

Framing smart working in the Covid-19 era: a data driven approach

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Abstract

In the last years, smart working has been introduced as an agile and dynamic way of working which provides high levels of performance, productivity, and job satisfaction in a “triple-win” configuration for customers, employees, and organizations. Although the advantages and disadvantages related to these new working practices have been recognized by the literature, how these new work practices, widely adopted during the Covid-19 pandemic, have been generally perceived on a massive scale is still unclear. Based on these considerations, this work aims to carry out a big data analysis in order to frame the collective perception about smart working. A large-scale text analytics study has been conducted on Twitter from January to June 2021. The data-driven approach identified the most frequently used macro-concepts about smart working by Twitter’s users: five perceived in a positive way (smartness, work-life balance, flexible approach, productivity, innovative working environment) and five perceived negatively (tech paralysis, technostress, technology hiccups, demotivation, social isolation). In this sense, the study offers several insights by generating useful implications for researchers and professionals both in the organizational design and psychological and Human Resources Management field.

1. Introduction

Over the last twenty years, the work practices have been shaped by generational change, technological innovation, and the emergence of new economic development models (Boorsma and Mitchell, 2011; Bednar and Welch, 2020). The new technological environment has provided opportunities for social innovation, community engagement, and economic growth, placing at the core of everything a new way of understanding the relationship between individuals and their communities. Thanks to the development of interactive devices, including the World Wide Web, social networking, and smartphones, there has been a proliferation and multiplication of channels of access to information, which have deeply

affected work practices in several sectors and people's life all around. This scenario has spawned new paradigms for how work gets done, along with significant opportunities to innovate, by leading to the define the so-called concept of "smart working". The workers in every sector of the economy have started to follow more collaborative and flexible forms of work that allowed them to contribute when they want, from virtually anywhere, with almost anyone. At the same time, increasing demands for speed and real-time access to information and partners, combined with the growing complexity of knowledge work, drive the need to collaborate and engage a broader workgroup to obtain needed results.

In such a context, the Covid-19 pandemic has accelerated the digitalization of the economy and organizations, anticipated many issues and transformations that would have taken longer to be addressed, and posed unique demands in terms of conditions and scale of technology adoption at work (Wang et al., 2021). In particular, even if smart working has been adopted slowly over the years because considered an occasional work pattern, during the pandemic many organizations sent their employees home and have created the conditions for the most extensive mass smart working experiment in history. However, although several studies about smart working at the time of Covid-19 have been carried out (Comacchio, 2021; Mascagna et al., 2019; Bednar and Welch, 2020; Murmura and Bravi, 2021; Rahman et al., 2020; Bucea-Manea-Țoniș et al., 2021; Moretti et al., 2020; Mari et al., 2021), due to their purely qualitative nature, how these new work practices are generally perceived is still an open question. Therefore, although the extent of the phenomenon has been recognized, how these new work practices have been generally perceived is unclear and the majority of research carried out, empirical and related to a limited number of people, opens the way to further investigations on large scale about smart working practices.

Based on these considerations, this work aims to carry out a big data analysis in order to frame the collective perception about smart working.

In nutshell, the paper is structured as follows: Section 2 provides a brief overview of the theoretical background on which reflections herein are based with specific reference to the definition of smart working and the related benefits and pitfalls pre and during Covid-19 pandemic; Section 3 introduces the methodological framework for carrying out the sentiment analysis on Twitter; Section 4 provides an overview and discussion of the results; Section 5 finally lists main theoretical and practical implications of reflections herein and it also draws main conclusions and directions for future research.

2. Literature review

Digital revolution along with socio-economic changes have led to innovative approaches in the way of organizing work based on flexible arrangements and widespread use of Information and Communication Technologies (ICTs) that enable to potentially work in "any time and space" (De Leede and Heuver, 2016). Such approaches, denoted as "smart working" practices, while being connected to different fields related to the technological revolution, as emerged in Figure 1, generally refer to a new model of work organization (Boorsma and Mitchell, 2011; Gastaldi et al., 2014; Zheltoukhova, 2014; McEwan, 2016; Bednar and Welch, 2020).

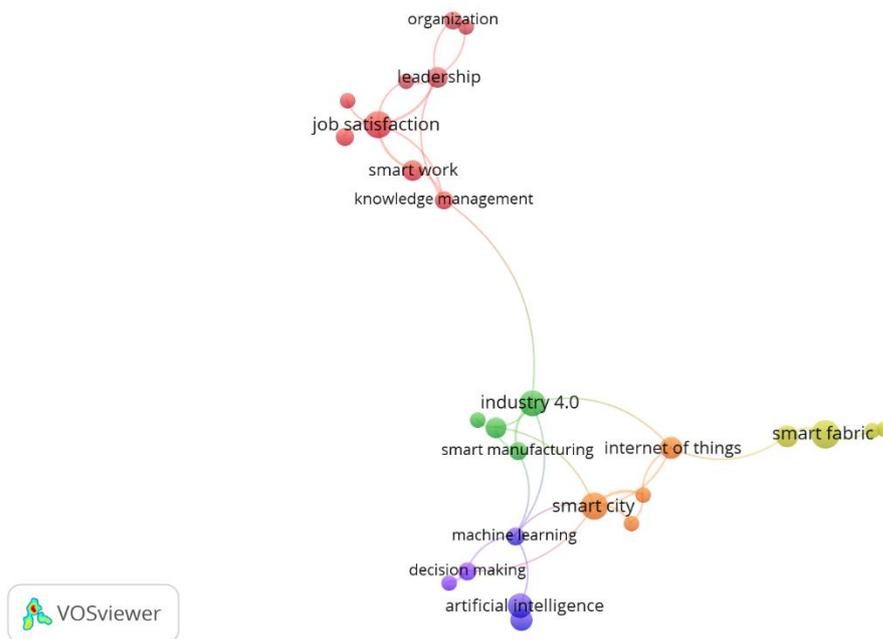


Figure 1: Keywords' co-occurrences map for “smart working” - authors' elaboration on VOSviewer (Van Eck and Waltman, 2013).

