A science mapping analysis of 'Communication' WoS subject category (1980-2013)

Mapeo científico de la Categoría «Comunicación» en WoS (1980-2013)

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ABSTRACT

Communication research field has an extraordinary growth pattern, indeed bigger than other research fields. In order to extract knowledge from such amount, intelligent techniques are need. In such a way, using bibliometric techniques, the evolution of the conceptual, social and intellectual aspects of this research field could be analysed, and hence, understood. Although the communication research field has been widely analysed using bibliometric techniques and science mapping tools, a conceptual analysis of the whole communication research field is still needed. Therefore, this article introduces the first science mapping analysis in the communication research field based on the Web of Science Subject Category "Communication", showing its conceptual structure and scientific evolution. SciMAT, a bibliometric science mapping software tool based on co-word analysis and h-index, is applied using a sample of 33.627 research documents from 1980 to 2013 published in 74 main communication journals indexed in the Journal Citation Reports of the Web of Science. The results show that research conducted in the communication research is concentrated on the following sixteen disconnected thematic areas: "children", "psychological aspects", "news", "audience", "surveys", "advertising", "health", "relationship", "gender", "discourse", "telephone communication", "public relation", "telecommunications", "public opinion", "activism" and "Internet". These areas have progressively disconnected among them, which drives to a Communication field relatively fragmented.

RESUMEN

El campo científico de la comunicación ha experimentado un enorme crecimiento a lo largo de los años, superando incluso a algunas áreas científicas consagradas. Mediante el uso de técnicas bibliométricas, podemos analizar la evolución conceptual, social e intelectual de esta área, así como comprenderla. En particular, el área de «Comunicación» ha sido ampliamente estudiada desde un punto de vista bibliométrico, pero no se ha realizado un análisis conceptual global del área englobado en un marco longitudinal. En este sentido, este artículo muestra el primer análisis de mapas científicos del área de investigación de la comunicación basándose en la Categoría de la Web of Science «Communication», centrándose en la estructura conceptual y cómo esta ha evolucionado. El estudio se ha realizado mediante la herramienta de análisis de mapas científicos SciMAT, basada en los mapas de co-palabras y en el índice-h. Un conjunto de 33.627 artículos científicos, publicados entre 1980 y 2013 en las 74 principales revistas del Journal Citation Reports de la Web of Science, han sido estudiados. Analizando los resultados, podemos destacar que la investigación llevada a cabo en el área de la comunicación se ha centrado en dieciséis áreas temáticas: «infancia», «aspectos psicológicos», «noticias», «audiencias», «sondeos», «publicidad», «salud», «relaciones», «género», «discurso», «comunicación telefónica», «relaciones públicas», «telecomunicaciones», «opinión pública», «activismo» e «Internet». Estas áreas se han desconectado entre ellas progresivamente, lo que conduce a un campo relativamente fragmentado.

1. Introduction

As pointed by Rogers (1994), communication is a professional field and also a scientific discipline. It has an extraordinary growth rate (Park & Leydesdorff, 2009), even more rapid than in biotech or computer sciences (Koivisto & Thomas, 2011). Moreover, Web of Science contains a category entitled "Communications" where different related communication journals are grouped. Since there is a huge amount of communication studies, the analysis of the conceptual evolution of the field must be done using intelligent tools, such as bibliometric and science mapping analysis.

Bibliometrics is a relevant resource to evaluate and analyse the scholarly production in the different areas of Science and Knowledge (Martínez, Cobo, Herrera, & Herrera-Viedma, 2015). They allow assessing the bibliographic production developed at different levels and by different agents, from nations to individuals, including institutions or journals (Martínez, Herrera, López-Gijón, & Herrera-Viedma, 2014).

Science mapping and performance analysis stand out as the main bibliometric methods used in this sense (Noyons, Moed, & Luwel, 1999). Performance analysis deals with the scientific impact and citation reached by different actors such as universities or scientists. Science mapping draws a representation of the structure of scientific research as well as its evolution at the intellectual, theoretical or social spheres.

