of communicative use and relevance (Sperber & Wilson, 1995), emojis become a language once the message recipient recognizes the intention of the sender beyond the literal meaning.

As stated, the responsibility for regulating standards in the emoji repositories lies with the Unicode Consortium, made up of representatives of the most influential technology companies, such as Adobe, Apple, Facebook, Google, Huawei, IBM, and Microsoft, among others. At a purely utilitarian level, the management of the emoji repository permits the growth of the library and easy incorporation into mediated writing systems. However, the work of the consortium is controversial.

On the one hand, Unicode has received numerous complaints that its decision-making processes for the inclusion and design of standard images is arbitrary and opaque (Hess, 2017). It has also been criticized for the slowness of its processes in a fast-changing digital world (Berard, 2018). This has led to demands for freer, faster, and more organic creation and use of pictographs by users (Feng et al., 2019; Loomis et al., 2016). The growing demand for graphic images in CMC also helps to explain why many different emoji repositories have emerged on distinct social networks and chat platforms in parallel to the Unicode system. At a linguistic-semantic level, these differences are highly relevant because even subtle design changes can lead to different uses and interpretations (Bai et al., 2019; Pohl et al., 2017).

As an issue of social openness, this has a number of consequences such as a loss of opportunity to enrich communication and represent new ideas, but also the exclusion of certain social groups, such as minorities or collectives who experience discrimination (Daniel, 2019; Williams, 2019). Those who argue that limiting and standardizing the images in repositories facilitates communicative processes are accused of ignoring cultural differences and simplifying communication in order to better serve corporate interests, such as the analysis of consumers' tastes and preferences in a global marketplace. This is seen as promoting a purely utilitarian social system that institutionalizes conventions for the sake of commercial interests, social control, and the reinforcement of hegemonic structures (Stark & Crawford, 2015).

Nevertheless, it is important to point out that the governance system has not been completely oblivious to these issues. Some emoji systems now incorporate identity markers related to phenotypic or racial diversity, allowing users to, for example, select different skin tones and hair colour (Kimura-Thollander & Kumar, 2019). However, as we discuss in the following section, this form of responsiveness is very limited and fails to meet real local needs (Goh & Kulathuramaiyer, 2020).

The political use of emojis on social media has been examined by various authors in terms of gender (Chen et al., 2018; Daniel, 2019), the inclusion of underrepresented and invisibilised collectives (Swartz et al., 2020), ethnicity (Williams, 2019), sexual orientation (Tang, 2017), religion (Wang et al., 2019), and socioeconomic status (Puente et al., 2021). These studies show that, when possible, users express social identities and political views through emoji use, reflecting diversity and visibilising discrimination and inequality. In this respect, a subset of emojis exists whose meaning varies partially or totally depending on culture and even subcultures and how they intersect with social status, educational level, age, gender, and other socio-political variables (McGrath, 2006; Pearce, 2009).

However, the degree and scope of the communicative capacity of any social group is limited by the Unicode standardization system. Authors such as Goh and Kulathuramaiyer (2020), for example, argue that the thinking and values of indigenous communities are different from those of Western societies and that in the frame of emoji-based communication they become further isolated, broadening the digital divide. They propose that adding a cultural "flavour" to emojis is simply not sufficient and have proposed subverting the universalization and standardization caused by the Unicode monopoly by taking social context and cultural values into account.

Conversely, as mentioned earlier, it is no less true that a global culture based on a universal emoji language has emerged, as evidenced by Hurlburt (2018) and Danesi (2019). In fact, certain emojis, mostly associated with facial expressions and emotions, have acquired universal significance across various cultural settings (Casalino et al., 2016). Thus, intercultural interactions over long periods of time can lead to a global consensus on the meaning of some emojis (Casalino et al., 2016; Goh & Kulathuramaiyer, 2020).

Hence, on the one hand, "technologies of globalization seek more universal codes to facilitate interaction between everyone" (Casalino et al., 2016, p. 47, authors' translation). On the other, emoji-based mediated communication is an expression and production of a progressively more globalized culture and spaces of renegotiation of common interpretative frameworks (Garfinkel, 2010; Goffman, 1974). From this perspective, interpretative contexts and social conventions should be understood as a practice and exercise of power, since accepted repertoires and interpretative frameworks reproduce hegemonies (Foucault, 1983; Goffman, 1990), inequalities, stereotypes (Becker, 1995), and ascribed social roles (Bourdieu, 2012).