The co-occurrence map in Figure 1 has been generated by the software VOSviewer, a computer program developed to build and view bibliometric maps (Van Eck and Waltman, 2010). Looking at the five clusters displayed in the graph, it is possible to identify the two main research fields mentioned above and related to smart working. The clusters represented with green, purple, yellow, and orange colors are closely linked to each other and include keywords related to technological revolution such as: industry 4.0, smart manufacturing, internet of things, smart city, artificial intelligence, decision making, machine learning. Instead, the cluster represented in red color includes keywords connected with the organizational issues of smart working such as: job satisfaction, knowledge management, leadership, organization, smart work. The relevance of the organizational research area can be deduced from the higher numbers of co-occurrences in the red cluster and the size of the circle which states the number of publications associated.

The sample set of articles used for the bibliometric map consists of 303 research papers in English, published from 1983 to 2021, and belonging to subject areas of Business or Management. The search for articles was conducted with the keyword “smart working” in the title, abstract, and keywords. Scopus, the largest academic online database, was used. In the document selection process, only articles were selected as they are considered documents with validated knowledge (Podsakoff et al., 2005). E-books, book chapters, conference papers, and articles under review, i. e the gray literature (Adams, Smart, and Huff, 2017), were not included because they are more variable and less available (Jones et al., 2011).

In the first subparagraph of the literature review, we, starting from the insights obtained by VOSviewer, frame smart working in terms of main definitions and research fields related to it.

Subsequently, more detailed and integrated observations about the advantages and disadvantages related to smart working pre and during the Covid-19 era are presented in the second subparagraph.

2.1. Framing smart working: main definitions and research fields

Among the most radical consequences of the adoption of the Industry 4.0 paradigm and smart city model is the dematerialization of workplaces due to the spread and adoption of digital tools (personal computers, tablets, smartphones) that, connected to the Internet, can allow workers to perform their services in places that are not necessarily the company's buildings (Bednar and Welc, 2020; Kylili et al., 2020; Mubaroq et al., 2020; Kirimtat et al., 2020). Smart working agenda, indeed, is linked to the advent of Industry 4.0 and integrated manufacturing systems (Lee et al., 2018), the supply of services (Barile and Polese, 2010; Armenia and Loia, 2022), and the need to reach competitive advantage in complex context (Pahurkar et al., 2019; Festa et al., 2022).

However, the scope and complexity of the digital revolution in the framework of Industry 4.0 and smart city highlight the importance of effective organizational analysis, especially recognizing the political and social dimensions involved. Digitally-enabled arrangements permeate and reshape different industries and fields of research, leading to deep changes in organizational models and Human Resources Management (HRM) practices (Alvesson and Kärreman, 2011). Therefore, although smart working has its roots in the digital revolution, its implications are mainly related to organizational aspects.

Smart working, indeed, has been defined as an evolutionary transformation taking place over a number of different dimensions in the world of work (Boorsma and Mitchell, 2011). In the context of many changes in approaches to “work, work cultures, business architectures, premises, decision making, communications, and collaboration” (Boorsma and Mitchell, 2011, p.2), the physical place of work activities has become less important; on the other hand, aspects as collaboration, employee autonomy, talent management, and innovation have acquired always more relevance (Hamel, 2007). Lake (2013) instead highlights flexibility as a key feature of new, smart working practices. All this lies in the basic concept of placing man at the center of the corporate organization. Smart working arrangements are in fact based on a different idea of work, which can no longer be represented in a place but in what you do and therefore in the results reached according to the objectives previously defined (Rodgers and Hunter, 1992; Watson and Gallagher, 2005; Antoni, 2005). Smart objectives, in particular, consist of specific, measurable, achievable, relevant, and timely objectives in line with the SMART criteria suggested by Chen (2015).

Therefore place and time can be managed alternatively. In this sense, flexibility with respect to working time and locations has already been shown to increase employee morale, and has been linked to the concepts of work-life balance, satisfaction, and performance (Hill et al., 2001; Gajendran and Harrison, 2007). However, flexibility and disappearance of place are only one feature of smart work. McEwan (2013) defines smart working practices as “agile, dynamic and emergent [...] outcomes of designing organizational systems that facilitate customer-focused, value-creating relationships that are good for business and good for people”. According to reports of the Chartered Institute for Personnel and Development – CIPID (2008), ‘smart’ work is categorized as systems aimed at “managing and optimizing both the physical and philosophical work environments to release energy that drives business performance”. In

the view of the CIPD, the focus for defining an organization as “smart” runs on two fundamental elements: core beliefs/culture and enable technologies that together enable “multiplicative relationships” – namely interacting sub-systems that thanks to management values and high-performance systems, pervade and enhance working environments. The interacting technologies, indeed, which can usefully support knowledge management and virtual teams, as well handle heterogeneity and discontinuity in knowledge (Yoo, 2010), are more likely to lead to effectiveness for an organization if they are designed so as to promote self-determination and choice for those engaged with them. In this sense, socio-technical perspective and socio-technical design tools are needed in order to explore and support these ‘multiplicative relationships’. Other scholars shed light on the potential of these innovative work and management practices for fostering both organizational agility and new workforce expectations (Zheltoukhova, 2014; McEwan, 2016; Bednar and Welch, 2019). In this regard, a common sense of trust and building team spirit have become fundamental aspects (Allen, 2015), and a healthy daily routine could manage loneliness and isolation (Király et al., 2020; Boyer et al., 2016). Such additional tools might lead to even better processes in virtual as compared to face-to-face teams, for instance, because team meetings are better structured, and team members receive more reliable information about the feeling states of the other members using online feedback tools (Rudolph et al., 2020).

