

Sociomateriality: an integrative review to understand the current status of scientific production

Sociomaterialidade: uma revisão integrativa para compreender o atual estado da produção científica

Sociomaterialidad: una revisión integrativa para comprender el estado actual de la producción científica

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Abstract

This paper was dedicated to understand the current status of scientific production on sociomateriality, the themes and theoretical approaches addressed, the ontological and epistemological perspectives, the methodology adopted, criticism about the theory and future research trends. In the end, it is hoped that this paper may contribute to the advancement and development of this field of study through the opening of a research agenda. Developed by an integrative review, which was carried out by means of a survey of the international scientific production in periodicals of great relevance. The findings show the ontological and epistemological approach adopted by these studies is social constructivism or critical realism, predominating social constructivism. The predominant research method is the qualitative approach case study. In addition to criticisms related to the ontological and epistemological approaches, the proposed concepts for sociomateriality and the generic examples, it is worth noting that research does not explore other types of materiality.

Keywords: Sociomateriality; Materiality; Theory.

Resumo

Este artigo objetivou compreender o estágio atual da produção científica sobre sociomaterialidade, os temas e abordagens teóricas, as perspectivas ontológicas e epistemológicas, a metodologia adotada, as críticas à teoria e as tendências futuras de pesquisa. Justificou-se no avanço e desenvolvimento deste campo de estudos por meio da abertura de uma agenda de pesquisa. Metodologicamente, desenvolveu-se mediante revisão integrativa, realizada por meio de levantamento da produção científica internacional em periódicos de grande relevância. Os achados mostram que a abordagem ontológica e epistemológica adotada por esses estudos é o construtivismo social ou realismo crítico, com predomínio do construtivismo social. O método de pesquisa predominante é o estudo de caso de abordagem qualitativa. Além das críticas relacionadas às abordagens ontológicas e epistemológicas, aos conceitos propostos para a sociomaterialidade e aos exemplos genéricos. Pode-se concluir, a partir da pesquisa, que a produção científica disponível não explora outros tipos de materialidade.

Palavras-chave: Sociomaterialidade; Materialidade; Teoria.

Resumen

Este artículo tuvo como objetivo comprender la etapa actual de la producción científica sobre la sociomaterialidad, los temas y enfoques teóricos, las perspectivas ontológicas y epistemológicas, la metodología adoptada, las críticas a la

teoría y las tendencias de investigación futuras. Justificó el avance y desarrollo de este campo de estudios al abrir una agenda de investigación. Metodológicamente, se desarrolló a través de una revisión integradora, realizada a través de un relevamiento de la producción científica internacional en revistas de alta relevancia. Los hallazgos muestran que el enfoque ontológico y epistemológico adoptado por estos estudios es el constructivismo social o realismo crítico, con predominio del constructivismo social. El método de investigación predominante es el estudio de caso con enfoque cualitativo. Además de las críticas relacionadas con los enfoques ontológicos y epistemológicos, los conceptos propuestos para la sociomaterialidad y los ejemplos genéricos. De la investigación se puede concluir que la producción científica disponible no explora otros tipos de materialidad.

Palabras clave: Sociomaterialidad; Materialidad; Teoría.

1. Introduction

Sociomateriality has been discussed since 1950's in fields such as sociology and economy. For example, Southern (1958), discusses sociomateriality in the welfare. Carver (1975), states that Marx understood work as part of the socio-material world, whereas Legasto (1979), argues the sociomaterial compensation in the economic development (Jones, 2014).

Authors who write about sociomateriality intentionally try to make a philosophical statement on the relationship between the social and the material, i.e., the social and the material would be closely related (Leonardi, 2013). Most studies on this subject are based on the works of Orlikowski (2007, 2009), Orlikowski and Scott (2008), Scott and Orlikowski (2009) that introduce the concept of "constitutive entanglement" and sign a relational ontology that supports the inseparability between the social and the material or between humans and technology. In fact, sociomateriality is specifically discussed in a paper entitled "Sociomaterial Practices: exploring technology at work" by Orlikowski (2007). However, it is important to emphasize that sociomateriality is "an umbrella term" under which a series of theoretical traditions are organized (Jones, 2014).