Thus, emojis can be said to be ambivalent, occupying a position of commonality or as markers of cultural differentiation. Hence, we begin to appreciate the broad social tensions between technological, economic and cultural perspectives and between global and local viewpoints. In this respect, it is clear that emojis are not neutral technocratic images, but a sociocultural and political

manifestation: lexical-semantic devices employed in the reproduction of hegemonies and systems of privilege, as well as activism and subversion. In other words, all communicative spaces are governed by normative codes, conventions, and social sanctions that frame the interaction of subjects.

This underscores the importance of understanding the structural factors that condition the standardization of communication through emojis and analysing the particular uses that are manifested in specific situations and contexts. This is particularly the case in view of the growing importance of automated systems for analysing information published through social networks. Through the analysis of large bodies of messages, such as those posted on Twitter, it is possible to explore the communicative processes linked to ideologies, cultural differences and group characteristics. In tandem with epistemological questions, there is also much scope for the development of new research methodologies, which are practically non-existent at present.

2. Objectives

Specific research objectives were established to guide the search strategy, data extraction and analysis. These focused on two key areas of interest and a number of sub-objectives: Firstly, the study aimed to generate a profile of the disciplines of scientific production that took emojis as the primary object of study, in terms of: thematic areas in scientific studies on emojis use in CMC; the quantity (in terms of numbers of articles) and characteristics of production of scientific publications (publication year and journal quality indexes); and the degree of interconnectivity and multidisciplinarity between different areas of knowledge production. Secondly, the study sought to generate a profile of scientific knowledge production in social, cultural, and political disciplines, in terms of: representativeness of social groups that experience discrimination, marginalization and inequality; amount of research production dedicated to the political framework of emoji use.

3. Materials and methods

Based on the literature (Kitchenham & Charters, 2007; Ramírez-Montoya & Lugo-Ocando, 2020), a standardized framework for the systematic review was developed that included the following sections: establishment of a search strategy, definition of inclusion and screening criteria, data abstraction, data analysis, and inference.

4. Search, inclusion and screening strategy

A search of Cisne, Web of Science, Scopus, Google Scholar, ProQuest Central, SciELO, Academic Research Premier, Research Gate, and JSTOR was carried out for the presence of the keyword "emoji" in any part of the document, title, summary, or text for the period 2011–2021. The search was conducted for both English- and Spanish-language texts. The initial search gave 3,219 results.

Subsequently, these initial texts were screened for: duplication of articles across databases; non-scientific articles (e.g., newspaper articles); scientific articles where the word "emoji" was purely anecdotal; scientific articles that did not meet appropriate quality standards for scientific knowledge production. The screening process resulted in the removal of 2,396 articles, leaving 823 publications for data extraction and analysis.

5. Data extraction and analysis: a mixed-methods approach

The study employed a mixed-methods design that combined both qualitative and quantitative techniques based on mapping and systematic literature review procedures (Hernandez & Zamora, 2012; Kitchenham et al., 2011; Yañez-Figueroa et al., 2016; Kitchenham & Charters, 2007; Ramírez-Montoya & Lugo-Ocando, 2020). This approach supports both qualitative inquiry as a practice of categorization, compression, and framing (Goffman, 1974) and quantitative analysis through the evaluation of trends and application of multivariate techniques.

The qualitative analysis involved the categorization of relevant content from the 823 articles into the fields established in the research objectives (scientific disciplines, study subjects, etc.) and the

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subsequent preparation of an SPSS file with 823 cases. To perform the cluster analysis on the production of socio-political knowledge, described in more detail below, an SPSS file was set up and six variables were created, including: social impact, political implications, shared identities and cultures, affect and emotions, communication and linguistics, and social media. Subsequently, in order to identify the degree of implication in each of these areas, each of the 823 articles was analysed and assigned a value ranging from one to five: 1: not addressed, 2: addressed but superficially, 3: addressed at a secondary level, 4: addressed as a significant focus of the analysis, 5: addressed as the primary focus of the analysis. The values were based on a reading of the abstract, keywords, and the study conclusions.