Compared to the concepts of teleworking, telecommuting, home-working, or remote working, which more generally intend any type of distributed work enabled by the use of ICTs (López-Igual and Rodríguez-Modroño, 2020; Loia and Adinolfi, 2021), smart working is instead defined as an agile and dynamic way of working that leads to high levels of performance, productivity, and job satisfaction that result in a “triple-win” configuration for customers, employees, and organizations (Gastaldi et al., 2014; Zheltoukhova, 2014; McEwan, 2016). In this sense, smart working requires a proper, “smart” leadership approach, characterized by a participated view of change and by forward and anticipatory thinking. Smart leadership, indeed, refers to an agile and flexible approach aimed at creating an exciting and compelling vision, inspiring people to deliver on it, energizing people in order to unleash and exploit their talents, at managing a team with the wisdom derived from experience and knowledge (Singh, 2017; Iannotta et al., 2020).

Particularly valuable lessons related to smart working were given by the recent Covid-19 pandemic. During this crisis, the lockdown conditions that were enforced by governments worldwide have caused, within a very short amount of time, the shift of a great number of everyday activities from the industry and office environments to homes. In view of that, the great potential of the role of smart working has strongly emerged. However, further research efforts are needed to address the deep changes in the way of organizing work during the pandemic, due to its strong socio-economic impact in such a short period.

2.2. Advantages and disadvantages related to smart working: pre and during Covid-19 era

In the last years, smart working practices have received enormous attention from researchers and society due to their great beneficial potential at multiple levels.

Advantages derived from smart working generally include a better work-life balance, less time and money spent on travel, lower rents and running costs for organizations, the attraction of new talent into the workforce, increased productivity, and reduction of absenteeism

(Gastaldi et al. 2014; HM Government UK, 2015; Dominguez, 2017; Errichiello and Pianese, 2019). In addition, supporters of smart working highlight that the use of collaborative and mobile technologies provides better support for team-working and innovation (Bednar and Welch, 2020) and that pervasiveness of digital technologies may improve employees' productivity and quality of the work experience (Tarafdar et al., 2015). Smart working seems to support the goal orientation of managers in their relationships with their colleagues as well facilitate the crossing of the trade-off between work and life, being this aim one of the most relevant challenges (Sarti and Torre, 2017). Furthermore, smart working has resulted in a useful solution to facilitate work-life balance in some particular situations related to the life of employees. For example, workers suffering from chronic diseases, the disabled, those who must follow therapeutic or pharmacological treatments or other similar situations, even temporary and physiological, thanks to smart working, can maintain continuity with their work, thus favoring their psychophysical well-being (Mascagna et al., 2019). On the other hand, smart working requires an optimal balance of skills, engagement, and supporting technologies and requires professional education and commitment from staff (Bednar and Welch, 2020). It has been recognized that smart working requires very careful planning and can involve a shift of costs from the employer to the employee. As well, during the period of smart working, employees may experience increased isolation (Bednar and Welch, 2020), may feel bad from a psychological and/or physical point of view (e.g., Tarafdar et al., 2015), and may have mental health problems and experienced mental disorders due to the changes in routine (ILO, 2021). From the employee perspective, smart working could not be implemented in a proper way if people do not possess an adequate computer, technology as well soft skills and if are not arranged to enable technological infrastructures (Iannotta et al., 2020). Technological skills, indeed, are crucial to the achievement of value-creation processes (Bednar and Welch, 2020; Zheltoukhova, 2014; McEwan, 2016). Especially during the pandemic, the skills such as the ability to resolve simple technical issues – such as accessing VPN, installing new software, or restoring backups - and the ability to identify major technical problems and to ask for help when needed - are considered highly important for remote working. Also, the ability to handle technical devices, i.e. the installation, configuration, and use of necessary communication equipment for remote work, is considered extremely important (Siegl, 2021). Most advanced technological innovations can affect existing jobs, especially regarding aspects such as the autonomy and control of workers (Ales et al., 2018; Balsmeier and Woerter, 2019), standardization of behaviors, and a decrease in the variety of activities and skills (Wang et al., 2021). Furthermore, the concept of techno-stress has received growing attention from organizational scholars (Barley et al., 2011) because employees have to struggle with the fast pace of innovations and have to spend more time and effort renewing their technological skills. Because of that, workers can be exposed to continuous changes in work conditions, to the risk of permanent availability, or to the loss of boundaries between working and non-working activities.