These methods have been applied to analyse the structure of Communication through different levels such as authorship (Barnett & Danawoski, 1992), associations (Barnett & Danawoski, 1992; Chung, Lee, Barnett, & Kim, 2009), institutions (Koivisto & Thomas, 2011), participation on Doctoral commitees (White, 1999), the influence of gender on received quotations (Knobloch-Westerwick & Glynn, 2013) and the relationship of communication with other areas (Barnett, Huh, Kim, & Park, 2011; So, 1988). When approaching the scientific production of the field, previous studies have selected papers from specific journals (Hakanen & Wolfram, 1995; Rogers, 1999; Leydesdorff & Probst, 2009; Poor, 2009; Schönbach & Lauf, 2006; Smith, 2000), from specific geographical areas (De-Filippo, 2013; Fernández-Quijada & Masip, 2013; So, 2010), published by certain authors (Lin & Kaid, 2000; Lauf, 2005), dealing with specific topics (Chung, Barnett, Kim, & Lackaff, D, 2013; Míguez-González, Baamonde-Silva, & Corbacho-Valencia, 2014; Repiso, Torres & Delgado, 2011; Tai, 2009) or quoted by flagship journals (Park & Leydesdorff, 2009).

This paper introduces the first science mapping conceptual analysis of the entire communication category, showing the field's structure, evolution and new trends. To do that, the communication research production (1980-2013) indexed at the Journal Citation Reports (JCR), and Web of Science (WoS) is examined using the SciMAT software tool (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2012).

Communication research field Research from the communication field has been traditionally divided into two disciplines (Barnett & al., 2011; Rogers, 1999): on the one hand mass communication and the other hand interpersonal communication. This issue is evidenced by the degree to which both disciplines cite each other (Rogers, 1999). It has also been described as a lack of communication among the communication researchers (Paisley, 1984; So, 1988) who in fact, use separate literature.

Nowadays, there is a great debate about the structure of communication research field and its fragmentation (Corner, 2013). Some authors argue that communication research field is an incomplete aggregation of atomized research domains (Park & Leydesdorff, 2009), and therefore, the field cannot be divided into mass and interpersonal communication (Barnett & al., 2011). Moreover, communication is influenced by other fields such as psychology, political science, and sociology (Barnett & al., 2011; Leydesdorff & Probst, 2009). For example, (Barnett & Danawoski, 1992) there are claims for a more complex structure, finding three different dimensions within the field: communication/interpersonal, humanistic/scientific, and theoretical/applied studies. This more complex structure is also supported by Barnett & al. (Barnett & al., 2011). In fact, communication could be split into various academic entities (Park & Leydesdorff, 2009), such as political communication (Lin & Kaid, 2000), technical communication (Smith, 2000), agenda-setting (Tai, 2009), speech communication, advertising, etc. Communication research field cannot be addressed as a stable set, but it is on the way towards the establishment of a specialty of its own (Leydesdorff & Probst, 2009).

This work provides maps to be useful for research policy actions as well as to science sociologists. It may also be useful for communication researchers who may need a science tree of their discipline to research career orientation purposes.

The current paper aims to draw the evolution of the Communication research field through the following research questions:

• RQ1. Which are the main research themes in Communication?
• RQ2. How central and developed are those themes?
• RQ3. Which are the most important topics according to production and impact?
• RQ4. How have those themes evolved since 1980?

2. Material and methods

SciMAT (Cobo & al., 2012) synthesizes most of the assets of the existing science mapping software tools (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011b). It was developed following the system designed by Cobo, López-Herrera, Herrera-Viedma and Herrera (2011a), based on the h-index (Hirsch, 2005) and on co-word analysis (Callon, Courtial, Turner, & Bauin, 1983). Performance analysis and science mapping are thus simultaneously used to scrutinize a research field by detecting and visualizing its conceptual sub-domains as well as its thematic evolution. A longitudinal co-word science mapping analysis carried out with SciMAT is based on four stages (Cobo & al., 2011a):

• Detection of the research themes. The keywords extracted from the documents of each period are used to build a whole network based on co-occurrence. That is, in the network, the nodes will re-

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present the keywords, and there will be an edge between two nodes if both keywords co-appear in a set of documents. Then, a clustering algorithm (Coulter, Monarch, & Konda, 1998) is applied to a normalized co-word network in each period to identify the existing research themes. A cluster or theme will represent a set of keywords strongly related to each other.

