# JOB SATISFACTION IN THE DIGITALISATION ERA: A BIBLIOMETRIC ANALYSIS

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## Abstract

**Background and objectives:** Job satisfaction is a fairly new issue that has been studied for several years. With the increasing integration of digital technologies into various aspects of the workplace, understanding the impact of this change on job satisfaction is providing a new impetus for job satisfaction research. The emergence of these combined research areas can be referred to from 2018 onwards if we consider that the number of publications in this field started to increase significantly during this time.

The aim of this article is to develop a bibliometric analysis based on a systematic literature review, to identify the most relevant factors influencing job satisfaction and to identify current research trends related to the integration of digital technologies in the workplace.

**Materials and methods:** The bibliometric analysis was supported by the Bibliometrix software (RStudio). A search query was used in the Scopus and Web of Science databases. A total of 832 documents were retrieved. After refining the search and removing duplicates, we evaluated 559 documents indexed in the Scopus and Web of Science databases.

**Results:** Based on these papers, a bibliometric analysis was performed confirming that the combination of these two research areas is an emerging field.

**Conclusions and summary:** Several relevant themes were identified, such as teleworking, motivation and stress, and there is a clear link between digital work and the Covid-19 pandemic pandemics.

**Keywords:** Job Satisfaction, Digitalisation, Industry 4.0, Bibliometric analysis, Bibliometrix

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## 1. Introduction

Job satisfaction has been a topic of interest for several years, in different sectors of activity and as an objective for different goals. By doing a simple search for the expression "job motivation" in two of the most relevant scientific databases, Web of Science (WoS) and Scopus, the number of resulting papers is astonishing with almost 200k documents on Scopus and over 37k on WoS. From the retrieved documents, the oldest one dates from 1920 (Younger, 1920). More recently, a larger number of documents containing the term "job satisfaction" have been published in relation to each previous year. This is a tendency verified in both mentioned databases. These figures show that job satisfaction is indeed a major concern for research purposes. When considering also words related to digitalisation, the oldest paper dates from 1980 (Hinomoto, 1980). However, in the eighties, there was neither 4th industrial revolution nor the digitalisation that is taking place today.

According to Bentley et al. (2016), job satisfaction comprises individual perceptions of task activities, achievement, rewards, working conditions and management practices. Citing Locke (1976), Bentley et al. (2016) remind us that job satisfaction is a positive emotional state coming from an individual's subjective experience of their job. This emotional state is reinforced by several authors (Inandi et al., 2013), (Robbins et al., 2012). At this stage, we would like to draw attention to the word subjective. According to the Cambridge Dictionary, subjective means to be influenced by or based on personal beliefs or feelings, rather than based on facts.

According to Sims et al. (1976), cited by Bentley et al. (2016), it has long been accepted in organisational theory that social interaction in the workplace, which includes friendship, rich communication, feedback and information sharing, is an important determinant of job satisfaction. However, the evolution of digital technologies may bring a reduction in the quality and frequency of worker interaction, and this may lead to a negative impact on job satisfaction (Bentley et al., 2016). Other authors consider that this lack of interaction may also compromise the commitment and performance of workers (Golden et al., 2008; Morganson et al., 2010).

Digital challenges arrived with the introduction of computers, which many people refer to as the 3rd Industrial Revolution, generally pointing to the end of the sixties in the 20th century. More recently, the 4th Industrial Revolution has accentuated these challenges. Words such as Industry 4.0, Industry 5.0, Digitalisation and Digital Transformation are currently part of the business and academic lexicons and a challenge for society.

The technological changes that arise with digitalisation affect not only the design of work, but also work conditions and ways of working (Schwarzmüller et

al., 2018). One of those conditions is pointed to be the constant connection between workers and their workplace, which affects both work and private life (Mazmanian, 2013).

To better understand and identify the main topics related to job satisfaction in the digitalisation era, this research was designed to aim at identifying the main factors that affect job satisfaction in view of the challenges that arrived with the digitalisation of work. Breaking down this goal, we can present the following research questions:

**RQ1**: What are the most relevant documents and sources referring to "digital" job satisfaction?

**RQ2**: What are the most relevant terms regarding job satisfaction in view of the digital challenges?

**RQ3**: What are the trends (topics) to be explored to understand and promote job satisfaction in the future?

To answer these questions, we propose to develop a bibliometric analysis through a systematic literature review. To analyse the documents retrieved, we will be supported by the RStudio software (Bibliometrix) (Aria & Cuccurullo, 2017).

A systematic review allows for the collection of available evidence to offer an evaluation of that evidence against predetermined criteria (Tranfield et al., 2003). *"A systematic review can offer a balance between comprehensively identifying a larger pool of publications and systematically identifying a smaller set of studies that fit criteria for inclusion and can inform research agendas"* (Linnenluecke et al., 2020). To achieve the research goal, we will proceed by describing the methodology adopted, followed by a presentation and analysis of the results. In the conclusion, we summarise the answers to our research questions.

## 2. Methodology

As mentioned in the introduction, when performing a search for the expression "job satisfaction" the number of retrieved documents was huge. However, these results are general, covering all the documents that include the term "job satisfaction". This paper aims to identify the most relevant terms, authors and documents regarding job satisfaction with a special focus on digitalisation and Industry 4.0 challenges. For that purpose, a systematic literature review was employed using both the WoS and Scopus databases, as used by several papers with similar purposes (Linnenluecke et al., 2020). For some authors, these two databases represent the major sources of general-purpose scientific literature (Kumpulainen & Seppänen, 2022).

Regarding the bibliometric analysis, there are several methodologies available in the literature (Fahimnia et al., 2015; Snyder, 2019; Tranfield et al., 2003) and despite different approaches, they all mention the following steps: (1) Plan the search –

the search planning: defines the scope and the places or databases to search; (2) Perform the search – it includes the initial search as well as the refinements added in order to close the search scope (including the removal of duplicates) and (3) Present the results – aims at drawing the main conclusions from the bibliometric analysis, which currently may be performed combining the use of a specific software, in this research – Bibliometrix, with a paper analysis that must be done by the researchers.