In terms of quantitative analysis, firstly, basic data and time series analysis (Cea D'Ancona, 2006) was generated by querying the scientific databases, mentioned above, as a dataset. This permitted the identification of scientific disciplines (grouping of sub-categories into the 8 primary categories presented in the results), multidisciplinarity (inclusion of articles in various disciplines), and indexing data (impact quartiles). Secondly, as the study was interested in the degree of implication in sociopolitical research, see above, hierarchical cluster analysis (Hair et al., 1999), using the Ward method, was employed to identify groupings of scientific knowledge production in the dataset. All cases were considered (N = 823). This produced three clusters, of which two were thought to be of interest to the study objectives. Subsequently, in order to visualize the results of the cluster analysis, we conducted a factor analysis, using Varimax, for each these two clusters to reduce the data to dimensions (two in each case) and then to create the graphs presented in Figures 1 and 2.

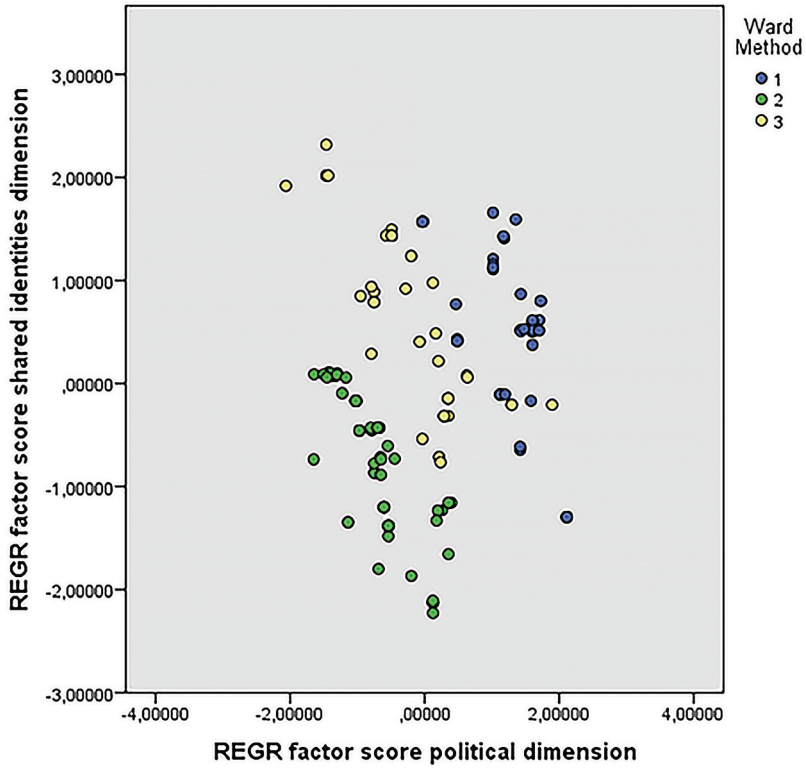

Figure 1. Hierarchical cluster analysis: The political and culture-identity dimensions (Ward method).