• Visualizing research themes and thematic network. A graphic representation of the identified topics is drawn through two different instruments: strategic diagram and thematic network. Following Callon, Courtial, and Laville (1991), two dimensions are used to characterize each topic: centrality and density. The former measures the external interaction among each network and can be understood as the relevance value of the topic. The latter measures the internal cohesion of the network, and it should be interpreted as a measure of the theme's development. Through centrality and density, a research field can be represented in a two-axis strategic diagram which draws four different categories:

a) Upper-right quadrant. Topics placed in this category are identified as "motor themes", as they are well developed and essential for building the research field.

b) Upper-left quadrant hosts topics characterized by strong internal ties but weak external links, with low relevance for the field. They stand as specialized themes on the area periphery.

c) Lower-left quadrant includes topics lacking development and relevance. They represent either emerging or disappearing themes.

d) Lower-right quadrant shows relevant themes but lacking development. They can be understood as transversal, basic and general topics.

• Discovery of thematic areas. The main themes of the field and their evolution are drawn through their diachronic changes. These changes are identified by overlaps in the clusters from one period to the following. That is, there is evolution if a theme from the period T1 share keywords with a theme of the period T2. As more keywords two clusters of consecutive periods have in common, stronger will be the evolution.

• Performance analysis. Each theme and thematic area are comprised of a set of keywords that appear in a set of documents. That is, a set of documents could be associated with each theme and thematic area. In that sense, the production and scientific impact of each topic and each thematic area are measured using bibliometric indicators

such as the number of published documents, citations, or different types of h-index (Hirsch, 2005).

The Journal Citation Reports (JCR) provided by Clarivate Analytics is used to obtain the most important communication journals because it presents the best retrospective coverage and it provides quality data to develop our study. The JCR (2013) listed 74 journals under the Communication subject category. Data were retrieved from Web of Science database

The sample is further restricted to the period 1980-2013 and it only includes articles and reviews. It includes 33.627 documents and their citations up to August 2014.

Author's keywords as well as they their Keywords Plus were used as units of analysis. Additionally, a de-duplication operation was carried out to refine data. As some documents lacked enough keywords, descriptive key-words were manually added. Those additional keywords were elaborated matching title words with other key-

Figure 1. Strategic diagrams for the periods 1980-1989, 1990-1999, 2000-2009 and 2010-2013.

words already present in the Web of Science database. Last, some keywords were excluded because of their low informational value: that was the case with stop words or terms which were deemed too generic, for instance, Communication. Finally, 29.951 keywords were used.

Next, the comprehended time lapse was divided into four periods: 1980-1989, 1990-1999, 2000-2009 and 2010-2013. WoS included 3,731, 6,583, 13,203 and 10,107 documents respectively for each one of these periods.

3. Results
3.1. Communication research themes
A diagram is presented for each chronologic period to analyse the most relevant themes in the communication research field. In each diagram, the sphere size is related to the sum of documents linked to each research topic. Also, the sum of citations received by each topic is offered in brackets.

• **First period (1980-1989)**. During this period, the communication research field pivoted on eighteen research themes (Figure 1).

The performance measures stated in Table 1 remark two topics: "Advertising" and "Television". Both themes got the largest number of documents and achieved more than four-thousand citations.

"Advertising" is the most central theme, standing as a basic and transversal topic, achieving a high citation rate and impact, related to brands, sales, and products.

The theme "Television" is categorized as basic and transversal, and it is very central in that period. It achieves the highest impact rate. This theme comprises research conducted on different aspects of television, such as the coverage of different disasters, social uses of television, and communication patterns among others.

• **Second period (1990-1999)**. According to the strategic diagram shown in Figure 1, the research field was mainly composed of motor themes in those years. Also, there is a great number of emerging themes which will be the basis of future themes in the next periods.

The theme "News" evolves from an emerging topic in the first period to one of the most important motor themes during this decade. According to Table 1, it ranks as the most productive theme in third place, according to its citations.

The theme "Response" is consolidated as a motor theme, is one of the most attractive to communication researchers. It is still covering and delving into similar topics.