It is important to emphasize that the papers by Leonardi and Barley (2008) and Leonardi (2010, 2011) not only lack a clear definition for sociomateriality but also apply this term very little (Kautz & Jensen, 2013). However, Orlikowski (2007, 2009), Orlikowski and Scott (2008), Scott and Orlikowski (2009) explicitly introduce the concept of sociomateriality, but the language used is also neither clear nor concise, which may justify the fact that the examples presented in their papers are too general (Kautz & Jensen, 2013). According to these authors, sociomateriality represents the recursive intertwining of human beings and technology in practice. The constitutive entanglement of the social and the material in everyday organizational life. The constitutive entanglement and the reciprocal inter-definitions of human and material agency, the way in which the phenomena are mutually interconnected (Orlikowski, 2007).

According to Leonardi (2012), in recent years, terms like materiality, sociomateriality and socio-technical systems have been introduced and discussed in conferences, workshops and colloquiums. However, some questions arise amid these talks, for instance: what does talking about materiality mean? And with no clear definition, these terms are regarded and criticized as "academic jargon", even by scholars who are interested in this line of research, rather than being used as useful tools to understand and explain the symbiotic processes of technological and organizational change.

Sociomateriality has attracted increasing attention in organizational studies, mainly in the field of information system. Since 2007, over 140 papers have been published, eighty percent of them after 2011, and almost all of them quoting Orlikowski (2007; 2009) and Orlikowski and Scott (2008) as concept source. Nevertheless, only a few approaches all the notions inherent in sociomateriality proposed by those authors: materiality; inseparability; relationality; performativity; practices. Thus, these paper's contributions to sociomateriality are still unclear (Jones, 2014).

Other authors who discuss sociomateriality also present some terms in search of a definition, like "sociomaterial assembly", "constitutive entanglement" and "imbrication", but they do not offer a potential contribution to the progress of the theory because of the lack of clarity in their ideas (Kautz & Jensen, 2013).

Putnam (2015) complements that it is necessary to focus on several kinds of materiality. Many researchers limit their studies by considering only one kind of materiality – objects, technologies or organisms – rather than a study about the place and the continuous sub-theorized space.

Materiality can be defined as the arrangement of physical and/or digital materials of an artefact in specific ways that persist through the differences in time and space and that are important for users (Leonardi, 2012). The study of the relations between the several human and non-human agents involved in the organization can contribute to the development of the organizational research and to a better understanding of sociomateriality (Putnam, 2015).

Regarding the ontological and epistemological perspectives, researches usually adopt the social constructivism or critical realism, and even if most discussions on sociomateriality are being established from social constructivism, it cannot be considered the appropriate approach. Although this approach may not be discarded, one must understand that sociomateriality can be studied from several perspectives that present their specificity and that seem more adequate under certain contextual circumstances (Leonardi, 2013).

There is a confrontation among the different approaches on sociomateriality, including an exclusionary arbitration in which critics apparently seek to distinguish right and wrong and determine what must be pursued in future researches. However, other researchers seem more flexible, acknowledging that the approaches on sociomateriality adopt different ontological positions, which leads to diversity in this field. This can be perceived as something positive, as it shows the willingness of researchers to identify different and alternative ways to understand the relations between the social and the material by believing that no perspective or paradigm guarantees the privileged access to the truth (Cezex-Kecmanovic et al., 2014).

It is possible to conclude that the flow of research on sociomateriality is still fairly new to define a unified approach (Orlikowski; Scott, 2008; Jones, 2014), which justifies new researches, especially empirical ones in different contexts, seeking to contribute to the evolution of the existing theory.

Therefore, this context justifies an integrative review that tries to answer the following question: how is the current status of scientific production on sociomateriality? Thus, a review of the international scientific production on sociomateriality was made in periodicals of great relevance according to the integrative review process proposed by Botelho, Cunha and Macedo (2011). The objective was to understand the current status of scientific production on sociomateriality, the themes and theoretical approaches addressed, the ontological and epistemological perspectives, the methodology adopted, criticism about the theory and future research trends. In the end, it is hoped that this paper may contribute to the advancement and development of this field of study through the opening of a research agenda.