Regarding the search for the current study, the search query used on both databases (WoS and Scopus) was the following:

"job satisfaction" OR "employ* satisfaction" AND "Industry 4.0" OR I4.0 OR Digit*
where "OR" is a Boolean operator used to broaden the search results; "AND" is used to narrow down the search results. According to the planning activity, the goal was to find documents combining satisfaction with digitalisation and Industry 4.0. The symbol "*" is a truncation symbol used to represent one or more characters within a word or at the end of a word, allowing the retrieval of variations of a term or capturing different word endings, such as plurals or variant spellings.

The search in both databases was performed considering the following items: Title, Abstract and keywords. As stated in the introduction, a search considering just the terms job or employee satisfaction retrieved a very large number of documents. Respecting the planning step for the bibliometric analysis, as well as the research objectives, with the introduction of the digital and Industry 4.0 perspective, contributed to a significant reduction in the number of documents retrieved. The results can be viewed in Table 1.

The search refinement respected just two criteria: (1) Only papers written in English were considered for the present study. (2) Regarding the publication years, despite finding published documents from as early as 1980, once the research focus was on digital challenges brought by Industry 4.0, the documents considered for this study were from 2010 until the present. Two notes are relevant at this stage: (1) 2010 is the antecedent year of the concept of Industry 4.0, which resulted from a project in the high-tech strategy of the German government, aiming at the promotion of the computerisation of manufacturing. In the same year (2011), the term Industry 4.0 was publicly introduced at the Hannover Fair, as the German strategic initiative to push their industries to be pioneers in revolutionising the manufacturing sector (Xu et al., 2018). (2) The research considered all documents indexed in the mentioned databases until June 26th, 2023. Including recent publications is justified to identify trends still in their initial steps (for instance, industry 5.0 (EC et al., 2021)).

After refinement procedures to meet the study goals, knowing that several documents are indexed in the WoS and Scopus databases, the removal of duplicates was performed, leading us to a final count of 559 documents. Those documents were the support for the bibliometric analysis performed through the Bibliometrix software.

**Table 1.** Documents Selection (Inclusion Criteria)

|  |  | WoS | Scopus | Total |
|---|---|---|---|---|
|  | Initial Search | 348 | 484 | 832 |
| Inclusion Criteria | English | 336 | 457 | 793 |
| Inclusion Criteria | 2010–2023 | 327 | 413 | 740 |
|  | After duplicates removal |  |  | 559 |

*Source*: Own elaboration using Bibliometrix.

## 3. Results

As previously presented, the dataset established for this analysis is composed of 559 documents, from 412 sources, written in English and published from 2010 to June 26th, 2023. This dataset is composed of all types of documents available in the WoS and Scopus databases. It includes documents from 1952 authors, of which 59 are single authored. Those authors selected a total of 1810 keywords. As regards publication rates, it presents an annual growth of 21.44%. The yearly results are presented in Figure 1. From there, it is possible to confirm an annual increase in publications, except for 2013 and 2019. Since 2020, the number of documents has been increasing.
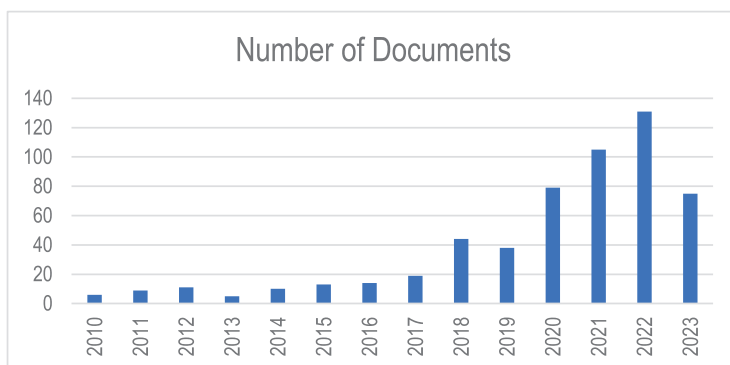


**Figure 1.** Annual Publication of Documents
*Source*: Own elaboration using Bibliometrix.

After documents are published, they become relevant if cited in other documents. From this dataset we can present the most cited documents (over 50 citations).

**Table 2.** Most Globally Cited Documents (over 50 citations)

| Title | Total Citations | Total Citations Per Year | Year | Reference |
|---|---|---|---|---|
| The primary health-care system in China | 455 | 65 | 2017 | (Li et al., 2017) |
| The role of organisational support in teleworker wellbeing: A socio-technical systems approach | 234 | 29.5 | 2016 | (Bentley et al., 2016) |
| Effect of Digital Cognitive Behavioral Therapy for Insomnia on Health, Psychological Well-being, and Sleep-Related Quality of Life: A Randomized Clinical Trial | 196 | 39.2 | 2019 | (Espie et al., 2019) |
| How Does the Digital Transformation Affect Organizations? Key Themes of Change in Work Design and Leadership | 99 | 16.5 | 2018 | (Schwarzmüller et al., 2018) |
| Trustworthiness of digital government services: deriving a comprehensive theory through interpretive structural modelling | 82 | 13.67 | 2018 | (Janssen et al., 2018) |
| Assistive technology for memory support in dementia | 77 | 11 | 2017 | (Van der Roest et al., 2017) |
| Teachers' well-being in times of Covid-19 pandemic: factors that explain professional well-being | 77 | 25.67 | 2020 | (Alves et al., 2020) |
| Shift Work Disorder in a Random Population Sample – Prevalence and Comorbidities | 76 | 6.91 | 2012 | (Di Milia et al., 2013) |
| The influence of internal marketing and job satisfaction on task performance and counterproductive work behavior in an emerging market during the Covid-19 pandemic | 69 | 23 | 2021 | (Nemteanu & Dabija, 2021) |
| Development of a Digitalization Maturity Model for the Manufacturing Sector | 63 | 10.5 | 2018 | (Canetta et al., 2018) |
| Empowering production workers with digitally facilitated knowledge processes–a conceptual framework | 63 | 10.5 | | (Hannola et al., 2018) |
| Coworking spaces: Empowerment for entrepreneurship and innovation in the digital and sharing economy | 62 | 15.5 | | (Bouncken et al., 2020; Hannola et al., 2018) |