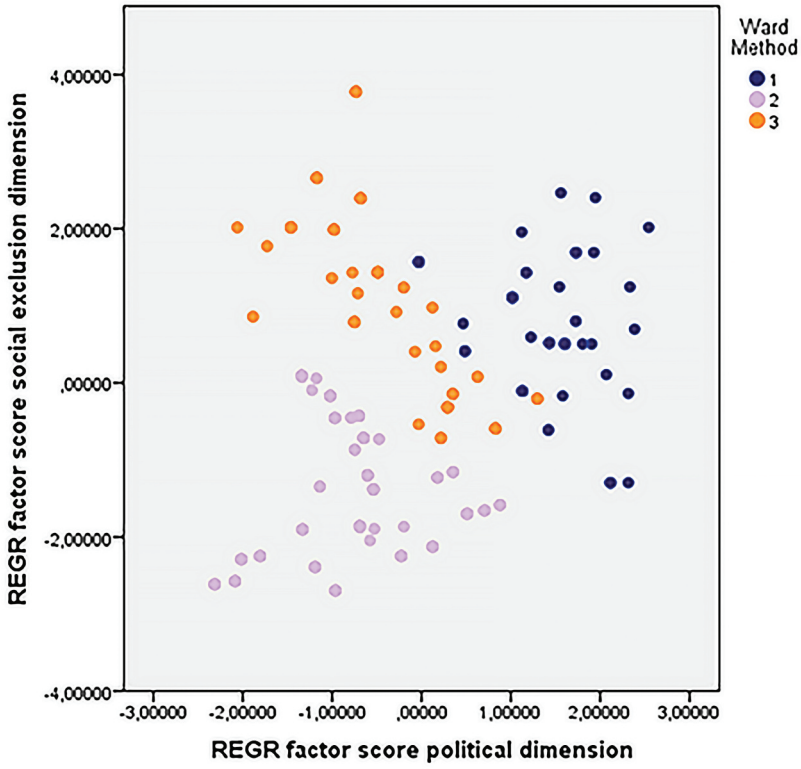

Figure 2. Hierarchical cluster analysis: The political and social exclusion dimensions (Ward method).

6. Results

6.1. Overall trends in knowledge production

The year-on-year trend analysis of the 823 published articles, presented in Table 1, shows a marked increase in the total number of publications and academic interest in the practices, processes, and implications of emoji use in digital communications from 2014 onwards. The analysis found exponential growth from 2014 onwards, when the publication rate grew at an average of 127.9% per year, although this slowed to 48.0 % per year from 2017. This increase is not only based on the progressive inclusion of new fields of study and epistemological perspectives but also because of the quantitative increase in the total number of published articles.

In terms of publication language, of the 823 articles analysed, 802 (97.4%) were English-language publications and only 21 (2.6%) Spanish-language.

7. Indexing and impact

As can be seen in Table 2, the analysis also undertook to explore the impact of emoji-focused articles in terms of indexing, measured as the scientific category quartile of the journal at the time of publication, based on Journal Citation Reports (JCR) and Scopus rankings. Prior to 2015 most articles on emojis were published in Q4 journals, but from 2017 onwards the proportion of all articles in the dataset that were published in Q1 or Q2 journals increased from 9.3% to 19.4%. Based on a linear correlation, the analysis found that the increase per year in the proportion of articles indexed in Q1 and Q2 journals was statistically significant (r Pearson = 0.522, $p < 0.05$). Within this overall growth, it is noteworthy that articles addressing the socio-political dimension of emojis showed extraordinary growth, and their growing communicate value as a differentiating element of CMC (Gray & Holmes, 2020; Miltner, 2020; Pereira-Kohatsu et al., 2019; Wang et al., 2019).

Table 1. Year-on-year trend in the publication of emoji-themed research papers 2011–2021

Year	Total number of articles published	Annual increase in total publications	Number of articles addressing socio-political themes	Annual increase in socio-political publications	Socio-political themed publications as a proportion of all publications
	n	%	n	%	%
2011	1	-	0	-	-
2012	0	-	0	-	-
2013	1	-	0	-	-
2014	2	100.0%	0	-	-
2015	6	200.0%	1	-	16.7%
2016	35	483.3%	4	300.0%	11.4%
2017	66	88.6%	5	25.0%	7.6%
2018	128	93.9%	20	300.0%	15.6%
2019	161	25.8%	39	95.0%	24.2%
2020	210	30.4%	54	38.5%	25.7%
2021	213	1.4%	56	3.7%	26.3%
Mean (from 2014)	117	127.9%	25.6	127.0%	18.2%

Table 2. Indexing data

	Total number of articles published	Total Indexed emoji-themed papers in SJR or Scopus (in any quartile)	% Annual increase	% Emoji-themed papers indexed in Q1/Q2 in JCR or Scopus
	n	%	n	%
2011	1	1	-	-
2012	0	0	-	-
2013	1	1	-	-
2014	2	0	-	-
2015	6	3	200.0%	-
2016	35	12	300.0%	10.5%
2017	66	41	241.6%	9.3%
2018	128	63	53.7%	12.6%
2019	161	84	33.3%	15.4%
2020	210	161	91.6%	18.6%
2021	213	161	0.0%	19.4%
Mean (from 2015)	117	75	131.5%	-

8. Scientific disciplines

The analysis also explored the main scientific disciplines for each of the 823 articles. As can be seen in Table 3, computer science (29.4%) accounted for almost one-third of all articles published between 2010 and 2021, followed by communications (14.6%), social sciences (13.6%), nutrition

