

Article

Shifting Workplace Paradigms: Twitter Sentiment Insights on Work from Home

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Abstract: The COVID-19 pandemic has forced organisations to evaluate whether work from home (WFH) best fits future office management and employee productivity. The increasing popularity of web-based social media increases the possibility of using employees' sentiment and opinion-mining techniques to track and monitor their preferences for WFH through Twitter. While social media platforms provide useful data-mining information about employee opinions, more research must be conducted to investigate the sentiment on Twitter of WFH employees. This paper meets this research demand by analysing a random sample of 755,882,104 tweets linked to employees' opinions and beliefs regarding WFH. Moreover, an analysis of Google trends revealed a positive sentiment toward WFH. The results of this paper explore whether people (as employees) are enthusiastic and optimistic about WFH. This paper suggests that WFH has positive and supportive potential as an HRM strategy to increase workplace effectiveness for greater staff engagement and organisational sustainability.

Keywords: work from home; Twitter; sentiment analysis; topic modelling; employee attitude



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1. Introduction

The COVID-19 pandemic has forced organisations to cease operations or rearrange their office work due to the intermittent lockdowns, work-from-home rule and stay-at-home orders. In response to the global pandemic, most organisations have adopted a work-from-home (WFH) policy to continue and maintain employee productivity. For example, public sectors, including many universities, banks, IT firms, and other businesses, have managed their employees' jobs online through WFH, aligning their HR policies and strategies. Several scholars recommended WFH and its adoption as an effective human resource management (HRM) strategy to meet the current pandemic challenge, and they anticipate its use in the future [1–5]. Moreover, employee productivity linked to WFH during the COVID-19 pandemic has been positive. For example, Barrero et al. [4] noted that “our survey respondents report being more efficient working from home during COVID than on business premises before COVID. So, we forecast the permanent shift to working from home will increase productivity by 2.4 per cent in aggregate” (p. 32). In response to the COVID-19 pandemic, organisations had to experiment with WFH and learn how it works. Further, the unprecedented pandemic provided researchers and practitioners with a comprehensive framework to evaluate the impact of WFH on organisations, their employees, clients, and suppliers.

The opinions expressed by employees in various social networks can help understand and predict their attitudes toward their current jobs [6], work engagement [7,8], and wellbeing and productivity [9,10]. Researchers have identified social networks as valuable sources of information for understanding employees' motivations and emotions [9,11]. For

example, Macnamara and Zerfass [12] suggested that organisations observe employees' job-related attitudes by collecting information from social networks "to identify the issues and topics being discussed, source quoted, and the tone of content—that is, whether it is positive or negative (p. 299)". Twitter is a popular online social network platform where employees tweet and share short notes or comments with their wider community by retweeting, replying, and adding hashtags. Murthy [13] demonstrated Twitter as an effective medium of self-affirmation, allowing individuals to assert, construct, and share opinions. Several studies have been conducted to mine social network platforms' information [7,9,11,14]; however, there is a lack of evidence solely on mining employees' opinions toward WFH during the pandemic. Therefore, this paper examines how employees use Twitter to express their positive or negative feelings about the experience of WFH during the COVID-19 pandemic. In other words, it explores how in a short tweet employees express their opinion on or responses to WFH (e.g., positive, negative, or neutral). As a result, future HR strategies and workplace policies will be better informed about WFH from the COVID-19 pandemic. Furthermore, by applying a mixed-method approach to analyse WFH sentiments, this paper also adds breadth to the debate over the future decision outcome for WFH. Finally, this paper adds to the literature and knowledge of researchers and practitioners related to WFH by focusing solely on social networks (e.g., Twitter) rather than traditional data-collection methods.