| | | | | |
|---|---|---|---|---|
| Challenging the shock of reality through digital storytelling | 61 | 4.69 | | (Stacey & Hardy, 2011) |
| Web-Based Tools and Mobile Applications To Mitigate Burnout, Depression, and Suicidality Among Healthcare Students and Professionals: a Systematic Review | 61 | 10.17 | | (Pospos et al., 2018) |
| Teachers' Innovative Behaviour: The Importance of Basic Psychological Need Satisfaction, Intrinsic Motivation, and Occupational Self-Efficacy | 54 | 9 | | (Klaeijsen et al., 2018) |
| Three job-related stress models and depression: A population-based study | 53 | 4.42 | | (J. Wang et al., 2012) |
| Supporting evidence-based practice for nurses through information technologies | 53 | 3.79 | | (Doran et al., 2010) |

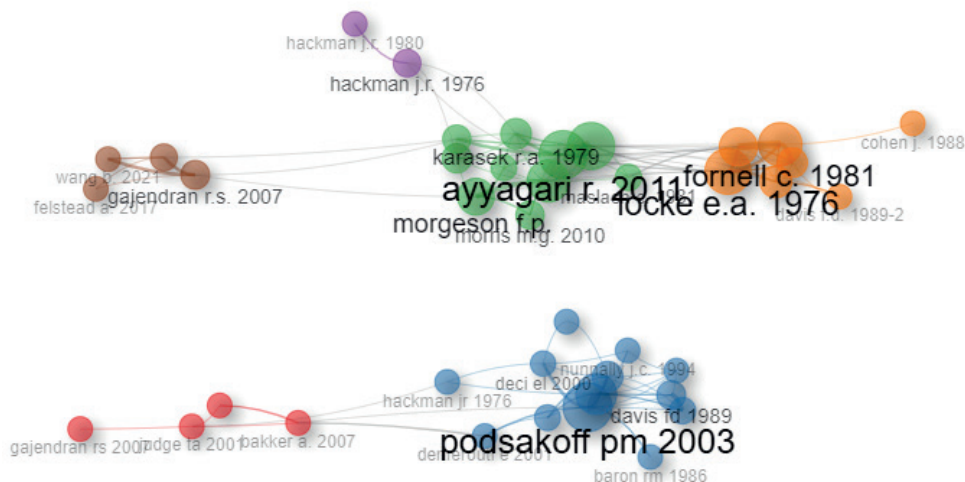*Source:* Own elaboration using Bibliometrix.

From the titles of the most cited documents, it is possible to verify that the issue of job satisfaction in digitalisation is common to several sectors, such as health, education, public services, or manufacturing. Some other papers like the work of Espie et al. (2019) ranked as the 3rd most cited paper, studies a therapy against insomnia, that can be performed in a digital way. Since insomnia may impact job satisfaction, the paper was selected by the search algorithm as a valid paper for our study. However, this paper did not show relevance to our research. Returning to sectoral diversity, this may raise a red flag, since workers from different sectors may have different needs and attain different types of rewards to achieve job satisfaction. The identification of sectoral diversity may also indicate that different clusters may be identified later regarding the study of job satisfaction in the digital age. From the papers identified in Table 2, as well as related studies cited by those papers, some factors affecting job satisfaction were identified and are listed in Table 5.

Another element that we can highlight is the fact that recent documents are the most cited with only the 8th document dating from 2013. All the higher ranked documents were published from 2016 onwards. This means that this field of research still has a long way to go.

Going deeper than a simple analysis of the citation numbers, we can perform a co-citation analysis. A co-citation network analysis in bibliometrics involves examining the relationships between documents based on their co-citation patterns. It identifies how often two documents are cited in a third document. This map can reveal influential or highly cited documents. Documents that receive many co-citations from other documents tend to be considered important works. Co-citation

networks can reveal the influential documents and may uncover clusters of related documents. Considering the cited documents within the documents that belong to our database, means that documents in this network may or may not be part of our database of 559 documents.

**Figure 2.** Co-citation Network



*Source:* Own elaboration using Bibliometrix.

From Figure 2, it is possible to identify two distinct groups of clusters. The first group is composed of 4 clusters, and the second composed of 2 clusters. In order to better understand the organisation of these clusters, some basic information is presented in Table 3.

After an analysis of the documents grouped in each cluster, it was immediately possible to identify an overlap of the documents from the second group (blue and red clusters). Blue cluster documents, broadly speaking, are related to methodological approaches and are the same as those in the orange cluster. The documents identified in the red cluster were also identified in the green and brown clusters from the first group. This may help us to reduce the clusters to those belonging to the first group. From that group, we can identify three main topics that supported the research, identified as relevant by our search query. The main topics were: (1) Impact of technology on workers (stress, wellbeing, productivity, commitment) in the green cluster; (2) Remote working in the brown cluster; (3) Motivational issues in the purple cluster; and one other general topic (not considered in the search query) that is (4) Methodological approaches. While performing a bibliometric analysis, it is interesting to identify the most relevant sources. In Table 4, we present the list of journals that published at least 5 documents during the period 2010 - 2023 on the subject under research.