The motor theme "Gender" obtained the highest impact rate in this period. It is related to gender/sex difference, intimacy, and sex as well as behaviour.

"Advertising" is also consolidated as the motor theme, reaching great impact with a limited number of documents. Among other topics, the use of advertisement on the Internet is studied.

• **Third period (2000-2009)**. During this period, the communication research field pivoted on twenty-two research themes (Figure 1).

The motor-theme "News" is the most important according to its performance indicators (Table 1). It studies topics related to news and mass media, the media effects models, and news coverage.

"Advertising" is consolidated as motor-theme in that period. It is devoted to different aspects, such as its use on Internet, corporations sponsoring, effectiveness or brand placement in video games.

"Internet" appears as an important motor theme with a high citation score and also with the best h-index. It covers different aspects of this news media. For instance, the differences among Web and mail survey response rates, patterns on Internet, and on-line Social Networks among others.

"Close-Relationship" is focused on aspects related to romantic relationships such as satisfaction, positive illusions, dating, dynamics of emotional reactions, and attachment.

"Children" become an important motor theme in this period, obtaining a huge impact rate. It is mainly focused on the analysis of the behaviour of children and youth, especially on the Internet. Also, it covers aspects related to the effects of violent video games and violent media content.

"Discourse" is strengthened as the motor theme in this period by improving its impact rate. Mainly the research conducted during this period was devoted to language, identity, ideology, narration as well as the discourse analysis.

The theme "Gender" obtained a moderate impact rate. It is centred on opinion gender gaps, sex differences in video games playing, differences in attitudes toward homosexuality or differences in empathic accuracy.

• **Fourth period (2010-2013)**. During this period, the communication research field pivoted on twenty-three themes (Figure 1).

Taking into account their performance measures (Table 1), the motor themes "News" and "Internet" stand out. The former covers a great variety of topics, such as the diffusion of news in new on-line tools like Twitter, framing or the media coverage of different news. The latter is focused on different aspects of the on-line communication.

Moreover, "Gender" is consolidated as the motor theme, and refers to topics such as the sexually explicit internet material, gender differences in the Internet, sex difference in on-line dating, gender roles and work-life, sex-difference in video games, or the necessity of seeking health information.

The theme "Advertising", although it is laid out in the fourth quadrant, it is very close to the centre of the strategic diagram. Also, due to its evolution and impact rate in this period, it could be considered as an important topic. It covers aspects related to in-game brand exposure, how users assess credibility to websites of brands, commercial media environment or the understanding of advertisements by children.

3.2. Thematic evolution of the communication research field

Using SciMAT, the research output in the field was observed to concentrate around 16 areas: "Children", "Psychological aspects", "News", "Audience", "Surveys", "Advertising", "Health", "Relationship", "Gender", "Discourse", "Telephone communication", "Public relation", "Telecommunications", "Public opinion", "Activism" and "Internet" (Figure 2). In this Figure, thematic links are represented by a solid line. In other sense, a dotted line connects topics which share common keywords other than their respective names (for a better understanding, the dotted lines which connect themes of different thematic areas were deleted). Meanwhile, the size of the sphere represents the number of documents belonging to each theme. Additionally, the different shadows gather the topics labeled under the same thematic area.

Structural analysis of the evolution of the communication scientific field. As seen in Figure 2, the analysed research output is characterised by a solid cohesion. Most of

Table 1. Performance of the themes in the for the periods 1980-1989, 1990-1999, 2000-2009 and 2010-2013