2. Methodology

For the purposes of this paper, the process of an integrative review proposed by Botelho, Cunha and Macedo (2011) was adopted. According to the authors, this procedure allows the synthesis and analysis of the scientific knowledge produced on a particular area of knowledge in order to understand the framework of the current status of its scientific production as well as generate new knowledge based on the results presented in previous researches.

The stages of this process are as follows: (i) identification of the topic and selection of research question; (ii) establishment of inclusion and exclusion criteria; (iii) identification of pre-selected studies; (iv) categorization of the selected studies; (v) analysis and interpretation of results; and (vi) presentation of review/synthesis of knowledge.

3. Results and Discussion

3.1 Stage 1 – Identification of the topic and selection of research question

During this stage, the research question must be formulated according to the study topic. Thus, the research question of this integrative review is: how is the current status of scientific production on sociomateriality? Afterwards, the descriptors or keywords of the search strategy must be defined, as well as the databases that will be consulted. The databases consulted for this study were: Science Direct; Scopus; Ebsco; Proquest. The keywords used were: materiality; sociomateriality.

3.2 Stage 2 – Establishment of inclusion and exclusion criteria

The criteria for inclusion and exclusion to be applied during the database search was established in this stage. Initial research, which happened between February and March 2016, considered, mainly, papers published in the past 5 years. Sixty-eight of them were selected. Some of the exclusion criteria adopted in the systematic mapping performed by Parmiggiani and Mikalsen (2013) were applied: papers that did not provide an explicit and dense definition on sociomateriality and that did not refer to the literature on sociomateriality. A sample of 48 papers was obtained.

3.3 Stage 3 - Identification of pre-selected studies

During this stage, there was a thorough reading of the pre-selected papers, considering the criteria for inclusion and exclusion. With a refinement on the selection of papers present in the Science Direct database, the final sample obtained 40 papers. Afterwards, a table containing the selected studies for this integrative review was elaborated. Table 1 (following) illustrates the total paper per scientific periodical of this analysis.

Table 1. Distribution of Publication on Sociomateriality

Scientific Periodical	Total of Papers	Impact factor
BBR. Brazilian Business Review	1	
Cambridge Journal of Economics	1	-
Canadian Journal of Administrative Sciences	1	
Construction Management and Economics	1	
Engineering Organizations	1	
Facilities	1	
Information & Management	1	
Information & Organization	9	-
International Journal of Child Computer Interaction	1	
International Journal of Communication	1	-
Journal of Management Inquiry	2	-
Journal of Management Studies	1	-
Journal of Strategic Information Systems	1	2.692
Medical Education	1	3.196
MIS Quarterly	5	5.311
Nordic Contributions in IS Research	1	-
Organization & Environment	1	-
Organization Science	2	-

Organization Studies	3	-
Pacific Asia Journal of the Association for Information Systems	1	
Research, Society and Development	2	
Social Science & Medicine	1	
Technological World	1	-
TOTAL	40	

Source: Developed by the authors (2022).

According to the table above, most publications on sociomateriality are found at Information and Organization and MIS Quarterly. Furthermore, some of the papers by the main researchers on sociomateriality, cited in the introduction of this study, are listed in these periodicals, such as Leonardi (2011), Leonardi (2013), Scott and Orlikowski (2013); Orlikowski and Scott (2015).

3.4 Stage 4 - Categorization of the selected studies

This stage involves the summary and documentation of the information extracted from the selected scientific papers. One of the strategies used is the synthesis matrix, which is formed by analysis categories that offer directions to assess the selected papers. It is important to note that these categories are defined from the research question in order to answer it. The categorization is done before the summarization process. However, during this process, new categories relevant to the study can still be identified.

The analysis of information can be done by the analysis of the relationship between variables, statistical or descriptive methods, etc. For this study, the descriptive method was applied. The following categories were established: research theme; definition of sociomateriality; ontological and epistemological perspectives; research method; target audience; criticism of theory; future research.