During the spread of Covid-19 in March 2020, a massive experiment of work-from-home (WFH) started abruptly almost worldwide and big changes of the work practices linked to the work detachment from standard places have been carried out (Comacchio, 2021). In addition to the benefits generally associated with smart working, several authors (Mascagna et al., 2019; Bednar and Welch, 2020; Murmura and Bravi, 2021) shed light on the environmental benefits generally recognized by smart working practices due to the reduction of air pollution during the pandemic. Along these lines, increased labor productivity, eco-innovation, innovative

leadership approach, innovative work behavior, and economic sustainability are associated, to a higher extent, with the companies which have agreed to more flexible working practices (Rahman et al., 2020; Bucea-Manea-Țoniș et al., 2021). However, other authors (Moretti et al., 2020; Mari et al., 2021) shed light on the main pitfalls related to the implementation of smart working during the Covid-19 pandemic related to work-related stress, mental health, and musculoskeletal problems.

Notwithstanding the unprecedented nature of the shutdown experience, the changes experimented with in this period might last beyond the end of the measures adopted to control the spread of the virus, due to the estimated long-term growth of remote working and the acceleration of virtuality and connectivity at work. This new normality, once established during the Covid-19 world, will necessitate new thinking about workplace management, space design, HRM, and organization design to disrupt many norms rooted during the industrial age (Hu, 2020). However, although the extent of the phenomenon has been recognized, how these new work practices have been generally perceived is still unclear and the majority of research carried out, empirical and related to a limited number of people, opens the way to further investigations on large scale about smart working practices.

3. Materials and method: a data-driven approach on Twitter

While the Covid-19 pandemic has presented unprecedented challenges to humanity, the scientific community has been able to access online openly available data with the aim to advance science in different fields of research (Lwin et al., 2020; Rufai et al., 2020; Shasi et al., 2021). Social media platforms, indeed, such as Twitter and Facebook contain an abundance of text data that can be utilized for research purposes (Banda et al., 2021). Over the last decade, Twitter, one of the most popular social media platforms where users around the world discuss popular topics related to major social issues, has proven to be a valuable resource during disasters for many-to-many crisis communication (Bruns and Liang, 2012; Zou et al., 2018).

Specifically, we carried out a data-driven approach with the main objective of understanding how smart working has been perceived during the spread of Covid-19. With the goal of avoiding interpretive bias in tweet ratings, the analysis was performed over a six-month period, from the beginning of January to the end of June 2021. During this time frame, although the vaccination plan was initiated, an increased number of people died from the disease, more than in any other period of the pandemic (Diamond, 2021). During the spring period, although the severity of the pandemic had decreased, due to the complex situation derived from the spread of variants, several employees continued to work remotely or in hybrid form until July 2021 (Estrada, 2020; Conger, 2020).

The data was captured by Twitter's application programming interface (API) which is a backend server that stores all tweets from individuals and allows for data collection from the audience. While there are many methods that can be used to process the data, we follow an approach adapted from Miner et al. and use the *Twitter* package for the R programming language. *Twitter* provides a well-documented and accessible means of mining data in a commonly used statistical data mining program.

We follow a dictionary-based method to analyze Twitter social media microblogging data. Adopting this approach, the semantic orientation of the text is calculated by summing the semantic orientation of the words and phrases in the document. Specifically, this method relies on a specific dictionary of annotated words with their semantic polarity. Compared to

Machine Learning techniques, the lexicon-based approach requires little effort in the human-labeled document and does not depend on the quantity and quality of the training dataset. Specifically, data collection was performed by establishing and then implementing specific filters in the form of hashtags in order to identify all user comments related to the topic of the analysis. A hashtag can be defined as a string of characters preceded by a hash character (#) used to summarize in a single word a concept that is subsequently described in 280 or fewer characters. In our case, the crawler only considered tweets containing the hashtag #smartworking. All text mining processes were defined and operationalized in R, an open-source statistical environment based on a programming language and a specific development environment for statistical data analysis.

Figure 2 outlines the steps taken to build and analyse our dataset from Twitter. During the “Data access” phase, by using the TwitterR package, Twitter messages are collected by using the specific keyword (#smartworking) and aggregated locally. After, the data should be cleaned. By using some additional packages, the data is prepared by cleaning up special characters, such as carriage returns, removing URLs, large blank spaces, removing stop words (non-functional), punctuation, and performing stemming (i.e., getting the root of the words). The output of this step is a structured representation of the tweets called “Term-Document Matrix”. Then, during the “Data analysis” phase, the structured representation produced in the previous step allows for performing the extraction process, such as finding association rules and the most frequent terms, as well as performing sentiment analysis through the lexicon-based approach, which uses a set of positive and negative words. A scoring function is used to assign a score to each tweet. During the “Visualization stage”, the word-cloud package and bar graphs are shown to represent the frequency of words in the collected tweets and the sentiment and emotion scores.

Specifically, at the end of the collection phase, approximately 6,000 tweets were collected and analysed for proper interpretation. The dataset consists of both tweets and retweets. There are several practical reasons to leave the retweets; tracing important tweets and their dissemination is one of them (Banda et al., 2021). To avoid conceptual bias, following the framework described above, the extracted text was cleaned by removing all stop words, punctuation, and white spaces. Specifically, after an initial step of determining the grammatical functions of words, Word Indexing grouped nouns that are more than 1%. Next, words that have the same meaning have been divided into homogeneous categories. After extraction, the word cloud representation of the tweets was performed. The size of each term in the cloud indicates the number of times the term is mentioned in the tweets, reflecting its importance. In addition, in order to investigate the impact of telecommuting on people during the pandemic, the emotional content of the text was highlighted, through emotion lexicons, a list of English words associated with eight basic emotions (anger, fear, anticipation, confidence, surprise, sadness, joy, and disgust) and two feelings (negative and positive). In addition, the collected data were subjected to the sentiment analysis module that allows identifying people's perceptions about telecommuting: the most frequent words were compared with a sentiment lexicon to determine their positive or negative potential.