Period 1980-1989				Period 1990-1999			
Name	Documents	Citations	h-index	Name	Documents	Citations	h-index
Advertising	295	4,002	33	Telecommunications	910	6,673	34
Television	223	4,034	35	Audience	898	12,535	49
Media	185	2,308	25	Perception	853	19,235	63
Response	143	2,458	28	Advertising	842	14,303	54
Telecommunications	130	429	10	Decision-Making	840	13,616	50
Public-Relation	109	812	12	Public-Opinion	782	13,406	55
Radio	106	642	13	Health	696	12,644	49
Rhetoric	104	1,083	16	Industry	693	5,742	35
Conversation	94	2,212	23	Public-Relation	689	9,123	43
Compliance-Gaining	66	1,148	19	Broadcasting	659	6,439	35
News	64	692	16	Children	591	10,609	46
Poll	58	616	17	Couples	382	10,877	47
Face-And-Facework	53	888	15	Conflict	317	5,450	36
Interaction	31	487	10	Country	291	2,915	25
Soap-Opera	28	992	18	Argument	276	3,393	32
Gender	26	470	12	Interaction	274	5,079	36
Gratifications-Sought	25	441	12	Telephone	246	2,902	29
Reagan, Ronald	16	209	9	English	187	2,515	27
				Democracy	172	2,401	27
				Recall	151	3,153	30
				Web	107	2,700	28
				News	1,330	20,299	62
				Response	1,273	20,978	64
				Discourse	1,024	13,397	48
				Gender	1,022	24,504	66
Period 2000-2009				Period 2010-2013			
Name	Documents	Citations	h-index	Name	Documents	Citations	h-index
Health	791	11,740	43	Health	856	2,836	19
Close-Relationship	698	11,874	43	Political-Communication	757	1,727	12
Social-Support	545	8,718	42	Mobile-Communication	654	1,805	16
Conflict	502	5,391	34	Film	648	874	10
Prevention	500	7,685	41	Satisfaction	544	1,491	14
Election	384	4,873	33	Political-Participation	523	1,629	17
Mobile-Phone	312	4,850	34	Romantic-Relationships	430	1,175	13
Activism	174	1,738	21	Persuasion	378	828	12
Adult-Attachment	159	2,889	29	Chinese	347	536	9
News	2,983	38,283	71	Youth	335	822	12
Discourse	2,396	25,829	55	Population	324	676	10
Perception	2,198	34,253	67	Social-Movements	321	725	11
Rights	1,931	19,949	51	Emotion	220	779	13
Internet	1,925	30,776	73	Facebook	218	1,046	17
Children	1,825	28,158	62	News	2,664	5,741	20
Advertising	1,690	23,059	55	Internet	1,944	5,754	22
Form	1,676	17,486	50	Discourse	1,808	3,317	17
Audience	1,627	18,582	52	Behavior	1,725	4,721	19
Memory	1,451	21,986	55	Form	1,247	2,675	18
Policy	1,441	15,053	49	Gender	1,168	2,409	17
Gender	1,353	19,373	51	Policy	1,120	2,432	18
Democracy	1,179	16,857	54	Advertising	1,030	2,063	15
				Organization	1,000	2,348	16

the identified topics are gathered under a thematic area. They derive from a topic appeared in the previous period. Also, they show a continuous evolution with almost no jumps or gaps. Regarding the starting period, ten thematic areas started in the first period. Thus, they could be considered as classic. Moreover, in the second period, three new thematic areas emerged: "Health", "Relationship" and "Internet". In fact, the thematic area "Internet" plays an important role in the development of the field. Regarding the theme composition, the thematic areas "News", "Relationship", "Gender" and "Internet" are mainly composed of motor themes in all the periods. Also, the thematic areas "News", "Gender" and "Internet" show a significant growth according to the rise in the number of documents (that is, volume of spheres in Figure 2).

Table 2. Performance of the thematic areas			
Name	Documents	Citations	h-Index
Children	4634	48171	73
Psychological-aspects	4881	74186	83
News	7243	67612	84
Audience	4187	39420	71
Surveys	2002	33505	75
Advertising	4101	46327	71
Health	3143	39779	68
Relationship	2652	34164	62
Gender	3779	52729	76
Discourse	7753	65503	76
Telephone-Communication	1265	10445	43
Public-Relation	5690	44894	69
Telecommunications	1728	15019	48
Public-Opinion	3624	39099	71
Activism	495	2463	22
Internet	3976	39230	76