3.5 Stage 5 - Analysis and interpretation of results

During this stage, the results obtained by the synthesis matrix are interpreted, presented and discussed. The results by category are presented below:

3.5.1 Research Theme

Most papers investigated sociomateriality in case studies involving the use of technologies, confirming that this topic has been attracting increasing attention from the area of information systems (Jones, 2014). As an example, there is the study about sociomateriality in synthetic worlds (Orlikowski, 2009), how technological artifacts become part of the promulgation process of institutional logics in sociomaterial practices (Hultin & Mähring, 2014), the materiality in the dynamics of services provided through technological development (Orlikowski & Scott, 2015; Johan et al. (2020); Cavalcanti & da Silva, 2020).

It was also identified papers that support a specific approach for research on sociomateriality. For instance, the study that compares critical and agential realism (Leonardi, 2013), the one that presents the flaws of agential realism and the contributions of the critical realism for the research on sociomateriality (Mutch, 2013), the one that discusses about the plurality of theoretical approaches in this area (Scott & Orlikowski, 2013).

It was also observed the existence of some studies that seek to understand the sociomateriality phenomenon in contexts that do not involve the use or implantation of technologies, which demonstrate an advancement for the theory by focusing on several kinds of materiality (Putnam, 2015). In this category are the study about sociomateriality in medical

practice and learning (Fenwick, 2014; Lupton & Lewis (2021), and the study on the role of sociomateriality in the development of genocidal processes (Clegg et al., 2013), another one on the role of materiality in the legitimization work of prizes (Monteiro & Nicolini, 2015).

Most studies present a relational view of sociomateriality based on Orlikowski (2007). Table 2 illustrates the themes of the 28 papers selected for this integrative review:

Table 2. Research Themes in the area of Sociomateriality

Themes	Authors	Total of Papers
Sociomateriality in synthetic worlds	Orlikowski (2009)	1
Dual Materiality and Knowing in Petroleum Production	Osterlie;Almklov; Hepso (2012)	1
Comparing the agential and the critical realism approach	Kautz and Jensen (2013); Leonardi (2013); Mutch (2013); Scott and Orlikowski (2013)	4
Affordance as a conceptual tool in studies about sociomateriality	Fayard and Weeks (2014)	1
Social logics promulgated in social practices	Hultin and Mähring (2014)	1
Information technology and communication and the interactions between the social, personal and material worlds	Mingers and Willcocks (2014)	1
Introducing emotions into sociomaterial dynamics	Stein et al. (2014)	1
The constitutive relationship between discourse and materiality	Putnam (2015)	1
Meaning, differences and relevance of materiality, sociomateriality and socio-technical systems	Leonardi (2012)	1
Sociomateriality in medical practice and learning	Fenwick (2014); Lupton and Lewis (2021)	2
Current status of scientific production and future research on sociomateriality in the area of information systems	Cecez-Kecmanovic et al. (2014)	1
How the 5 main notions of sociomateriality contribute to explain the relationship between the social and the material	Jones (2014)	1
How anonymity is formed by an entanglement of the material and the meaning	Scott and Orlikowski (2014)	1
The constitutive entanglement of the social and the material in everyday life	Orlikowski (2007)	1
Sociomateriality in the process of user-generated content on travel review sites	Feldman and Orlikowski (2011)	1
Sociomateriality and the mutual construction of organizational space and legitimacy	De Vaujany and Vaast (2014)	1
The tension between business process modelling and organizational flexibility from a sociomaterial approach	De Albuquerque and Christ (2015)	1