Table 3. Primary research themes in each of scientific knowledge production

Computer science (29%) • *Mass analysis of online data* • *Artificial intelligence* • *Pattern recognition*	***Communication (15%)*** • *The role of emojis in CMC* • *Emoji use by context and digital platform* • *Cultural and semantic preferences: universalism vs. localism*	***Social Sciences (14%)*** • *Emoji use in different socio-cultural contexts* • *Emoji use on social media networks* • *Penetration of emoji use by socio-demographics* • *Power and political platforms*
Nutrition (8%) • *Consumer habits, interests and tastes* • *Evaluation of satisfaction (use in measurement scales)*	***Psychology (8%)*** • *Emoji use and personality features* • *Positive and negative attributes of emojis in global contexts*	***Behavioural science (8%)*** • *Nonverbal communication* • *Semantic differences and communication contexts*
Linguistics (6%) • *Nonverbal communication* • *Possibilities and limits in language use*	***Science & Technology (4%)*** • *Multidisciplinary overviews of the technology as a transformative communication tool*	

science (8.4%), psychology (8.0%), behavioural science (8.0%), and linguistics (6.4%). Collectively, these fields account for almost 89% of the articles in the dataset.

Nevertheless, as mentioned above, the year-on-year growth in article publication varied between the full dataset and Social Science articles (sociology, political science, anthropology, social psychology and social communication). This sub-group grew at a faster rate than the overall dataset in the last three years of the time-series analysis (see, Table 1). Although the first articles to specifically address the political and social dimensions of emojis were not published until 2015–2016 (see examples such as Mayank et al., 2016; Stark & Crawford, 2015; Zhang & Zhang, 2016), their relative weight was low until 2018. However, this discipline now represents one-in-four published articles (26.3% in 2021), a significant change.

In terms of the field of publication and language, 71% of Spanish-language texts focused on communications and linguistics. However, the analysis could not identify any article addressing the socio-political dimension of emojis.

9. Research topics

9.1. General observations

As expect, the results, presented in Table 3, also show very clear differences in research focuses across each field. Social science publications span various themes, addressing political, social, and identitary issues, including representation and race (Miltner, 2020; Williams, 2019), hate speech Pereira-Kohatsu et al., 2019), gender inequality (Daniel, 2019), imaginaries and political perception of governments (Parkwell, 2019), and regional policy (Liebeskind & Liebeskind, 2019).

Secondly, many articles (26.3%) focus on the evaluations of opinions and attitudes towards particular products or news stories on the basis of automated analysis of large caches of social network data. This approach is common in computer engineering, data analysis, machine learning, and marketing (Liu et al., 2019). In contrast, we find those studies that address the particularities of language use in different cultural/regional contexts (Tang, 2017), in interpersonal relationships (Rodrigues et al., 2017), as related to individual or group identity (Yuhui et al., 2016), among others. These articles, which focus on computer-mediated communication, tend to be produced from within behavioural sciences, social sciences, psychology, communication, and sociolinguistics.

9.2. Sociopolitical knowledge production: hierarchical cluster analysis

The cluster analysis resulted in the generation of three groups/clusters. A qualitative analysis of these groups indicated that two were of specific interest to the study. As mentioned above, two dimensions were identified for each of these two groups: in both of clusters a "political" dimension was identified, this included articles focused on electoral campaigns, activism, fake news, the public image of leaders and political parties, corruption, destabilization, national security, management of natural disasters by governments, international relations, nationalism, management of COVID-19, and social policies, among others. The clusters were differentiated, however, by the identification in a "culture-identity" and "social exclusion" dimension. Culture-identity relates to articles addressing topics such as cultural representativeness and diversity, social identities, social movements around issues of culture, values, traditions, symbols, beliefs, customs and local specificities of emojis. Social exclusion related to articles addressing discrimination and oppression of minorities and marginalized social groups, social stereotypes, hegemonic domination, heteropatriarchy, racism, and functional diversity. Figures concerning factor scores allows for the visualization of groupings considering two dimensions.

The first cluster analysis, presented in Figure 1, visualizes the strength of focus on "political" themes of emoji-based communication (X-axis) in conjunction with articles that focused on issues of "culture-identity" (Y-axis). The results of the analysis show three clusters (groups), identified as green, yellow and blue. The first group (green dots) identifies those articles with little to no focus on the political dimensions of emojis or culture-identity. The second group (yellow dots) represents those articles that had a partial focus on political issues associated with emojis, but which have a low focus on culture-identity. Finally, the third group (blue) represents articles that have a strong focus on both dimensions. Additionally, it is worth noting that this last group had the most significant growth, +47% from 2015–2021, representing a larger proportion of all socio-political texts amongst the three types of groups analysed.