Performance analysis of the evolution of the communication scientific field. Table 2 shows the performance indexes of each topic. The order in the table is the same as the order of the thematic areas highlighted in Figure 2. Regarding the impact scores, two thematic areas stand out: "News" and "Internet". Both could be considered thematic areas with a global impact, playing a central role in the development of the field. Their evolution of h-index and citations show a rising trend. It is also remarkable the huge rising trend of the thematic area "Internet", which started with little impact and now becoming the origin of a new research area. In fact, since the beginning of this thematic area, the topics covered by the other ones are closely related to "Internet". Moreover, the thematic areas "Children", "Health" and "Gender" achieved a great impact, but their evolution performance was not growing across the periods equally. That is, in the second or third period there was little interest in those thematic areas, but in the last period they continued attracting the interest of the scientific community. The remaining thematic areas could be divided into two groups. On one hand, the thematic areas "Advertising", "Relationship", "Discourse", "Telephone Communication" and "Public Relations" present an adequate impact, and their themes occupy a central position according to their h-index. Also, "Telephone Communication" and "Public Relations" show a small scientific decreasing interest in the central periods. On the other hand, "Psychological aspects", "Audience", "Public opinion" and "Activism" present low impact scores. It should be pointed out that while "Psychological Aspects" and "Public Opinion" present a fading trend, "Activism", although with little impact rate, seems to be the origin of a new research area of interest.

4. Discussion

Regarding the thematic evolution shown by the detected thematic areas (Figure 2), some conclusion should be done:

• The thematic area "Children" is present in the four periods, covering topics related to the communication aspects, behaviour or patterns at different ages. In the first years, it was mainly devoted to the effects and behaviour in the use of media by children and young people. Later, although the interest in children media behaviour and effects continued, new topics related to bullying, attachment formation and relationships, predictors of children's friendships, or the perceptions of their sibling relationships appeared. In the period 2000-2009, there was an increase in the interest of topics related to the behaviour of children on the Internet. Finally, in the last period, the topics covered were focused mainly on the Internet.

• "Psychological Aspects" was devoted in the first period to issues related to compliance gaining and perception. In the second period, it was focused on the levels of processing, dimensions of emotional experience, cognitive capacity, or third-person effect. Later, the topics evolved to narrative persuasion. Finally, some specific Psychological aspects of communication were analysed.

• "News" is one of the main thematic areas of the communication research field. In the first years, it was dedicated to the seeking of gratification, news memory, news comprehension, news structure and diversity of news. In the second period, the interest on it grew up, covering topics related to news coverage of different events, effects of news frames on readers' thoughts and recall, news reception, or the relationship between journalistic story frames and the thoughts and feelings of readers. Next, the thematic area covered a variety of topics, for instance: news
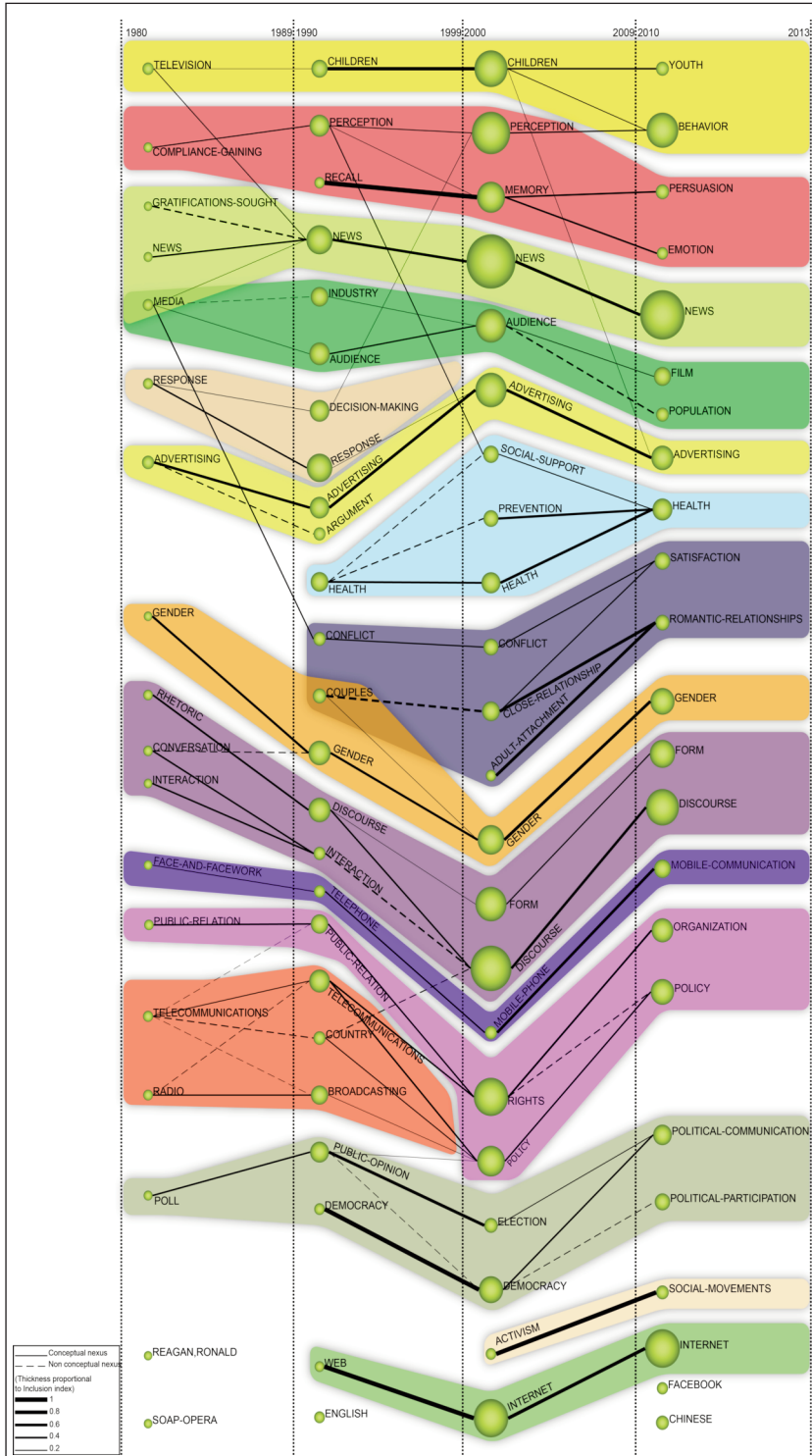
Figure 2. Thematic evolution (1980-2013).