The materiality in the dynamics of services provided through technological development	Orlikowski and Scott (2015)	1
The dynamics of sociomateriality in multidimensional networks involving technological elements	Contractor; Monge; Leonardi (2011); Johan et al. (2020); Cavalcanti and da Silva (2020)	3
The role of imbrication of human and material agencies in the flexibility of routines and technologies	Leonardi (2011)	1
Systematic mapping of concepts and definitions of literature on sociomateriality	Parmiggiani and Mikalsen (2013); Kim; Yang; Bradford (2020)	2
The role of sociomateriality in the development of genocidal processes	Clegg et al. (2013)	1
The role of materiality in the legitimization work of prizes	Monteiro and Nicolini (2015)	1
The materiality of the natural worlds	Bansal and Knox-Hayes (2013)	1
The role of sociomateriality in creating identity in the workplace	Symon and Pritchard (2015);	1
Sociomateriality in education environments	Mehto et al. (2020); Sousa e Lima (2022); Medeiros et al. (2021).	3
Sociomateriality and co-creation value	Priharsari; Abedin (2021);	1
Sociomateriality and Artificial Intelligence	Chedrawi; Haddad (2022)	1
Sociomateriality in Engineering Organizations	Burnell et al. (2020)	1
Sociomateriality: theory and practice	Moura; Bispo (2020); Stanko et al. (2022)	2
TOTAL		40

Source: Developed by the authors (2022).

3.5.2 Definition of Sociomateriality

Two definitions were identified according to the ontological and epistemological perspectives. The agential realism defines sociomateriality as the inherent inseparability between the social and the material (Orlikowski, 2007). In contrast, the critical realism as the promulgation of a specific set of activities that merge into materiality with organizations, norms, speeches and every other phenomenon are defined as social (Leonardi, 2012).

3.5.3 Ontological and epistemological perspectives

The ontological and epistemological perspectives of this integrative analysis focus on the critical realism and, mainly, the social constructivism. Regarding the ontological position, for the agential realism proposed by Barad (2003) and that is englobed by the social constructivism, there is no social interaction distinct from materiality, there is only a sociomaterial fusion. As for the critical realism, the social context and its materiality are separate. The social and the material become sociomaterial through social imbrications between people and the material agency.

The epistemological stance, however, the analysts of agential realism make arbitrary distinctions between what is “social” and what is “relevant” (agential cut) when looking at the unified whole (sociomaterial). In contrast, the analysts of the critical realism determine how and why the separated “material” and the “social” become “sociomaterial”, which persists over time (Orlikowski, 2007; Leonardi, 2013).

3.5.4 Research Method

It was possible to identify the qualitative analysis of case study as the predominant approach in empirical studies on sociomateriality, in addition to the literature review. The methods applied for data collection in those studies are: interview, observation and document analysis. It was also identified the presence of three ethnographic case studies (Osterlie; Almklov & Hepso, 2012); (Contractor; Monge & Leonardi, 2011) (Leonardi, 2011). There was no study with a quantitative approach.

The obtained results are similar to the systematic analysis made by Parmiggiani and Mikalsen (2013) which identified that most studies apply an interpretive case study approach, focused on the human being, employing ethnographic methods, interviews, video-recording to register the use of technologies, sites review, etc. Some prefer more than one method for data collection. The data analysis usually applies coding to identify themes and constructs. Table 3 illustrates the data corresponding to the research method applied in the selected papers:

Table 3. Research Methods Applied in studies on Sociomateriality.

Scientific Periodical	Total of Papers
Qualitative Approach (case study)	23
Qualitative Approach (ethnographic case study)	3
Literature Review	14
TOTAL	40

Source: Developed by the authors (2022).

3.5.5 Target Audience

Even though most empirical studies on sociomateriality involves the use of technology, they occur in organizations and with individuals from different sectors. The researches analyzed in this integrative review had the following target audience: software development company; petroleum production company; hospital; private and public universities; tourism company; aircraft maintenance company; automotive company; central prison; public organizations; carbon industry company; railway engineering company.

3.5.6 Criticism of Theory

Some researchers may present criticism to the current scientific production on sociomateriality. In general, this integrative review was able to identify the following criticism: the discourse on sociomateriality in information systems is limited to the materiality on technological artifacts (what they represent in the physical world) rather than explore the different configurations that may arise from social practices; the main authors who discuss sociomateriality introduce several concepts that do not offer potential contributions for the advancement of the theory due to lack of clarity.

Although most discussions on sociomateriality are based on the agential realism, it cannot be considered the most adequate approach. Sociomateriality can be investigated applying other approaches that are more adequate to certain contextual circumstances; authors who present the critical realism as the “right path” for studies on sociomateriality are not clear about how this approach will contribute to create strong, appropriate notions and legitimate research movements. The criticism is about the statements of exclusion rather than what the papers are trying to achieve.