2. Research Gap and Significance of This Paper

This paper addresses a critical research gap by delving into the sentiments and attitudes of employees toward work from home (WFH) during the COVID-19 pandemic, specifically using Twitter as a data source. While there is existing research on the impact of WFH on organizations and employees [15,16], there needs to be more in the literature regarding the real-time sentiments expressed by employees on social media platforms like Twitter. This gap is compelling because it relates to a current and widely adopted practice necessitated by the pandemic, with potential long-term implications for office management and employee engagement. This study contributes significantly by shedding light on employees' sentiments through a novel data source, thus offering a fresh perspective. Moreover, this paper connects the concept of WFH to sustainability, highlighting its multifaceted implications [17,18], a novel and captivating aspect of our study. This paper closes this gap in research, enabling HR professionals and organizations to make more informed decisions about post-pandemic workplace strategies. The key contributions of this paper include a comprehensive analysis of employee sentiments, the connection of WFH to sustainability, and the recognition of social media as a vital platform for employee voice [6]. Overall, this study offers practical implications for firms by helping them understand their employees' experiences with WFH, which can guide their post-pandemic workplace strategies, sustainability initiatives, and their approach to monitoring and engaging with employee voices on social media. These insights contribute to the advancement of management theory, practice, and the understanding of the evolving role of social media in employee sentiment analysis [6,17,18].

The significant relationship among Twitter insights, WFH, HRM strategy, employee engagement, and organizational sustainability lies at the core of this paper. Twitter insights provide a unique window into individuals' sentiments, experiences, and perceptions during a critical transition to remote work necessitated by the pandemic [17,19]. When effectively harnessed, these insights can inform HR strategies that cater to a remote workforce's evolving needs and expectations. Organizations can enhance employee engagement by aligning HR practices with the sentiments expressed on social media platforms like Twitter, bolstering their staff's overall wellbeing and job satisfaction [15–17,19]. As a result, improved employee engagement contributes to organizational sustainability since engaged employees are more productive, committed, and aligned with the company's mission. Additionally, this holistic approach is aligned with sustainability principles by addressing human and organizational wellbeing and the challenges of remote work.

Organisations have needed help finding strategies to deal with the unprecedented crisis of COVID-19. Based on Twitter data, this paper explores how employees' attitude toward WFH has changed during the COVID-19 pandemic. This paper argues that organisations should look beyond traditional research approaches and implement opinion mining to uncover hidden patterns of employees' sentiments toward WFH. Therefore, this paper provides insight into employees' perceptions of WFH during the COVID-19 pandemic. First, it helps to understand the opportunities and challenges of WFH during the COVID-19 pandemic from employees' perspectives. Second, this paper explains why employees' opinions and attitudes toward WFH impacts are critical for an organisation's post-pandemic strategic decisions regarding day-to-day office management. Third, it explores employees' attitudes regarding WFH, such as positive, negative, or neutral voices. As a result, practitioners and policymakers will be able to take responsible initiatives to improve employee wellbeing and maintain the sustainability of organisations, especially in WFH.

3. Literature Review

3.1. Research on Social Media and Twitter

The increasing use of social media has changed many aspects of individual and social life. Researchers and practitioners use these virtual platforms (such as Twitter or Facebook) as sources of information and for collecting data for their research studies [1,20–22]. Among all the leading social media platforms, Twitter has received significant attention from researchers for diverse research issues such as customer engagement, product promotion, social networking, and information diffusion [6,23,24]. As one of the leading microblogging virtual platforms, Twitter allows its subscribers (i.e., users) to share short notes and messages with photographs (known as a tweet). Each tweet allows 280 characters (or less) and includes two information sections, including a text message and its metadata. These tweets have varied information about their users' "language, location, followers, retweet count, followers, and so on" [25] (p. 887). An example tweet and its partial metadata are presented in Table 1.

Table 1. Example of tweet data attributes.