**Table 3.** Main Topics by Cluster

| Cluster | Title | Topics of Interest | Reference |
|---|---|---|---|
| Green | Technostress: Technological Antecedents and Implications | (Techno)Stress, productivity, commitment | (Ayyagari et al., 2011) |
| | Development of the Job Diagnostic Survey | Motivation and Productivity | (Hackman & Oldham, 1975) |
| | The consequences of technostress for end users in organizations: Conceptual development and empirical validation | (Techno)Stress, commitment | (Ragu-Nathan et al., 2008) |
| | The Job Demands-Resources model: State of the art | Stress models, employee wellbeing | (Bakker & Demerouti, 2007) |
| | Job Characteristics and Job Satisfaction: Understanding the Role of Enterprise Resource Planning System Implementation | Impact of technology on job satisfaction | (Morris & Venkatesh, 2010) |
| | How Technology Is Changing Work and Organizations | Impact of technology on workers | (Cascio & Montealegre, 2016) |
| | Information and Communication Technology Use and Social Connectedness over the Life Course | Impact of technology on workers | (Chesley & Johnson, 2014) |
| Orange | The Nature and Causes of Job Satisfaction | Factors that affect job satisfaction | (Locke, 1976) |
| | Common method biases in behavioral research: A critical review of the literature and recommended remedies | Methodological approaches to behavioural studies | (Podsakoff et al., 2003) |
| | Evaluating structural equation models with unobservable variables and measurement error | Statistical analysis | (Fornell & Larcker, 1981) |
| | Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology | Development of scales to analyse technology acceptance | (Davis, 1989) |
| | Consistent Partial Least Squares Path Modeling | Use of PLS in information systems research | (Dijkstra & Henseler, 2015) |
| | Statistical Power Analysis for the Behavioral Sciences | Book on statistical analysis for behavioural sciences | (Cohen, 1988) |

| | | | |
|---|---|---|---|
| Brown | The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences | Positive and negative consequences of telecommuting | (Gajendran & Harrison, 2007) |
| | How Effective Is Telecommuting? Assessing the Status of Our Scientific Findings | Telecommuting and its implications | (Allen et al., 2015) |
| | Assessing the growth of remote working and its consequences for effort, well-being and work-life balance | Assesses the scale of remote working and its consequences | (Felstead & Henseke, 2017) |
| | Achieving Effective Remote Working During the COVID-19 Pandemic: A Work Design Perspective | Mixed methods research on challenges experienced by remote workers | (B. Wang et al., 2021) |
| Purple | Motivation through the design of work: Test of a theory | Motivation | (Hackman & Oldham, 1976) |
| | Work redesign and motivation | Motivation | (Hackman, 1980) |
| Blue | Common method biases in behavioral research: A critical review of the literature and recommended remedies | Methodological approaches to behavioural studies | (Podsakoff et al., 2003) |
| | Evaluating structural equation models with unobservable variables and measurement error | Statistical analsysis | (Fornell & Larcker, 1981) |
| | Effects on teachers' self-efficacy and job satisfaction: Teacher gender, years of experience, and job stress | Study of job satisfaction and teachers' stress using factor analysis and structural equation modelling | (Klassen & Chiu, 2010) |
| | Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology | Development of scales to analyse technology acceptance | (Davis, 1989) |
| | A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) | Book on PLS - SEM | (Hair, 2017) |
| | Structural equation modeling in practice: A review and recommended two-step approach | The use of SEM | (Anderson & Gerbing, 1988) |

| | | | |
|---|---|---|---|
| Red | The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences | Positive and negative consequences of telecommuting | (Gajendran & Harrison, 2007) |
| | The job satisfaction–job performance relationship: A qualitative and quantitative review | Job satisfaction and performance | (Judge et al., 2001) |
| | Technostress: Technological Antecedents and Implications | (Techno)Stress, productivity, commitment | (Ayyagari et al., 2011) |
| | The Job Demands-Resources model: State of the art. | Stress models, employee wellbeing | (Bakker & Demerouti, 2007) |

*Source:* Own elaboration using Bibliometrix.

**Table 4.** Number of Documents (above 5) Published by Sources

| Sources | N. of Doc. |
|---|---|
| INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH | 54 |
| PLOS ONE | 43 |
| ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING | 38 |
| FRONTIERS IN PSYCHOLOGY | 32 |
| SUSTAINABILITY | 31 |
| ACM INTERNATIONAL CONFERENCE PROCEEDING SERIES | 27 |
| SPRINGER PROCEEDINGS IN BUSINESS AND ECONOMICS | 22 |
| LECTURE NOTES IN NETWORKS AND SYSTEMS | 13 |
| JOURNAL OF BUSINESS RESEARCH | 11 |

*Source:* Own elaboration using Bibliometrix.

Considering just the documents published by the sources identified in Table 4, it is interesting to notice that these account for 271 publications, which means 48% of all publications during the period under analysis. Another relevant detail is related to the publication years. Regarding those sources, just one paper was published in 2013 and one more in 2014. The number of publications started to grow more significantly from 2019 with 11 publications. In 2023, in less than half a year, the number of published documents amounts to 90.

The information presented up to now allows us to suggest an answer to the first research question:

**RQ1:** What are the most relevant documents and sources referring to "digital" job satisfaction?

Combining the results from Table 2. Most Globally Cited Documents and Table 4. Number of Documents Published by Sources, we can identify the most relevant documents and sources. From Table 3 and Figure 2, we can also identify some documents that supported, or in other words, led to the development of the current studies on job satisfaction.

Taking into consideration the most cited documents (Table 2), an analysis of those documents allowed us to identify some terms mentioned as affecting job satisfaction. This analysis, also enabled us to verify that some of those documents, despite being identified by the searching algorithm as relevant for this study, did not present information identifying factors affecting job satisfaction. On the other hand, some documents identified other papers where those factors could be identified. In Table 5 some of the identified terms are presented.

Still looking for relevant terms in order to find an answer to the second research question, there are several options using Bibliometrix to find relevant words spanning all the documents. Figure 3 lists the most frequent words used in the authors' keywords, and Figure 4 presents the most frequent words in abstracts.