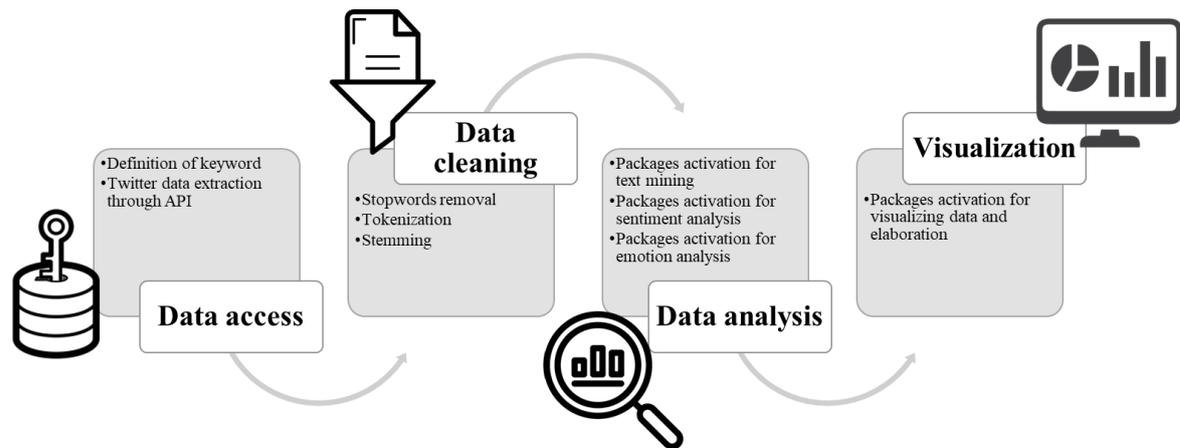


Figure 2. Methodological steps related to sentiment analysis on Twitter based on R Language - authors' elaboration from Loia and Adinolfi (2021) and Younis (2015).

4. Results and discussion

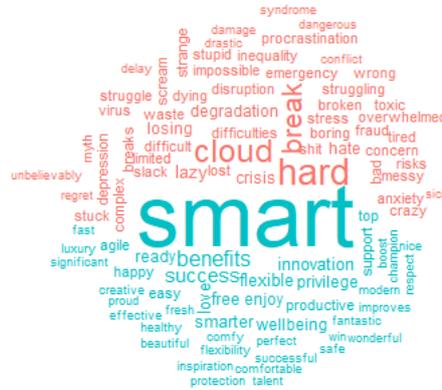
Data-driven analysis performed on Twitter has enabled to extract the stream of data posted on Twitter regarding smart working by users worldwide over the time interval considered. Specifically, about 6,000 tweets containing the hashtag #smartworking were collected, cleaned, and analyzed according to the previously exposed methodological approach.

4.1. Word cloud on #smartworking

Word cloud analyses enable to visualization of the representation of word frequency about #smartworking. Without considering stop words, the more commonly the term appears within the text extracted by the web crawler on Twitter, the larger the word appears in the image generated. The size of the words represented in the figure, thus, is directly proportional to the number of times they were found in the text. In detail, words are highlighted in red or blue depending on their positive or negative connotation.

As depicted in Figure 3, it is possible to notice that, on the whole, the most positive and negative frequent words are almost equivalent. Although the negative words have been detected, especially with reference to the difficulties ("hard") and the technical pitfalls ("cloud" and "break") related to these new work modalities, on the other hand, these preliminary results also provide insight into some positive perceptions associated with smart working, especially related to keywords such as "smart", "benefits", and "success".

negative



positive

Figure 3. Cloud analysis on #smartworking (authors' elaboration).

4.2. Most recurrent emotions related to #smartworking

From the perspective of users' emotions, the emotional content of the most recurring words associated with #smarworking is highlighted in Figure 4. As the graphs below show, the positive emotions generally are more recognized rather than negative ones. This can be explained in the light of fact that the smart working, after a first moment characterized by high turbulence and fear due to the emergency situation, has started to be perceived, during the third wave of Covid-19, as a new working habit harbinger of different opportunities.

Assessing the most recurring words, “anticipation” emerges as a key emotion. Users, indeed, show a form of excitement regarding smart working practices because their potential to lead to success, better time management, and, more generally, a happier and more joyful approach to work. In this sense, “time”, “success” and “start” are used recurrently by users with the purpose of expressing some sort of enthusiasm about working at home. This also is shown by the joy emotion which, represented by the most recurrent keywords such as “success” “love” and “enjoy”, highlights those smart workers probably tend to enjoy the flexibility and independence in selecting their working hours and locations thanks to the use of digital tools which allow greater agility in daily life. In this direction, the majority of keywords related to positive emotion are “productivity”, “technology”, and “success”. This is in line with the literature (Boorsma and Mitchell, 2011; Gastaldi et al., 2014; Zheltoukhova, 2014; McEwan, 2016; Bednar and Welch, 2020) which highlights that, thanks to the widespread use of ICTs, smart working can improve performance, productivity, by resulting in a successful “triple-win” configuration for customers, employees, and organizations (Gastaldi et al., 2014;

#smartworking			
<i>Negative concepts</i>		<i>Positive concepts</i>	
<i>Macro-category</i>	<i>Keywords</i>	<i>Macro-category</i>	<i>Keywords</i>
Tech paralysis	Hard; hardness; difficult; difficulties; unable; incapable.	Smartness	Smart; smartness; smarter; intelligent.
Technostress	Hate; degradation; crisis; stress.	Work-life balance	Wellbeing; happy; privilege; enjoy; love; free; health.
Technology hiccups	Break; slack; broken; crash.	Flexible approach	Flexible; flexibility; agile.
Demotivation	Lazy; boring	Productivity	Active; productive; easy; success; successful.
Social isolation	Lonely; loneliness.	Innovative working environment	Innovative; innovation; new. .