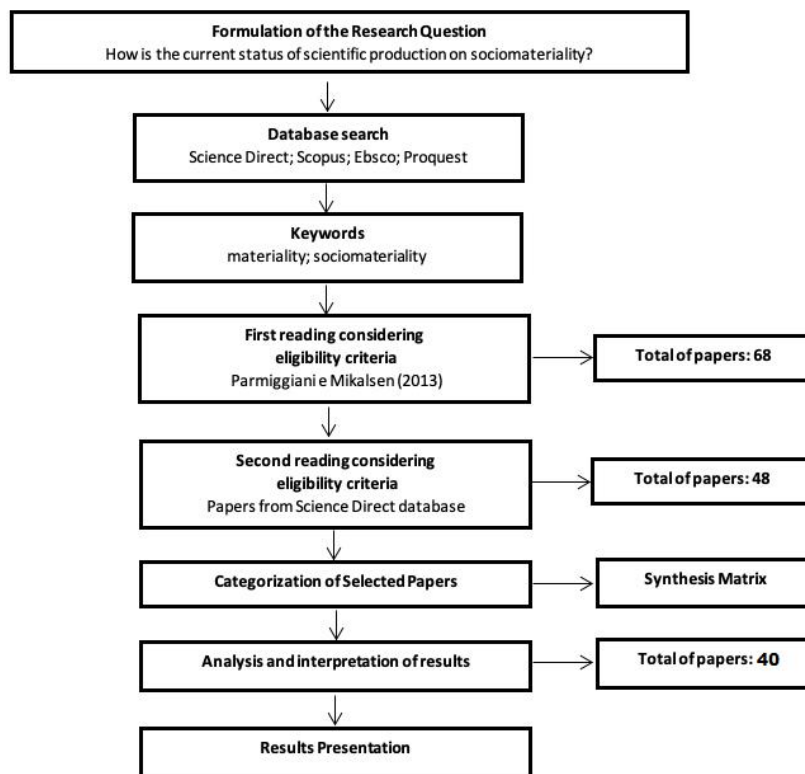
The agential realism reduces two distinct but intertwined structures (social and material) to a duality that loses sight of both configurations; the emotions that motivate humans are being neglected in studies about sociomateriality. Emotions allow people to take a position regarding the unfolding of the social reality.

There is little attention to the relevance of materiality (objects, technologies, nature, etc.) in learning; the main strategies for dealing with materiality in organizational research are conceptually problematic. Nowadays there are two methods: the first one mostly ignores, minimizes or regards it as something already conceived in organizations. There is a complete lack of treatment or theorization about material artifacts, bodies, settings and infra-structures that result from practices. The second one regards materiality in case studies about adoption, diffusion and use of technology in organizations. Researches on identity creation have been neglecting the investigation about the role of materiality in this process.

3.6 Stage 6 – Review/Synthesis of the results

This stage presents the final document, describes all the undertaken steps and presents the main findings. Figure 1 describes all the stages of this integrative review. The results are discussed in the conclusion section of this study.

Figure 1. Process of this Integrative Review.



Source: Based from Botelho; Cunha; Macedo (2011).

3.7 Discussion

This integrative review gathered important information regarding the current status of research on sociomateriality. Periodicals that concentrate most papers on the topic are Information and Organization and MIS Quarterly.

Most researches seek to understand sociomateriality in contexts involving the use of technology. There are few papers exploring other kinds of materiality, and the relationship between sociomateriality and other phenomena, such as learning, legitimization and emotion.

The different emphases and assumptions present in the literature make it unrealistic to talk about a single conception of sociomateriality (Jones, 2014). This integrative review has identified two variables on sociomateriality that adopt strongly contrasting positions.