Text message	RT @HyperNephroma_: Those who can work from home its better to do so. You guys are privileged in this regards. I wish I could work from home but I can't. Please visit health institutions only when truly needed. Otherwise, The Covid Tsunami can hit us badly.
Time frame	March 2020 to October 2020
User's screen name	asjha
Hashtags	#stayhome OR #stayathome, #work*home" OR #working*home, #remote*work* OR #remote*jobs OR \$#remote, #digitalwork* (N.B: * represents a wild card)
Number of retweets	18
Language	English

Mass media, including news outlets, social media platforms, and influencers, shape public opinion and perspectives [5,26]. This paper acknowledges that alongside individual responses, external factors such as mass media, influencers, and societal ideologies hold a significant role in shaping and biasing the way individuals perceive and react to various stimuli. Mass media, including traditional news outlets and contemporary social media platforms, are recognized as primary information sources for most individuals [5,26]. These channels often operate with distinct ideological and economic agendas, which can inadvertently or deliberately influence the framing of issues and events, thus impacting how individuals interpret and respond to them. Similarly, influencers, whether through social media or traditional media, wield considerable influence over their followers and

can shape their beliefs and behaviours [5,26]. However, it is imperative to acknowledge that influencers too may have their affiliations and motives, which could introduce biases into the responses of individuals who follow them [5,26]. Moreover, this study recognizes the pervasive influence of broader societal ideologies, which can be driven by political, social, or economic forces and are deeply embedded in culture [17,19]. These prevailing ideologies substantially impact individual responses to their Twitter comments, often leading individuals to align their reactions with their identified worldviews or values.

People connect with their friends through social media, but they also communicate with their professional colleagues, experts, or celebrities to follow, reply to, and retweet through Twitter. As a result, it creates more diverse, more extensive, and more complex networks in the virtual world with a conversation environment and creates a valuable data source for various social issues [27]. Researchers recommended that Twitter effectively produces electronic word of mouth with its users' tweeted opinions and retweets [28]. Brian et al. [25] noted "Compared with other social media platforms like Facebook and TripAdvisor, accessing data on Twitter is relatively straightforward through the use of Twitter API" (p. 888). Researchers can capture approximately 1% of all tweets with an API and simultaneously follow up to 5000 users [29].

3.2. WFH and Sustainable Development

Research on WFH strategies has tended to neglect their connection to sustainable development [18]. It is critical to acknowledge the profound and wide-reaching implications of WFH for individuals, institutions, the environment, and society [17,18]. It represents a multifaceted catalyst for sustainable development that warrants intensive scrutiny. For example, it emerges as a potent instrument for mitigating the environmental impact of daily commuting, thereby substantiating its potential as a significant contributor to reduced carbon emissions and alleviated traffic congestion [17,18]. This environmental benefit, stemming from a decreased need for vehicular transportation, underscores WFH's pivotal role in fostering ecological sustainability [17,18]. Moreover, the profound influence of WFH on the wellbeing of employees is palpable, as it facilitates improved work–life balance, heightens job satisfaction, and advances overall fulfilment and happiness [17,19]. Such positive effects on individuals, intrinsically tied to their psychological and emotional welfare, underline WFH as a dynamic force for social sustainability [17,30,31].

Concerning organisations, WFH offers substantial cost savings, notably if real estate expenditures are reduced, which can be channelled toward more sustainable and productive investments [17,30]. The economic perspective indicates the potential for WFH to bolster organisations' financial sustainability [17–19]. Additionally, WFH fosters inclusivity by eliminating geographical barriers, thereby allowing individuals with disabilities and those living in remote or underserved areas to engage in the workforce actively, thereby promoting social and economic sustainability [17,30].

3.3. Twitter and Employee Voice

The study of employee voice has increased in recent years, and Twitter is becoming more popular among researchers as a source of information on employee attitudes. Employees use Twitter to share their opinion regarding job-related issues (e.g., job satisfaction, engagement, or WFH) as an effective channel for employee voice [32,33]. Many scholars have suggested that Twitter has changed many aspects of employee and organisational outcomes for social studies research [9,34]. For example, Holland et al. [34] noted that "employee voice describes how employees attempt to have a say and potentially influence organisational affairs about issues that affect their work and the interests of managers and owners" (p. 2625). Conventional and traditional studies examining employee opinion and attitudes toward their jobs are highly criticised for socially desired responses [35] and the authenticity of the information [36,37]. However, tweets are more bias-free since they are created and expressed without management or organisational control [38].