Table 1. Most recurrent positive and negative keywords related to #smartworking (*authors' elaboration*)

Advantages

Among the positive concepts, the key concept of “Smartness” seems to be recognized as the most important due to the spread use of keywords such as “smart”, “smartness”, “smarter”. Smartness refers to the ability to self-manage, take responsibility, to overcome the idea of the “stressed worker”: an image that has accompanied employees since the last century, born from the constant friction between market needs - always evolving - and a stereotyped way of working, which has always imposed to do things according to a single vision. In an organizational context where there is a balance between fostering the welfare of workers, and being avant-garde in the face of market needs, it is possible to establish, as previously highlighted in the literature, truly “smart” objectives (Chen, 2015), starting from the negotiation between company and worker (Gastaldi et al., 2014; Zheltoukhova, 2014; McEwan, 2016). In addition, the complex situation due to the spread of Covid-19 does not make it possible to return the entire workforce to the employer's location, and the smart working paradigm has become particularly relevant for at least part of the workforce, especially for high-risk and vulnerable groups.

The second most recurrent macro-concept is “Work-life balance” which includes words like “wellbeing” and “enjoy”. Work-life balance, as reported in the literature review, (Gastaldi et al. 2014; HM Government UK, 2015; Dominguez, 2017; Errichiello and Pianese, 2019), is an important aspect of a healthy work environment, which can be reached thanks to good time optimization and high productivity. Smart working, in this sense, can allow to better manage time in order to have more free time and find the energy to devote to what you like best. Finding the perfect balance between work and personal life is by no means a foregone conclusion: up until now, the tendency (due to a too widespread management style of so-called presence) has been to think that personal time outside of work was expendable. Today this way of understanding work and its link with private life is no longer current or accepted. In fact, the work-life balance has become a determining factor in the choice of a job, and it is precisely on the improvement of this aspect that companies must work to remain competitive

in the labor market and attract (and retain) resources in the company. Furthermore, smart working has resulted in a useful solution to facilitate work-life balance in some particular situations related to the life of employees, as stated above. For example, workers suffering from chronic diseases, the disabled, those who must follow therapeutic or pharmacological treatments or other similar situations, even temporary and physiological, thanks to smart working, can maintain continuity with their work, thus favoring their psychophysical well-being (Mascagna et al., 2019).

“Flexibility”, which is represented by the most recurrent following keywords “flexible” and “agile”, refers to the possibility during the smart working of more flexible hours for workers who are free to work from an alternative location away from the employer's premises. As reported in the literature, Lake (2013) highlights flexibility as a key feature of new, smart working practices which can enable to follow the concept of placing man at the center of the corporate organization. Smart working arrangements are in fact based on a different idea of work, which can no longer be represented in a place but in what you do and therefore in the results reached according to the SMART objectives previously defined (Chen, 2015). In this sense, flexibility with respect to working time and locations has already been shown to increase employee morale, and has been linked to the concepts of work-life balance, satisfaction, and performance (Hill et al., 2001; Gajendran and Harrison, 2007). This is perfectly in line with mainstream studies (Rodgers and Hunter, 1992; Watson and Gallagher, 2005; Antoni, 2005), more current than ever during the Covid-19 era, that say smart working can include identifying goals, tasks, milestones, and monitoring progress remotely, allowing staff the flexibility and autonomy to work without the manager having to constantly monitor progress.

“Productivity”, by referring to sub-concepts such as “active”, “productive”, and “easy,” highlights that smart working, not only ensures business continuity and the required level of production even outside the physical office, but can also improve employee productivity. This concept is in line with the literature on smart working, as shown above, which refers to a dynamic way of working that leads to high levels of performance, productivity, and job satisfaction (Gastaldi et al., 2014; Zheltoukhova, 2014; McEwan, 2016). Goal setting, participation in decision making, and objective feedback have each been shown to increase productivity (1991). Advantages derived from smart working, indeed, include increased productivity and reduction of absenteeism. (Gastaldi et al., 2014; HM Government UK, 2015; Dominguez, 2017; Errichiello and Pianese, 2019). During the spread of Covid-19 increased labor productivity has been associated, to a higher extent, with the companies which have agreed to more flexible working practices. (Bucea-Manea-Țoniș et al., 2021). Once a good environment and also good physical, psychological, and ergonomic aspects are organized, it is possible to achieve and even improve work performance, especially in jobs that require high mental concentration (Loia and Adinolfi, 2021).

“Innovative work behavior” has also been recognized as a positive macro-concept related to the following keywords: “innovative”, “innovation”, and “new”. From the analysis of the literature, several scholars shed light on the potential of these advanced work practices (Zheltoukhova, 2014; McEwan, 2016; Bednar and Welch, 2019) to provide better support to innovative work behaviors (Bednar and Welch, 2020). During the spread of Covid-19, in addition to the benefits generally associated with smart working, an innovative leadership approach has been associated, to a higher extent, with the companies which have agreed to more flexible working practices (Rahman et al., 2020).