framing, agenda setting, and priming effects, media aspects, news coverage, aspects of on-line news or event-driven news. Finally, in the period 2010-2013, due to its structural characteristics, it was related to other thematic areas. Some topics covered in those years were: news on Twitter, media and news coverage and framing.

• The thematic area "Audience" was devoted in the first period to the analysis of the audience of different ages, genders, and races, and to the measurement of the audience of television news and soap operas. From 1990 to 1999, it covered topics such as audience reception, perception, and levels, or response to media content. Later, the thematic area focused on specific topics such as relationships between media companies, hostile media perception, television audience polarization, the audience for corporate Web sites and product (or brand), as well as placement in films. Finally, the interest of the audience on the Internet rose during the last analysed period. Also, this area covered journalism audience and campaign evaluation.

• "Surveys" was only present in the two first periods, is an important research area in those years. In both periods, it was devoted to the study of surveys, response rates, deal with non-response or asking for sensitive questions.

• "Advertising" is devoted to producing a purchase by showing the products to consumers and trying to reach

their attention. In the first period, it included themes regarding the effectiveness of advertising in different media, image management, political advertising or the use of sex in advertisements. Next, the interest on advertising grew up, is an important motor theme. In the third period, the interest of advertising on the Internet increased dramatically. Also, the thematic area pivoted on other topics such as effectiveness, brand evaluation, credibility and international advertising. In the last period, in addition to the topics covered early, "Advertising" is devoted to in-game brand exposure, children understanding of advertisers and viral advertising effectiveness.

• The thematic area "Health" started in the period 1990-1999 focusing on the health communication related issues, for instance: social support messages exchanged by persons with disabilities, factors influencing responses to questions on sexual behaviour, persuasive health messages, effectiveness health communication or health communication campaigns. Afterwards, it focused on the presentation of health information, information sources, health information seeking and avoiding, and also the analysis of media consumption patterns. Recently (2010-2013), this area has been mainly focused on health communication through the Internet.

• The thematic area "Relationship" compromises the research conducted on the communication process of personal relationships, especially into romantic relationships. It started in the second period (1990-1999), focusing on scales and models. Also, it refers to attachment and coping strategies. In the next period, the thematic area was articulated into three main topics: attachment, dating, couples, and family. Finally, from 2010 to 2013, this thematic area covered predictors of non-marital romantic relationship dissolution, adult and adolescent attachment, online dating, and model for relational turbulence.