Employees' comments shared over social network platforms can help organisations understand common expectations and attitudes toward their jobs to uphold organisational effectiveness and citizenship behaviour [34,39]. For example, Twitter provides an opportunity for an effective communication platform and stores evidence of employees' positive and negative impressions toward their jobs and organisations [9,39]. In other words, Twitter can reflect employees' opinions regarding their work-related attitude with reach and immediacy [9,34]. As a result, researchers and practitioners can receive 'real-time' information shared by their employees or outsiders responding to and discussing work-related issues as they emerge. As a result, scholars concluded that using social media, particularly Twitter, can benefit employees and organisations in their future strategy and policymaking [9,32,34].

3.4. *Work from Home (WFH) during the COVID-19 Pandemic*

The concept of WFH is also known as remote or mobile working or telecommuting in the literature but was practised well before the COVID-19 pandemic. Scholars from the US [40] and Europe [41,42] suggested that about 40% of regular office jobs can be managed or potentially carried out through WFH. Before the pandemic, the practice of WFH increased from 0.75% in 1980 to 2.4% in 2010 [43] and 4.0% in 2018 [16]. However, the COVID-19 pandemic boosted WFH, and about half of all employed people worked wholly or partly from home from 2020 [16]. When WFH is provided with an efficient way to manage work, and COVID-19 exposure risk decreases, organisations choose WFH as their preferred method. Gottlieb et al. [44] noted that "many countries are implementing drastic measures of social distancing to tame the spread of COVID-19. These measures often involve closure of workplaces to limit interpersonal contact" (p. 72). Hence, choosing WFH is considered a strategic option in determining the economic consequences of social distancing policies across all countries and organisations to manage office work during the pandemic. As a result, now is the time to come up with research outcomes to determine if WFH can be continued after the pandemic.

WFH strategies encompass various job roles, particularly online tasks and digital communication tools [45]. Industries like technology, finance, and marketing have successfully adapted to remote work, with roles in software development, data analysis, content creation, and digital advertising as prime examples [14,46]. However, it is essential to acknowledge that specific jobs requiring physical presence or access to specialized equipment, such as manufacturing or healthcare, may face challenges in implementing WFH [1,14]. Additional research and industry-specific analyses are necessary to identify job types aligning with WFH strategies, considering technological infrastructure and organisational culture [45,46]. This approach can help organizations make informed decisions regarding implementing remote work policies and better understand the broader implications of this workplace paradigm shift.

There was a 400% increase in WFH over the last decade, especially in the US and EU regions, reflecting their desire to be more competitive, efficient, and resilient for better business performance [47]. However, many organisations still need to determine how much of their work can be handled remotely and the best way to adopt and implement this WFH approach. Moreover, during this pandemic, particularly after 2020, organisations are forced to rely more and more on their WFH for survival. For example, a study found that the American minimum average cost per workstation is over 18,000 dollars each year, taking over 520 h to commute to their offices and releasing over five thousand pounds of carbon dioxide each year [47]. However, if they implement WFH, these estimates could be the equivalent of just 2000 dollars per office, and they would have no pollution and no commute time to their offices [47].

WFH may have some limitations in terms of quality, particularly for specific organisations like universities. This is due to the absence of face-to-face education, which can negatively impact the quality of student learning. Therefore, it is crucial to highlight these limitations for specific organisations like universities. The shift to online learning during

the COVID-19 pandemic in higher education has highlighted significant challenges [19]. Face-to-face education can negatively impact student engagement, limit hands-on learning experiences, and create technological disparities among students [17,19]. Moreover, social isolation and reduced faculty–student interaction are notable drawbacks [17,20]. To address these limitations and maintain or enhance educational quality in the WFH setting, universities must invest in technology infrastructure, provide faculty training, and design engaging online courses [19,20]. A hybrid approach that combines in-person and remote learning may offer a balanced solution. Emphasising these limitations underscores the importance of tailoring WFH strategies to specific organisations, particularly in education, where personalised interactions and practical experiences are vital components of the learning process [17,19].