Disadvantages

Chief among them, “Tech paralysis”, represented by keywords such as “hard” and “difficult”, has emerged negatively as one of the most relevant macro-concepts in reference to smart working. As highlighted in the literature, smart working arrangements, although can offer several advantages to the employee, in some cases, can cause big difficulties and crippling issues in the work execution through ICTs because they require technological skills which are crucial to the achievement of value-creation processes (Bednar and Welch, 2020; Zheltoukhova, 2014; McEwan, 2016). From the employee perspective, indeed, smart working could not be implemented in a proper way if people do not possess an adequate computer, technology as well soft skills (Iannotta et al., 2020). According to the Connected Worker survey carried out by Deloitte (2018), 44% of workers cite issues with technology as a critical reason they waste 10 minutes every hour. What has been said finds more relevance to the times of the Covid-19 where the modalities from remote in many fields have been necessarily adopted from the organizations.

As a result, “Technostress” is the second most recurrent concept which has emerged by the big scale analysis. Technostress, referring in the analysis to sub-concepts such as “hate,” “degradation,” and “stress,” can be defined as symptoms of post-traumatic stress disorder, anger, and emotional exhaustion due to the combination of technology and work. As highlighted in the literature, technostress refers to the psychosomatic illness caused by daily work with ICTs, which can increase fatigue, irritability, and the inability to take off from work and rest properly. It consists of a negative experience as a result of the constant connectivity, information overload, frequent system changes and resulting uncertainty, constant relearning, and resulting job insecurities related to technical problems in using information technology. As previously highlighted, the concept of techno-stress has received growing attention from organizational scholars because employees have to struggle with the fast pace of innovations and have to spend more time and effort renewing their technological skills. Because of that, workers can be exposed to continuous changes in work conditions, to the risk of permanent availability, or the loss of boundaries between working and non-working activities. Especially during the spread of Covid-19, some authors shed light on the main pitfalls related to the implementation of smart working during the Covid-19 by highlighting terrible effects such as work-related stress and mental health.

In the third place, “Technology hiccups”, related to the keywords such as “break”, “slack”, “broken”, refers to a non-recurring problem of an indeterminate cause that usually can cause a temporary disruption of work on ICT platforms. During remote work, because can occur technology failures which cause confusion, eat up valuable time, and make look unprofessional, it is important to reduce the impact of tech snafus. As emerged by the literature, smart working could not be implemented in a proper way if people do not possess adequate technological infrastructures.

In addition, among the negatively perceived concepts, “Demotivation” highlights the possibility that smart working arrangements may affect employee performance (“lazy”, “boring”, etc.). Smart working practices, indeed, can also affect negatively the efficiency of organizations and consequently cause a loss of productivity. This negative consequence, which has been highlighted in the section regarding the disadvantages, especially affects those workers who value social relationships and therefore are less engaged and motivated when working from home. Another reason for lost productivity is the difficulty of monitoring

employees' work, which is a problem identified by some studies, especially in the case of low levels of self-discipline and inadequate leadership styles (Loia and Adinolfi, 2021).

“Social isolation” highlights the sense of loneliness that employees may feel in relation to organizational or social loneliness. As highlighted in the literature, loneliness and isolation can lead to severe depression (Bednar and Welch, 2020). In work environments, lack of face-to-face contact can affect relationships between colleagues and could generate a greater potential for conflict, less opportunity for team leaders to control, and less feedback on team processes. Actually, virtual collaboration in times of the Covid-19 pandemic crisis provides multiple ways to continue collaboration in a safe environment and offers additional opportunities to stay socially connected and maintain a high team spirit despite spatial dispersion. This is facilitated by using regular video conferences with the whole team (e.g., morning briefings, virtual coffee breaks), continuous communication between individual team members (e.g., online chats), and constant updates on work progress (e.g., as part of advanced groupware tools).

5. Conclusions and implications

In recent years, several authors have shown that the integration of digital technologies, such as social, mobile, analytics, and cloud, is profoundly transforming organizational models, with specific reference to the way companies and public administration design new organizational forms, modify inter-organizational relations, and manage HRM work practices and processes (e.g., Kane et al., 2015). Issues such as internal commitment to digital progress, the HRM lifecycle, and talent attraction and retention are closely intertwined with the ongoing digital transformation that modern organizations are experiencing (Orlikowski, 2007). The underlying principle of this revolution is found in the increased potential for organizational actors to connect through digital information and communication technologies to organize work across conventional organizations (Faldetta, 2021). In such a scenario, where the physical place of work activities has become less important, smart working practices have been developed as an evolutionary path in the world of work (Boorsma and Mitchell, 2011) aimed at improved collaboration, employee autonomy, flexibility, talent management, and innovation in organizations thanks to the technological advanced environment (Hamel, 2007; Lake, 2013). Smart working arrangements are in fact based on a different idea of work, the so-called Work From Anywhere, which can no longer be represented in a place but in what you do and therefore in the results reached according to the objectives previously defined (Rodgers and Hunter, 1992; Watson and Gallagher, 2005; Antoni, 2005). In some contexts, such as in Italy, smart working is often associated with the concept of teleworking (Loia and Adinolfi, 2021). However, although smart working is closely related to the concept of teleworking, it is a natural evolution of the latter which has added greater mobility and versatility to the features of the “traditional” distance work such as hourly flexibility regarding the times and places of the work performance, as well as by the fact that the activity must be oriented and assessed on the basis of the achievement of production objectives, agreed with by the entrepreneur/employer. If teleworking is used to move the work from the office to the home, smart working is taken it to almost any other place through the use the new technologies, with the aim to improve both the performance and the satisfaction.