**Table 5.** Factors Affecting Job Satisfaction

| Terms | Activity Sector (if specific) | Reference |
|---|---|---|
| Income, social benefits, career development paths, exhaustion, depersonalisation, lack of personal accomplishment | Health | (Li et al., 2017) |
| Organisational Support | | (Bentley et al., 2016), (Babin & Boles, 1996) |
| Telework | | (Mahler, 2012), (Gajendran & Harrison, 2007) |
| Work-private life connection | | (Mazmanian, 2013) |
| Trust | Public Service | (Cho & Park, 2011) |
| Nature of work, intensity of work, physical conditions, educational system and social environment, social status, wages, interpersonal relationships, student quality, career opportunities and obstacles and self-realisation, general well-being, quality of life or stress at work, leadership | Education | (Alves et al., 2020), (Inandi et al., 2013) |

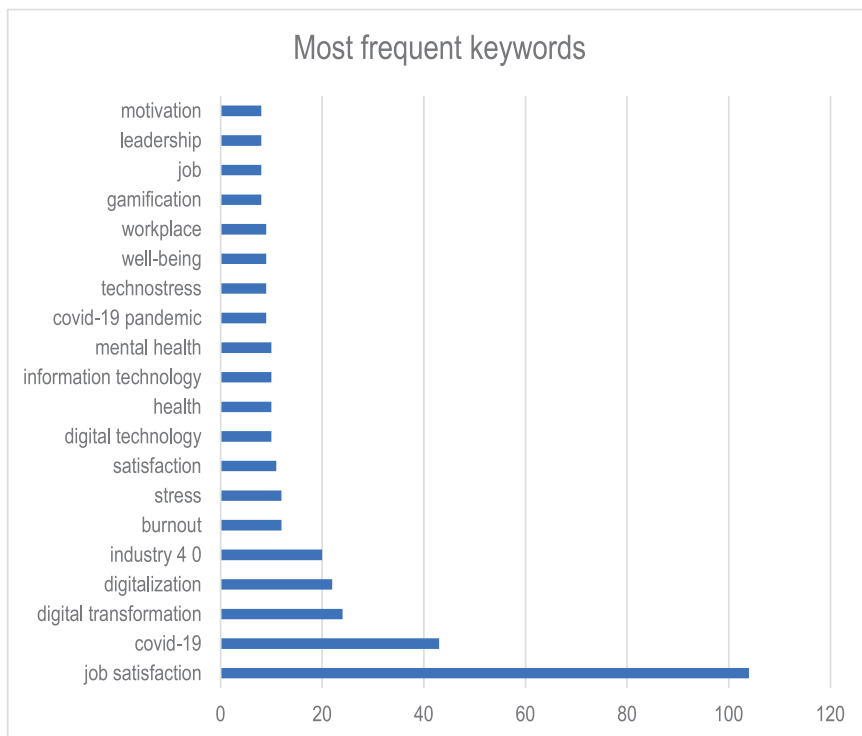| | | |
|---|---|---|
| **Internal Marketing**, anxiety, technostress, social interaction, frustration, occupational burden, counterproductive work behaviour, exhaustion, burnout, depersonalisation, and increased turnover intention, relationship with co-workers and supervisors, working environment, salaries, ergonomics, work acknowledgement, promotion opportunities, job security, degree of organisational concern for the employee's needs | | (Nemteanu & Dabija, 2021), (Ohara et al., 2021), (Jutengren et al., 2020), (Dolbier et al., 2005), (Nemteanu & Dabija, 2020) |
| Knowledge Sharing | Manufacturing | (Hannola et al., 2018) |
| Coworking Spaces, Knowledge Sharing, Autonomy, Empowerment | | (Bouncken et al., 2020) |
| Stress | Health | (Pospos et al., 2018) |
| Intrinsic Motivation, Work environment, Basic Psychological needs | Education | (Klaeijsen et al., 2018) |
| Technology adoption | Health | (Doran et al., 2010) |

*Source:* Own elaboration using Bibliometrix.