3.5. Sentiment-Analysis Studies

Sentiment analysis (also known as opinion mining) helps explore individuals' emotions and evaluates attitudes toward a specific situation or subject [21,22]. Researchers apply this technique to categorise and clarify individuals' sentiments to indicate whether they are positive, negative, or neutral to a particular subject or situation [48]. For example, Oliveira et al. [22] noted that sentiment analysis aims to identify and extract "subjective information from large volumes of unstructured data by combining data-mining techniques, machine learning, natural language processing, information retrieval, and management knowledge" (p. 37). There are three levels of sentiment analysis: word level [49], comment level [50], and document level [51]. Moreover, Ghiassi, Skinner, and Zimbra [52] proposed this approach with two semantic and machine-learning orientation categories. First, the machine-learning technique automatically categorises database samples to develop models based on words or text to analyse data [53]. Second, the semantic orientation approach uses a previously constructed dataset (with words or text) containing positive and negative terms and judges their polarity or sentimental positions [48,49]. Machine learning has shown more consistent and accurate results among both approaches and, therefore, has been commonly used in many previous studies [22].

Employees nowadays frequently use social networking platforms, including Facebook, Twitter, and Instagram, to express their opinions on various issues and experiences. Hence, these virtual social platforms become attractive data sources for researchers to conduct explorative studies through sentiment analysis [21,22]. Yu et al. [48] recommended sentiment analysis for three justifications. First, it allows researchers to convert a large dataset into unstructured information to predict an individual's attitude toward a subject or situation. Second, sentiment analysis helps develop research models by analysing collective opinions, disclosing information about people's minds, and predicting future behaviour trends. Third, it facilitates researchers, practitioners, and policymakers to collect information regarding the target audience's response and attitude toward a particular issue or subject, such as products, and political or election campaigns, including many other day-to-day issues or topics. Several researchers applied sentiment analysis to various fields of study, including medical and health studies [24], web and digital science [23], political studies [54], financial analysis [55], marketing and advertising [56], and HRM studies [6].

4. Method

Data Collection and Preparation (Twitter Sampling)

This paper collected data by extracting tweets using different search patterns relevant to working from home during the COVID-19 pandemic. This study followed three techniques to identify and analyse the targeted topic (i.e., WFH) and patterns in the collected tweet data. These specific techniques included word frequency, content, and network analysis. Figure 1 provides an overview of the complete dataset used in this paper. Data for this study were obtained from Panacea Labs' open-access COVID-19 Twitter chatter dataset [57].

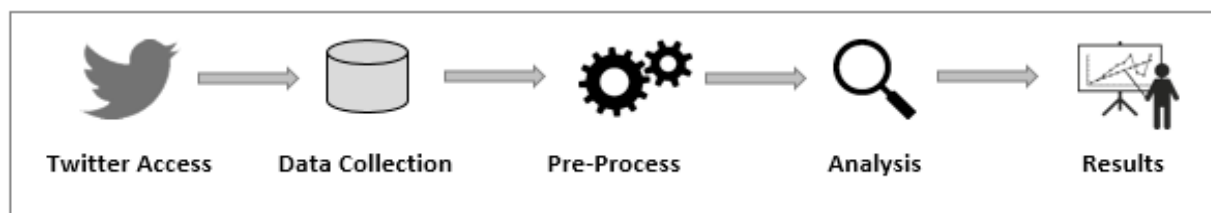


Figure 1. Analysis process.