In the second cluster analysis, the "political" dimension is retained on the X-axis but "social exclusion" is introduced on the Y-axis. In Figure 2, the first group (purple) represents articles that did not address either of the two dimensions. The second cluster (orange) groups articles that addressed political issues related to emojis (for example, electoral campaigns, fake news, national security, corruption, international relations, public image) but where social exclusion was not an important focus. The third cluster (blue) identifies the articles that had an explicit focus on both the political and social exclusions dimensions, in other words, a hybrid approach.

10. Collaboration and multidisciplinarity

The analysis also reveals that there is significant multidisciplinarity in some areas of scientific research, a notable evolution from relatively unitary and isolated approaches to more integrative and multidisciplinary perspectives. In 2017, only 9.0% of authorships were multidisciplinary, compared to 19.5% in 2021, representing an increase of 116.7%.

However, despite the progressive increase in multidisciplinarity since 2015, when the data is analysed at a deeper level it becomes apparent that the degree of interdisciplinary work is somewhat limited. The majority of collaborations (68.7%) occur between fields that are epistemologically close (engineering, humanities, health sciences). Furthermore, there is significant variation in the degree of

collaboration between the different disciplines. In this respect, linguistics was the field with the greatest tendency towards multidisciplinary authorship (22.4% of articles), followed by computer science (15.1%). It was also apparent that there was little collaboration between perspectives from within engineering fields, using automated approaches, and language focused research.

11. Epistemological and methodological observations

From another perspective, there is a predominance of studies that approach emojis from a descriptive, utilitarian, or functional standpoint, making up 86.0% of all articles. This means that only 14.0% of articles considered emojis from within an anthropological or sociological epistemology that explores the cultural and broader social transformations produced during digitally mediated interactions. In parallel, there was also a notable lack of articles focused on diversity and inclusion (prejudices, stereotypes, invisibilisation or exclusion of minorities, inequalities, etc.). As expected, the largest group of articles in this area come from social science (40.2%), compared to only 8.2% across all disciplines. In terms of language, only 8.1% of all English-language articles addressed issues of cultural and social diversity and inclusivity, while this rose notably to 23.8% in Spanish-language articles, a statistically significant difference (Pearson's Chi-squared, $p = 0.12$).

Although the characteristics of symbolic universal language have already been addressed (Azuma & Ebner, 2008; Feng Yuhui et al., 2016; Kimura-Thollander & Kumar, 2019), most articles analysing these issues have focused on opinion mining, the dissemination of ideology and product consumption (Liu, 2012; Pereira-Kohatsu et al., 2019).

Overall, there was a significant scarcity of themes that are highly relevant to social sciences. Specific gaps include research on cultures and/or social and cultural representation, contexts and areas of use, styles, accessibility, interactions and social practices mediated by emojis, and issues relating to exclusion and inequality based on gender, race, social class or functional diversity.

As a final observation it is relevant to point out that there was an almost complete absence of articles (0.2%) employing novel methodological techniques specifically designed for the study of emojis on digital platforms.

12. Discussion and conclusions

The objective of this systematic literature review was to map, critically evaluate, and conduct a trend analysis of original research contributions on emoji-based communication during the period 2011 to 2021 in both English- and Spanish-language publications. In terms of the direction that research into emoji use is taking, this is highly important because the way that emojis are understood and defined has important theoretical, methodological, political and social implications. The epistemological frames applied to emoji research and the way that the relationship between language and socio-political dimensions is defined deeply affects ways of seeing and interpreting socio-communicative reality, power and social exclusion.

Through the analysis we have been able to identify relevant trends related to total publication, multidisciplinarity between scientific disciplines, indexing, representation of minority social groups, utilitarianism and uses linked to public opinion and media. The analysis permits a number of important conclusions in relation to 1) the language of knowledge production, 2) the broader socio-political implications of emoji research, and 3) the knowledge, analytic and methodological gaps in evidence and research effort.