**Figure 3.** 20 Most Frequent Authors' Keywords
*Source:* Bibliometrix.

## Most frequent abstract words
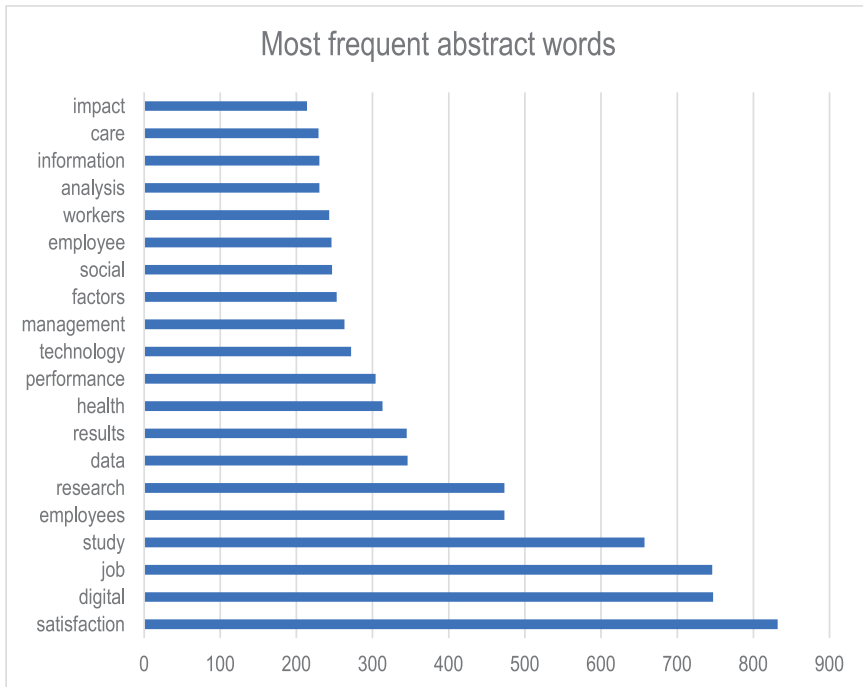


**Figure 4.** 20 Most Frequent Words in Abstracts
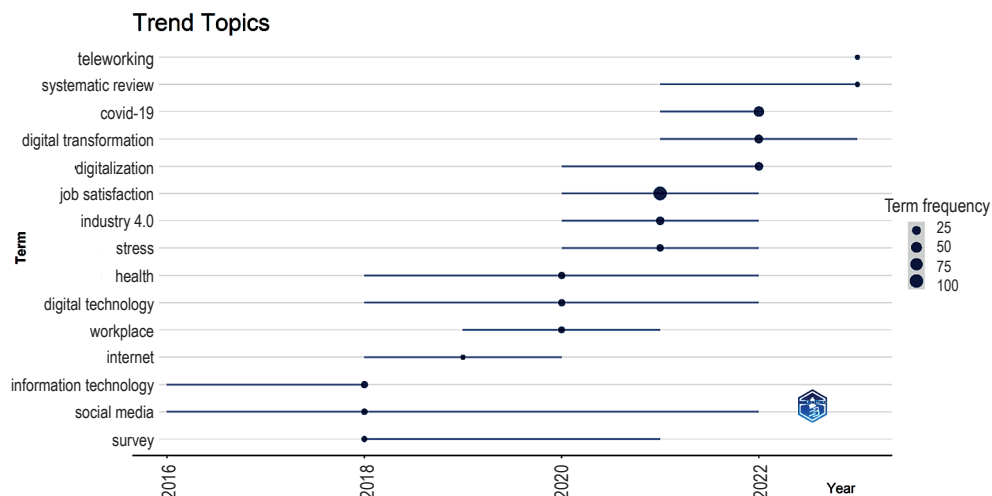*Source:* Own elaboration using Bibliometrix.

From the previous Figures, it is possible to identify some common words related to satisfaction, and digital words. However, looking for words that can be pointed out as factors related to job satisfaction, from the list of authors' keywords we can identify, for instance, words such as: (techno)stress, wellbeing, leadership, or motivation. But looking at the complete list, some other words might be identified: organisational commitment; telework, engagement, performance, creativity, leadership, working environment, corporate-social responsibility, career, work-life balance, incentive programmes, turnover, autonomy, internal marketing, knowledge sharing, performance (worker and company), support, rewards, wages.

Looking again at the list, but now based on abstract words, where normally some research results are presented, some other words might be added: design, training/learning (support), skills, burnout, change, purpose, opportunities, happiness, customer, marketing, sustainability, competencies. Some other words may also be related to job satisfaction factors, but it is very risky to make such a connection when looking at the word out of its context.

It might be important to notice that some words are presented in different ways, such as leadership, transformational leadership, digital leadership, e-leadership, among others, nd even if their meanings are different in the research where they

were utilised, in terms of factors influencing job satisfaction, they are perceived in the present research with a similar meaning.

To identify other relevant words some other techniques were applied. The trend topics can also be analysed supported by keywords, abstracts, or titles. In Figure 5 it is possible to see the most relevant words from 2018. Some of those words, as expected, are words related to the search performed, such as job satisfaction, Industry 4.0 or digitalisation.



**Figure 5.** Trend topics identified using the authors' keywords

*Source:* Own elaboration using Bibliometrix.

From Figure 5, other words can also be pointed out. To start with, we can mention the current trends identified for 2023. Two words/expressions were identified as trends, one is systematic review (related with research purposes), which means that much research is still focusing on the (re)organisation of the state of the art. It may also be relevant to point out that in a word frequency over time analysis, the expression systematic review starts to be present in document titles only in 2018. Combining this trend with the fact that most cited publications in this area are from documents published from 2016, once again we can identify that this is a field of research that is still at an early stage.

Another current trend from the identified words is teleworking, which can easily be associated with the word Covid-19 (trend in 2022) and stress in 2021. These words are somehow connected as it is broadly known that the pandemic contributed to an increase in teleworking, and the combination of both to an increase in stress levels.

If we consider keywords plus (which incorporate additional exact terms extracted from the titles and abstracts), the most recent trends are management, out-

comes and anxiety. From 2022, the word burnout was also added to the word pandemic. This might allow us to identify a recent trend that is related to stress, probably fostered with the pandemic, that may be leading workers to stages of anxiety and burnout. This should be a red flag, which an organisation must keep an eye on to avoid or minimise employee turnover.

From an abstract perspective, some other words can also be identified as current trends: digital leadership, soft skills communication, and business process virtualisation, and from 2022, we also notice the expression digital organisational culture.

In an attempt to sum up these results, one can identify a digital work trend that might be leading employees to psychological negative effects. This will clearly bring job dissatisfaction. Is this a real concern? Can we identify it as a potential research field?

Besides the identification of trend topics, Bibliometrix also allows us to identify the word frequencies over time. Considering the frequency on the basis of keywords plus, the word/expression job satisfaction takes the lead after 2010, but from 2019 the difference from this keyword to the remaining ones is even more noticed which means an increase in the number of papers exploring this issue. Other words that have also been identified as increasing their frequency over time are gender related words (male and female) and the word human. At this point, it might be interesting to bring to the debate the concept of Industry 5.0 (EC et al., 2021). While Industry 4.0 might be more centred around a technological perspective, Industry 5.0 *recognises the power of industry to achieve societal goals beyond jobs and growth to become a resilient provider of prosperity* (Resilience)*, by making production respect the boundaries of our planet* (Sustainable) *and placing the wellbeing of the industry worker at the centre of the production process* (Human Centric) (EC et al., 2021). Considering the three main elements of Industry 5.0, it is the last one (human centricity) on which research on job satisfaction seems to walk hand in hand. In a period where technology and digital competencies threaten to rule the workplace, researchers and institutions such as the European Commission are trying to understand and find the best solutions to keep workers (the human side) satisfied in their work activities.