This study used ScraperWiki, an online platform, to collect and archive random Twitter data regarding WFH from March 2020 to October 2020—covering eight months. This paper considers 245 days and 755,882,104 tweets in the dataset. Lamy et al. [49] defined random sampling as “a common strategy for content analysis of social media” (p. 6). Accordingly, several Twitter hashtags linked to WFH, such as #stayhome or #stayathome, #work*home” or #working*home, #remote*work* or #remote*jobs or \$#remote, #digitalwork*(here, * represents a wild card), and #lockdown were searched from Twitter API to collect people’s opinions, attitudes, and metadata. Several researchers have recognised this method of collecting Twitter data as a standard procedure of research-data collection [25,58,59]. Moreover, this paper applied various data preparation and transformation tools for descriptive analysis and social mapping. For example, this paper considered tweets in English only linked to WFH after language filtering. This step removed about 14% of tweets in languages other than English. This is because English is the most used language on Twitter [60]. Finally, the retweeted tweets were also eliminated since they do not add additional information to their original tweets or are possibly considered duplicates. Table 2 illustrates the total occurrences of all hashtags. Figure 2 indicate the monthly analysis of individual hashtags and this study’s top 10 monthly tags.

Table 2. Total occurrences of all hashtags.

Months and Total Hashtags							
March	April	May	June	July	August	September	October
122,829	319,072	247,747	110,286	84,769	61,361	47,720	59,142

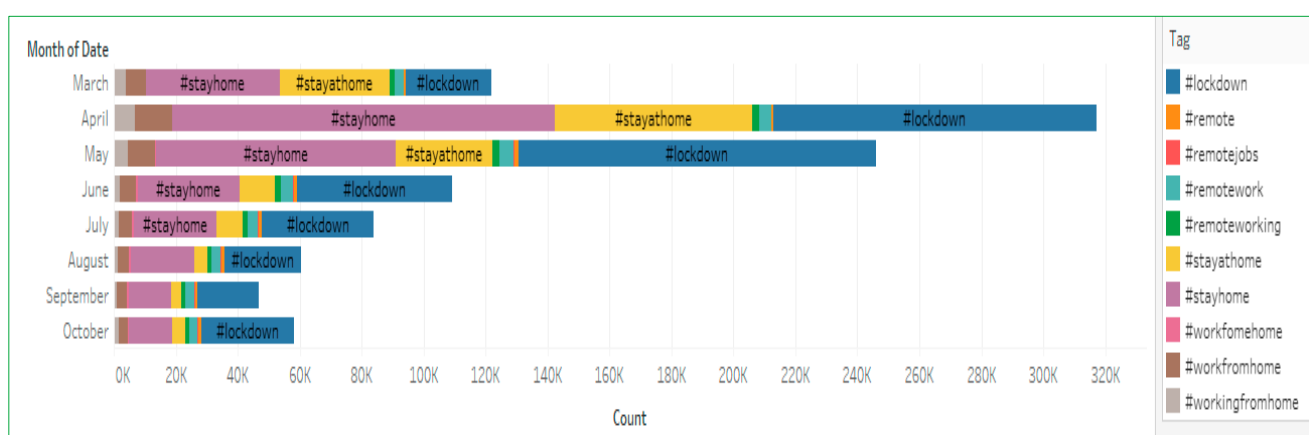


Figure 2. The top 10 monthly tags.

5. Results

5.1. Text Mining and Word Frequency

In this study, WFH was the topic of tweets that contained words, hashtags, and uniform resource locators (see Table 3). Therefore, an extensive list of hashtags and phrases (or words) that describe WFH is generated based on frequency analysis. This resulted in a

list of 377 tags extracted for 1,052,926 occurrences. For example, the hashtags were filtered and removed using the following criteria (where * represents a wild card):

- #stayhome or #stayathome
- #work*home" or #working*home
- #remote*work* or #remote*jobs or \$#remote
- #digitalwork*
- #lockdown

Table 3. Example of WFH-related tweets.