• "Gender" started as a thematic area referred to research conducted on differences among genders or specific analysis of the gender behavior. In the second period, it became an important motor theme, and therefore, it was related to themes, such as relationship or advertising effect and reception. In the period 2000-2009, it remained an interest in the gender differences and gender identity, masculinity, male violence, racial minorities, stereotypes, and also the role of gender in the third-person effect. In the last period, this thematic area was heavily influenced by the Internet.

• The thematic area "Discourse" refers to the research conducted on the communication process such as rhetoric, narrative and language. In the first years, it covered topics related to rhetoric of science, link between rhetoric and ideology, reciprocity in negotiations, initial interactions, discourse strategies or narrative in organizations. In the second period, it centred on the research conducted on conversation and language. Also, in those years it began to cover topics related to the Internet. In the third period, it focused on advance communication topics, such as, identity as produced in linguistic interaction, narrative persuasion, discourse analysis, multilingualism among others. Finally, in the last period it continued studying advance issues and topics related to the analysis of on-line discourse.

• The thematic area "Telephone Communication" varied across the periods from studies related to telephone coverage and usage, to mobile phone and mobile data usage.

• "Public Relation" was focused, in the first years, on the communication process in organizations such as social responsibility, moral values, licensing, issue management or role models. Afterwards, the interest continued in aspects related to social responsibility. It should be noted that there was an incipient interest on the relation of public relation and the Internet. In the third period, it covered general and advanced aspects of social responsibility and public relations. In the last period, there was a great influence of the Internet.

• The research area "Telecommunication" was present in the two first periods. In the former, it was focused on broadcasting and telecommunication policy and also in the television deregulation. In the latter, among others, it was comprised on the research conducted in telecommunication behaviour, Internet adoption, differences in Internet connectivity, standards-setting for global telecommunication services, channel repertoire and the differences between VCRS and cable television.

• "Public Opinion" is mainly focused on the democratic process, voter's behaviour and political issues. In the first years, it consisted in the research conducted on polls, evaluation of poll data and voting behaviour. In the second period, it broadened to include topics related to campaign media, democracy deliberation, mediatisation of politics, relation of public opinion and public policy, or the influence of news coverage on the perceptions of public sentiment. Afterwards, it was focused on similar topics and also some aspects related to the Internet. In the last period, the influence of the Internet increased, covering topics such as college students' use of on-line media for political purposes, levels of interactivity of Presidential Candidates' Websites and the influence of these social media on political cynicism. Moreover, it comprised other topics such as civic engagement and democratic communication.

• "Activism" arose in the third period (2000-2009) covering aspects related to some social movements and protests. Moreover, it compromised the research conducted on democratic media activism, and alternative media. In the last period, it was focused on the personalization of collective actions, and many social movements around the globe.

• Since "Internet" appeared as a thematic area in the second period, the whole communication research field has been heavily influenced by it, especially from the third period up to now. In the years 1990-1999, it referred to the research conducted on exploring Web users' motivations and concerns, users' issues, and on-line service adoption. In the third period, it was related to Internet use and social network among others. Finally, in the period 2010-2013 there was an increase interest in communication issues in on-line social network. For instance, whether Facebook users have different connection strategies, such as Twitter, social scientists, predictors of Facebook communication and relational closeness. Also, it comprised the research conducted on e-science technologies, online credibility or the use of big data to resolve significant questions.

5. Conclusion

As pointed above, Communication Research has been labeled as a fragmented field. This survey supports this claim by delimiting sixteen thematic areas with almost no topical links among them. Connections were more common from 1980 to 2000, but in the 21st century, those areas are becoming isolated.

Anyway, this outcome does only reflect scientific production indexed at WoS, which is biased towards the English language. Further research might compare the results with samples from other databases such as Scopus or Google Scholar with a wider geographical and linguistic scope (Delgado & Repiso, 2013), allowing then to significant transnational comparisons. In the same sense, future studies might collect papers according to a purposeful selection of journals.

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