Firstly, the low rates of collaboration between disciplines, compared to other more consolidated fields, not only reflect that this is a new and emerging field, but also the need to promote spaces and networks for multidisciplinary discussion and collaboration on emojis as communicative and socio-technical devices. We propose that it is necessary to create multidisciplinary working groups

and forums to consolidate practices and overcome inertia between disciplines and production contexts (inclusion and diversity of people and spaces).

Related to this, while the dominance of English-language publications has a number of benefits, such as dissemination, standardisation and accessibility, it is also necessary to critically evaluate the negative consequences of overrepresentation. The monopolisation of Anglo-centric knowledge production can mean a loss of sociocultural sensitivity; the potential perpetuation of stereotypes, frameworks and collectives imaginaries; and the imposition of structures that reproduce privileges and exclusion (Bernárdez, 2008). The low production of Spanish-language texts makes it difficult to conduct comparative analysis and segmentation between contexts and sociocultural realities. Language as an extension of power results in the reproduction of colonialist hegemony (Durand & Xavier, 2006). As such, the research results support, within the terms of this research, claims that local perspectives are absent in the investigation of emoji-based communication. However, the problem may be far more extensive, and we must consider to what degree Spanish-language studies are reproducing practices from English-language research—epistemologies, study objects, design and methods, etc. It is also worth asking, therefore, how English-language scientific production is shaping the codes, worldviews and approaches to emoji-based research.

In relation to the production of material in the sociopolitical domain, the growth of approaches that address emojis as a communicative practice with political implications and social intersections stands out in recent years (see, Liebeskind & Liebeskind, 2019; Parkwell, 2019; Williams, 2019). Especially evident is how emojis operate as communicative devices that reproduce hegemonic systems of privilege and inequality (Kimura-Thollander & Kumar, 2019). Thus, as a communication system, emojis intersect with power structures that reproduce dominant, stereotypical interpretative frameworks (Berard, 2018; Daniel, 2019) and favour practices of inclusion-exclusion of minority groups (Miltner, 2020). Materially, they make the existence of unequal relations of power visible and tracking the digital footprints they leave on devices is an excellent opportunity for social critique, visibilisation of oppression, subversion, and social change.

The rapid growth of articles focusing on sociopolitical issues could indicate two things. Firstly, the significant potential for growth and consolidation of this line of research, where various disciplines are engaged (political science, social communication, sociology, and anthropology; Gray & Holmes, 2020; Pereira-Kohatsu et al., 2019; Wang et al., 2019). Secondly, the turbulent social and consumer climate caused by numerous economic, social and, more recently, health crises, has led to a growing interest in the study of emojis as a reflection of attitudes, social discourses, consumption intentions and political affinities.

A dichotomy also exists between articles dealing with emojis in terms of their universality and particular situational uses. This would seem to relate to the fact that research produced from within engineering fields, which tend to have a more practical perspective, see structural and semantic dimensions as an obstacle that must be overcome through prediction and learning algorithms . On the contrary, articles that analyse the particularities of emojis use in mediated communication tend to approach these characteristics as an opportunity to develop deeper understandings of our communication mechanisms in a globalized and digitalized context.

The analysis also found that there was a scarcity of articles applying analytical research methodologies and fieldwork that was specific to emoji-based research. We could also observe a lack of specific analytic methodologies, either imported from specific disciplines, such as linguistics or sociology, or new methodologies for the specific analysis of this phenomenon in communication.

On the other hand, there is a general lack of critical work on the organisation and functioning of standardised repositories. There is a very important relationship between standardisation processes and emoji publication that raises important questions on the underrepresentation of specific vulnerable social groups and interests of those organisations that control everyday language use in billions of computer-

mediated messages all over the world. This might include asking: Why are there are no high-contrast repositories adapted to the needs of people with visual diversity? Is the censure of emojis and their replacement with more innocuous forms an infringement on freedom of expression? Do skin tones represent a form of racial classification and not a genuine attempt at accepting differences? Do decisions on which emojis to include represent a real interest in enriching linguistic communication or are inclusions essentially arbitrary? Has a proper socially transparent system for choosing emojis been considered? Does the anecdotal vision and representation of cultural stereotypes correspond to the English-speaking world or global-local standpoints?

These are only a few of the questions that must be answered and represent the need for research and critical evaluation of the repository system and its functioning. All language is an instrument of power and it can be most damaging when a select group condition the communication of the majority (Bernárdez, 2008).

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