Moving from keywords plus to authors' keywords, job satisfaction still holds the pole position; however, other words were identified as relevant by the authors of the documents under analysis. In this case, we can find two major groups of words. Group 1 might be presented as the digital concern (digital transformation, digitalisation, Industry 4.0, digital technology). Group 2 might be the health concern (Covid-19, burnout, stress, health). Analysing words presented in document titles, one can notice some similarity with the previous ones (keywords). As previously mentioned, just the expression "systematic literature review" might be noticed as gaining some space in the research area.

Another possible technique is a co-occurrence network map, also known as a co-word network map. It is a visual representation that can be displayed through Bibliometrix and presents the relationships and patterns of co-occurring terms or concepts. As in the previous analysis, we can choose the source of the terms to be analysed (keywords, titles or abstracts). These maps may also help us to identify clusters of terms and concepts, in order to separate the research by different topics.



**Figure 6.** Co-occurence Network Considering Authors´ Keywords
*Source*: Own elaboration using Bibliometrix.

From Figure 6, it is possible to identify 6 clusters of terms. The green cluster is the largest one and is related to job satisfaction. Here, we can also find terms such as performance, happiness, commitment, and productivity, among others. In other words, this cluster might be associated with psychological factors affecting workers. The next cluster, represented by the blue colour, gathers together the digital issues (digitalisation, information technology, digital transformation), but also words that could be connected to other clusters, such as technostress. The red cluster represents working conditions. In the orange one, it is possible to identify terms that suggest a wellbeing cluster. The purple cluster combines leadership and communication issues. In this map, we can also identify a brown cluster, which we could call miscellaneous. The terms from this cluster (survey and employment) are related to each other, but do not present any clear connection with the terms belonging to other clusters. For that reason, we will not consider this cluster as relevant. Summing up, the main terms creating clusters are psychological job satisfaction, job digitalisation, physical working conditions (environment), wellbeing and leadership. These terms identified by the co-occurrence network somehow incorporate most of the terms previously identified. To break down each term, Table 3 and Figures 3 to 5 can be explored in detail. These terms can also be indicated as an answer to the second research

question (What are the most relevant terms regarding job satisfaction in view of the digital challenges?).

After the identification of the terms related with job satisfaction in the digitalisation era, and bearing in mind the third research question, it might be interesting to try to identify tendencies in terms of future research. In Figure 5, the trend topics were identified, whereas now in Figure 7, we present the most frequently used terms using 3 time cut-points (2015, 2018 and 2022).
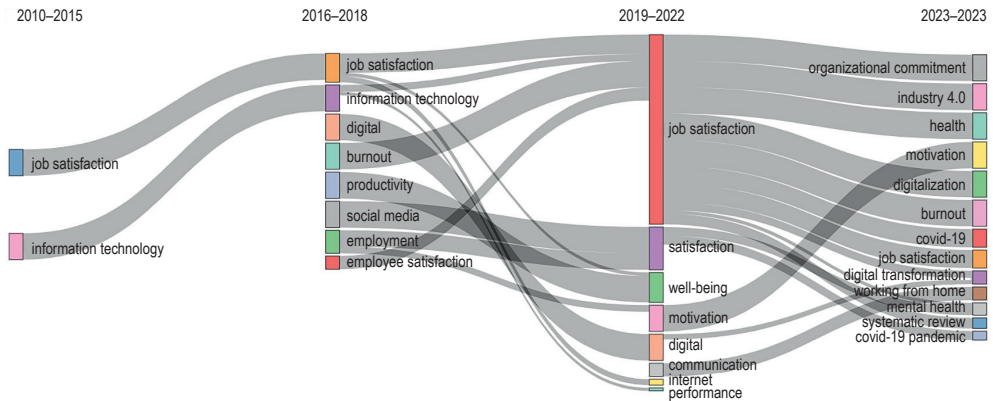


**Figure 7.** Thematic Evolution of Terms under Research

*Source*: Own elaboration using Bibliometrix.

Looking at Figure 7, what immediately stands out is the evolution of topics (or terms) covered during the years, which can be visually confirmed with this analysis. While in 2010 there were two main topics, job satisfaction and information technology, during the next years it was possible to identify different approaches to those two terms. While job satisfaction remained a relevant topic, around 2019, the term information technology was replaced by terms related to digitalisation and Industry 4.0. Along with the digital terms, also assuming an important role are terms related to health issues, such as Covid-19, burnout, and more recently, mental health. Thus, from this figure, one can say that physical and mental wellbeing are relevant topics to consider when researching job satisfaction.

In order to validate, complement or refute the identified topics, another statistical technique is a historiograph, which is a chronological network map of the most relevant direct citations resulting from a bibliographic collection (Figure 8).
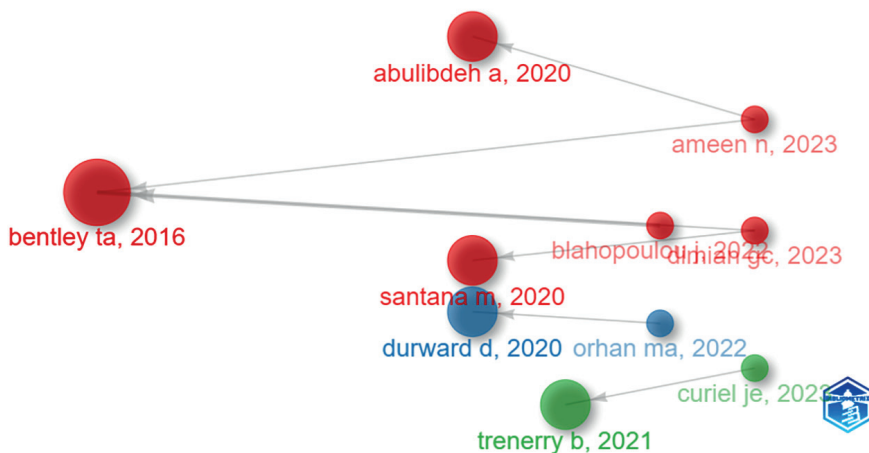
**Figure 8.** Citations Historiograph

*Source*: Own elaboration using Bibliometrix.