Smart working practices have reached widespread due to the spread of Covid-19, although they have experimented in an atypical way driven by the need and not by the free choice of individuals and organizations. The unprecedented nature of the shutdown experience and the

deep changes experimented within this period might last beyond the end of the measures adopted to control the spread of the virus, due to the estimated long-term growth of smart working and the acceleration of virtuality and connectivity at work. This new normality will necessitate new thinking about workplace management, space design, HRM, and organizational design (Hu, 2020).

As emerged by the analysis carried out in the timespan under examination, the *smartness* in the working practices has been generally recognized as a fundamental aspect of the current world of work, aimed at overcoming the idea of "stressed worker" and reaching a positive work-life balance through the establishment of "smart" objectives which guarantee the employee's flexibility and productivity (Gastaldi et al., 2014; Zheltoukhova, 2014; McEwan, 2016). However, the results of the analysis are not entirely homogeneous, and some negative outcomes are also emerging concerning smart working, for instance, related to tech paralysis, technostress, and technological hiccups.

The bipolar nature of collective perception about the smart working is useful data for the professionals and the researchers called, in this historical time, to take advantage of the pandemic experience and to lay the cultural foundations for the new normality previously mentioned. Two main theoretical and practical implications involving the organizational design and Human Resources Management field arise from the analysis, useful to inspire future research and organizational practices.

Firstly, the organizational and cultural issues of the post-pandemic scenario compose the big picture of the new normality that can be interpreted accurately by a smart leadership "illuminated" and grown up with the lesson learned in the pandemic experience. The new smart leadership can create an exciting and compelling vision, to support people according to their knowledge, experience, and skills, in managing teams with wisdom (Singh, 2017; Iannotta et al., 2020). The priority attention to organizational performance leads the smart leader to provide an original interpretation of time and space, which overcomes the traditional paradigm of quantitative e physical control for delegation and empowerment injected, purpose-made, at the different levels of an organization. In this regard, the paper shows that there are different categories of workers/users, and it is necessary to propose personalized paths according to technological skills able to support the employee who has the most difficulty with technology in order to ensure that the advantages of smart working are increasingly recognized. In other words, this suggests the smart leader adopt a people care approach in order to satisfy the specific needs of each worker improving autonomy, engagement, and motivation.

Furthermore, smart working practices require a strong team agreement. When changing working patterns and enabling more choice in how work is done, indeed, it is important to have team agreements that set out the expectations around letting others know where and when you are working, keeping calendars and workflow systems updated, ensuring availability for the various kinds of meetings and calls, making work-in-progress available to others, and reporting any problems and issues in good time.

The density of smartness is also connected with new inspirations and innovations that the leader is able to provide to the followers. In the analysis carried out emerges how the work-related environmental ethics is still little explored. In particular, environmental advantages are strictly related to smart working, especially during the Covid-19 era (Mascagna et al., 2019; Bednar and Welch, 2020; Murmura and Bravi, 2021). However, in the post-Covid era when

users express their opinion about smart working, environmental considerations are not really emerging on a large scale. Therefore, it would be necessary for organizations to carry out communication policies that make workers really aware, not only of the personal benefits related to performance, flexibility, and work-life balance, but also of the great opportunities of smart working regarding a decrease of human impact on the environment (Loia and Adinolfi, 2021) (considering that the analysis shows low awareness about the environmental benefits of smart working). This dimension can become a powerful source of inspiration for workers and organization, and a distinctive feature of smart leadership.

The second implication of the research concerns a renewed importance of workplace design for the full success of smart working. In the post-pandemic scenario, indeed, the workplace can become a strategic artifact able to solve many of the negative emotions that emerged from the study. New reflections stimulated about the workplace design allow the conceptual transition from "space" to "place" (Robelski et al., 2019). It implies the construction of a sense of belonging for the workers who live in the physical and virtual space. Innovative physical layouts and virtual workplaces, in fact, can contribute to the engagement of current smart workers and to the attraction of future talents especially those belonging to the new generations.

In conclusion, the real challenge, which lies in the background with respect to the question of the sudden pandemic that has inspired the use of smart working, is that of succeeding in bringing about a true cultural revolution that innovates the relationship between employees and employers, followers and leaders as well as the physical and virtual way of organizing work.

6. Limitations and future lines of research

The new technological scenario has triggered the need to rethink working practices and has prompted future organizational efforts to define and follow new paradigms for how work gets done, along with significant opportunities to innovate, by leading to the define the so-called concept of "smart working". In the last years, the Covid-19 pandemic has accelerated the digitalization of the organizations, and posed unique demands in terms of conditions and scale of technology adoption at work, by leading the conditions for the most extensive mass smart working experiment in history. Given the intensity and relevance of the phenomenon, this work carries out a big data analysis in order to frame the collective perception about smart working, by analyzing the collective perceptions of users on Twitter regarding the smart working.

However, the contribution provides preliminary insights that pave the way for further investigation for a deeper understanding of smart working. In this sense, the limited nature of the research does not allow us to generalize, although the insights that emerged from this first study on the subject can provide a foundation and useful stimulus for future theoretical and empirical studies, qualitative and quantitative. Future lines of research could concern, for example, a different big data analysis on another social network – for instance Facebook or Instagram – in order to frame in a broader way the collective perception on this issue which deeply impacts the society. It also could be interesting to expand the tweet collection time interval to a post-Covid 19 period. Moreover, due to the relative scarcity of specific literature, it might be of interest to carry out in-depth interviews in order to select users with specific demographic and social characteristics.

Keywords

smart working; Covid-19; data-driven approach; Twitter; organization design; Human Resources Management

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