I hope you all work hard at home. You will see my efficiency increase by a lot. #workfromhome #office #manager #vacation #holiday #chill #dance
Suffering from WFH burnout? @TalentCulture offers some practical tips in this article, including initiating formal virtual #mentorship relationships and conducting weekly check-ins #WFH #burnout #HR #leadership https://t.co/0mPPPyvMx2 (accessed on 15 December 2022)
When the pandemic began, virtual meetings became all the rage. But soon, companies were holding too many meetings, and it led to "Zoom fatigue." Gradually, people have realized that virtual meetings are not a panacea. Read more at https://t.co/734wqnzRBK #workfromhome #zoom (accessed on 15 December 2022)
These are rough times for workers & those running business. Here are the details of the income support & business support for those affected by lockdown. Thx @DanielAndrewsMP for securing this support for Victorians. #stayathome #GetVaccinated #springst #auspol #support #CovidVic https://t.co/9NLpvUaLb0 (accessed on 15 December 2022)
Feels like I am doing makeup more now, for zoom conferences, than when I actually worked in an office 😊😊 even life got weird or me 😊 #pandemiclife #workfromhome #workingremotely #conferencespeaker

Figure 3 key terms associated with work-from-home trends.

Tag	Date																							
	March 2020			April 2020			May 2020			June 2020			July 2020			August 2020			September 2020			October 2020		
#lockdown	27,761			104,256			115,375			49,972			36,274			24,746			19,751			30,079		
#stayhome	43,201			123,377			77,231			32,900			26,680			20,457			13,731			13,868		
#stayathome	35,258			63,604			31,210			11,463			8,490			4,276			3,171			4,299		
#workfromhome	6,355			11,926			8,856			5,038			4,359			3,810			3,044			2,978		
#remotework	2,755			3,747			4,488			3,850			3,198			2,920			3,059			2,654		
#workingfromhome	4,046			6,861			4,456			1,989			1,604			1,187			1,083			1,584		
#remoteworking	1,777			2,371			2,404			1,938			1,531			1,304			1,201			1,388		
#remote	639			847			1,556			1,067			844			970			730			745		
#workfomehome	51			206			414			711			578			537			730			270		
#remotejobs	60			74			135			158			346			217			328			393		
#workathome	159			372			231			229			135			158			136			136		
#remoteworkers	143			225			174			131			116			103			79			51		
#digitalworkplace	62			88			75			70			58			171			278			203		
#remoteworkforce	68			215			206			168			104			82			78			48		
#remoteworker	45			82			109			95			79			88			73			69		
#workingathome	94			87			85			94			36			25			4			5		
#workoutfromhome	54			135			132			59			21			18			4			3		
#workoutathome	71			104			69			43			55			32			17			10		
#remoteworkvia	24			55			62			47			40			33			33			26		
#remoteworkhttps	23			35			40			24			29			19			13			39		
#digitalworkplaceday																						170		
#remoteworkplace	3			41			35			9			28			3			11			2		
#remoteworkinghttps	9			20			27			16			16			17			4			13		
#remoteworkopportunities				14			78			14			6											
	OK 100K 200K			OK 100K 200K			OK 100K 200K			OK 100K 200K			OK 100K 200K			OK 100K 200K			OK 100K 200K			OK 100K 200K		
	Count			Count			Count			Count			Count			Count			Count			Count		

Figure 3. Popular words and hashtags related to WFH.

In addition to the specific WFH-related hashtags, Table 4 summarises those related to words that may indirectly describe WFH and finds three specific themes. First, lockdown-related words: emergency jobs, income support, stay home, and business support. Second, job-related words: remote work, digital work, virtual meetings, and Zoom. Third, emotion-related words: suffering, burnout, fatigue, work–life balance, happiness, and love. These themes indirectly support the contention that WFH constituted a valid sample set. For example, hashtags and photos indicate that most tweets contain pictures or links to more information via Hypertext Transfer Protocol (HTTP). In addition, Twitter users often share links to communication across different networks to express their emotions or experiences.

Table 4. Frequency analysis of the hashtags related to WFH.