From the historiograph (Figure 8), we can identify three main clusters. The largest is the red one, highlighting 6 documents. All of them are related with teleworking (Abulibdeh, 2020; Ameen et al., 2023; Bentley et al., 2016; Blahopoulou et al., 2022; Dimian et al., 2023; Santana & Cobo, 2020). The most recent ones (Ameen et al., 2023; Dimian et al., 2023) combine the remote working issue with topics such as wellbeing, work-family balance and mental health.

The blue cluster highlights just two documents, (Orhan et al., 2022) and (Durward et al., 2020). The latter, which dates from 2022, studies the wellbeing of remote workers and is supported by a study of crowd workers. In general, the cluster is related to remote workers, motivation and job satisfaction.

In the green cluster, we can find research performed by de Esteban Curiel et al. (2023), which focuses on teleworking issues. This study is supported by the work of Trenerry et al. (2021), which focuses on employee related factors regarding digital transformation. Therefore, this cluster, like the previous ones, might be presented as technological remote work focusing on the advantages and disadvantages of remote work or teleworking.

In attempting to answer the third research question (What are the trends (topics) to be explored to understand and promote job satisfaction in the future?), one topic stands out for future research, namely teleworking. This is in fact a current tendency that deserves some attention to find out how to keep employees satisfied and reduce turnover rates. Along with teleworking, other topics that seem to become more frequent in recent research are workers' wellbeing and work-life balance, which are related to stress levels and mental health issues.

Following the presentation of possible answers to the three research questions that led to this study, we will now present our conclusions, where the main results obtained will be briefly presented.

## 4. Conclusions

The present study has shed light on the relationship between job satisfaction and the digital era, offering valuable insights into the factors that might impact employee wellbeing due to technological advancements. In general, life is becoming more digital, and that impact is also noticed at the workstation. The arrival of the pandemic led to a digital shift in several sectors. And with more and more technological advances at the workstation, job satisfaction seems to focus on performance at work digitally, and most often remotely.

Aiming to identify the main topics related to job satisfaction in the digital era, three main questions were posed:

**RQ1**: What are the most relevant documents and sources referring to "digital" job satisfaction?

**RQ2:** What are the most relevant terms regarding job satisfaction in view of the digital challenges?

**RQ3:** What are the trends (topics) to be explored to understand and promote job satisfaction in the future?

In order to answer those questions, this research was based on the Scopus and WoS databases. The first step consisted of the query definition: «"job satisfaction" OR "employ* satisfaction" AND "Industry 4.0" OR I4.0 OR Digit*». By using this query to search documents in both databases, 832 documents were retrieved in total. The search refinements were related to the document language (only documents written in English were considered) and the publication period, which was defined to be from 2010 to 2023. After the inclusion of those two criteria, duplicate documents were removed, leading us to a total number of 559 documents.

Most of the documents combining the subjects of job satisfaction and digitalisation were published from 2018. In regard to the most cited documents, it was also identified that the most cited documents are those published from 2016 onwards. The fact that the number of publications increased from 2018 and that the documents are recent (mostly starting from 2016) means that this is an emerging research topic. Employee wellbeing or job satisfaction are topics that have been studied for a long time, but the emergence of digital technology brought new challenges for workers and companies. The research on job satisfaction must now consider a new variable in the form of job digitalisation.

In attempting to answer our research questions, the achieved results allow us to suggest the following answers:

**RQ1: What are the most relevant documents and sources referring to "digital" job satisfaction?**

In terms of sources, it was verified that 9 sources (Table 4) account for almost 50% of the publications in this research field. Regarding the documents, Table 2 provides a list of the documents that account for 50 or more citations. As mentioned in the text that follows Table 2, some of the listed documents do not provide relevant insights for this research; however, they allow us to validate that this is a topic that reaches several sectors of activity, such as health, education, public services, or manufacturing.

**RQ2: What are the most relevant terms regarding job satisfaction in view of the digital challenges?**

Several topics were identified as interesting topics in this research field. However, from the co-citation network analysis, it was possible to identify three main topics: (1) The impact of technology on workers (stress, wellbeing, productivity, commitment); (2) Remote working; (3) Motivational issues. Other terms such as psychological job satisfaction, job digitalisation, physical working conditions (environment), wellbeing and leadership were also identified as relevant from the co-occurrence analysis (Figure 6).

**RQ3: What are the trends (topics) to be explored to understand and promote job satisfaction in the future?**

Considering the recent trends in this research field, the topic that stands out for future research is teleworking. Other topics that seem to become more present in recent research are employee wellbeing and work-life balance. Somehow related to these are also those topics related to stress levels and mental health issues. The future of research in this area seems to point to those who are working from home and to find strategies to help them to deal with single-space management (the fact that work and private life are performed in the same place).

The results achieved by this research allow us to define future lines of research; however, they also suggest that most research focuses on jobs that can be performed remotely. There are other jobs that must be performed on site, which may also be affected by work digitalisation. For workers that need to deal with new technological advancements in their work post, manual workers that are being replaced by automated processes, or even the increase in job opportunities along the value chain regarding deliveries, some specific research should also be undertaken. It seems obvious that topics such as stress, leadership or physical work conditions also address those challenges that are not related to remote working; however, further research should be performed in order to validate whether the factors that influence on-site job satisfaction are in fact the same as those that affect the satisfaction of remote workers.

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