The ontological and epistemological perspectives applied by these researches is the critical realism and, mainly, the social constructivism, as most researchers present a relational view of sociomateriality based on Orlikowski (2007). For these authors, there are the strong and the weak sociomateriality. The strong sociomateriality proposes a completely relational ontology in which the entities only exist because of the relationship with each other. In contrast, the weak sociomateriality supports that the material and the social exist separately. The differences between these approaches that follow the agential realism (strong) and the critical realism (weak) cause practical consequences on issues related to phenomena studied by the researchers and, ultimately, to the insights and ideas that may arise to improve the ways in which organizations operate (Jones, 2014).

For the followers of critical realism, the agential realism englobed by the social constructivism has weaknesses that prevent the description of some combinations between the social and the material present in contemporary social life. Agential realism reduces what would be two distinct but intertwined structures to a duality that loses sight of both configurations. However, these authors make it clear in their studies how critical realism can contribute to the current research.

It is possible to identify contradictions and limitations in both approaches. Leonardi (2010; 2011) and Leonardi and Barley (2008) get in contradiction when they introduce some concepts formulated by themselves based on Barad (2003) with a relational perspective, such as: performativity, agency. Moreover, Orlikowski (2007; 2009), Orlikowski and Scott (2008), Scott and Orlikowski (2009), who support the inseparability of the elements, use the term “assemblages”, which presume the existence of separate things. Thus, the lack of a clear and concise idea is present not only in the language used, but also in the examples given by researchers who follow agential realism – they are too general, making it difficult to identify and understand the sociomateriality phenomenon (Kautz; Jensen, 2013).

Regarding the research method, the qualitative analysis of case study is the predominant approach. The methods applied for data collection in these studies are: interview, observation and document analysis. The target audience of these researches are individuals and companies from different industries, for instance: software development company; petroleum production company; hospital; private and public universities; tourism company; and others.

Besides the criticism towards the ontological and epistemological perspectives, the proposed concepts of sociomateriality and the general examples presented, it is important to emphasize the fact that these articles do not explore other kinds of materiality (Leonardi, 2010).

As for future researches, it is necessary to identify new ways to study the social and material entanglement flow, specially by applying methods that are not completely dependent on social actors. Furthermore, there is the absence of studies that explore this entanglement in the process of research and development of new products.

It is also believed that empirical studies involving all the inherent notions to the approach of sociomateriality proposed by Orlikowski (materiality; inseparability; relationality; performativity; practices) can contribute to its advancement and better understanding, besides answering the criticisms to the agential realism. According to Jones (2014), there are few researches on sociomateriality that apply these author’s propositions and discuss all these notions.

Likewise, empirical researches that adopt critical realism can contribute to the strengthening of this approach, in order to clarify how an ontology of representation that accepts the separability of the social from the material can help to understand the way organizations operate. The comparison between the theoretical foundations allows the identification of new paths for the study of sociomateriality, contributing to a better understanding of such phenomenon (Leonardi, 2013).

4. Conclusion

The findings show the ontological and epistemological approach adopted by these studies is social constructivism or critical realism, predominating social constructivism. The predominant research method is the qualitative approach case study.

In addition to criticisms related to the ontological and epistemological approaches, the proposed concepts for sociomateriality and the generic examples, it is worth noting that research does not explore other types of materiality.

Finally, yet importantly, is the need for new studies that seek to validate the results obtained by the empirical researches up to date in order to generalize, validate and complement the results found. It was observed that most studies are single and not multiple case studies. In addition, it is necessary to apply several methods of data collection to allow a triangulation for the mutual validation of the methods and results obtained in the research.

4.1 Future Research

In addition to criticizing the scientific production on sociomateriality, some studies suggest propositions for future research. The main suggestions are: identify new ways to study the social and material entanglement flow, specially by applying methods that are not completely dependent on social actors to explain how the technology operates in assemblages, in order to overcome the point of view centered on humans that has dominated the studies in social sciences; focus on mutuality, performativity and multidimensionality aspects, in search of explanations about how the humans and non-humans' associations are dynamically articulated; do empirical research about how materials are involved in different kinds of institutional work (routines), in different conditions and configurations, and how distinct materials are particularly useful in different kinds of institutional work; explore the "negative" role of the material elements in the institutional dynamics; avoid general examples that make it difficult to identify and understand sociomateriality in the selected papers; investigate which materialities are still present in the age of virtual relationships.

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