	Term	%	Frequency	Hashtag	%	Frequency
1	covid	27.56%	1,198,638	#lockdown	38.77%	408,214
2	covid19	20.86%	907,130	#stayhome	33.38%	351,445
3	coronavirus	19.65%	854,450	#stayathome	15.36%	161,771
4	people	4.48%	195,033	#workfromhome	4.40%	46,366
5	pandemic	3.72%	161,591	#remotework	2.53%	26,671
6	deaths	3.09%	134,584	#workingfromhome	2.17%	22,810
7	virus	2.87%	124,834	#remoteworking	1.32%	13,914
8	health	2.05%	89,295	#remote	0.70%	7398
9	news	1.91%	83,028	#workfomehome	0.33%	3497
10	lockdown	1.83%	79,384	#remotejobs	0.16%	1711
11	world	1.48%	64,567	#workathome	0.15%	1556
12	work	0.99%	43,061	#remoteworkers	0.10%	1022
13	pandemia	0.99%	42,879	#digitalworkplace	0.10%	1005
14	home	0.79%	34,322	#remoteworkforce	0.09%	969
15	stay	0.64%	27,908	#remoteworker	0.06%	640
16	COVID_19	0.52%	22,617	#workingathome	0.04%	430
17	school	0.49%	21,374	#workoutfromhome	0.04%	426
18	schools	0.46%	19,821	#workoutathome	0.04%	401
19	healthcare	0.45%	19,542	#remoteworkvia	0.03%	320
20	immunity	0.44%	19,013	#remoteworkhttps	0.02%	222
21	working	0.43%	18,820	#digitalworkplaceday	0.02%	170
22	workers	0.40%	17,589	#remoteworkplace	0.01%	132
23	community	0.38%	16,568	#remoteworkinghttps	0.01%	122
24	united	0.37%	15,943	#remoteworkopportunities	0.01%	112
25	worse	0.36%	15,708	#workflowfromhome	0.01%	110
26	lockdowns	0.35%	15,013	#digitalworkspace	0.01%	92
27	lockdown2	0.30%	13,010	#remoteworklife	0.01%	87
28	covidiots	0.24%	10,500	#remoteworkingapps	0.01%	56
29	homes	0.23%	10,104	#digitalworkforce	0.01%	56
30	pandemic	0.23%	9975	#remoteonlinejobs	0.01%	53

Over the 245 days, the frequency analysis of hashtags shows 377 tags, including 755,882,104 tweets. A total of 1,052,926 different hashtags appeared in the dataset. Many Twitter conversations also contained WFH hashtags like #workfromhome, #remotework, #workingfromhome, and #remote. Other popular hashtags included lockdown-related or job-related hashtags like #lockdown, #stayhome, #digitalworkplace, and #remoteworkforce. Moreover, many hashtags are directly related to conversations under “digital work” and “online job”, like #onlinejob, #digitalworkplace, and #legitworkfrom. These are unique hashtags used by Twitter users to engage with other users interested in the concept of WFH. For example, the #legitworkfrom on Twitter refers to “legit work from home”, inviting people for online jobs to earn money and achieve success. The hashtag is also used on other social media platforms, such as Facebook, to advertise new job opportunities, where members discuss WFH (Legit Work from Home, n.d.). However, other popular hashtags are not as frequently used as expected. When compared, some of these less frequently used hashtags are lockdown related, like #quarantine, #lockdownchallenge, and #staysafe, and

emotion-related hashtags such as #quarantineandchill and #coronavirussucks show a talk about similar conditions like WFH. To extract tweets based on user profiles, *Knime* was used to collect user profile information. The study's results (Figure 3 and Table 3) reveal several themes.

5.2. Network-Mapping Analysis

In addition to text mining and word frequency, this paper employs geographical and network topology visualisations. According to Figure 4, the country-wise network topology presents a high-level view of network structure and communication (e.g., tweeting) frequency and percentage. Here, Figure 4 represents the entire network of Twitter users tweeting about WFH and was constructed using relationships or links through country-wise locations where tweets originate.

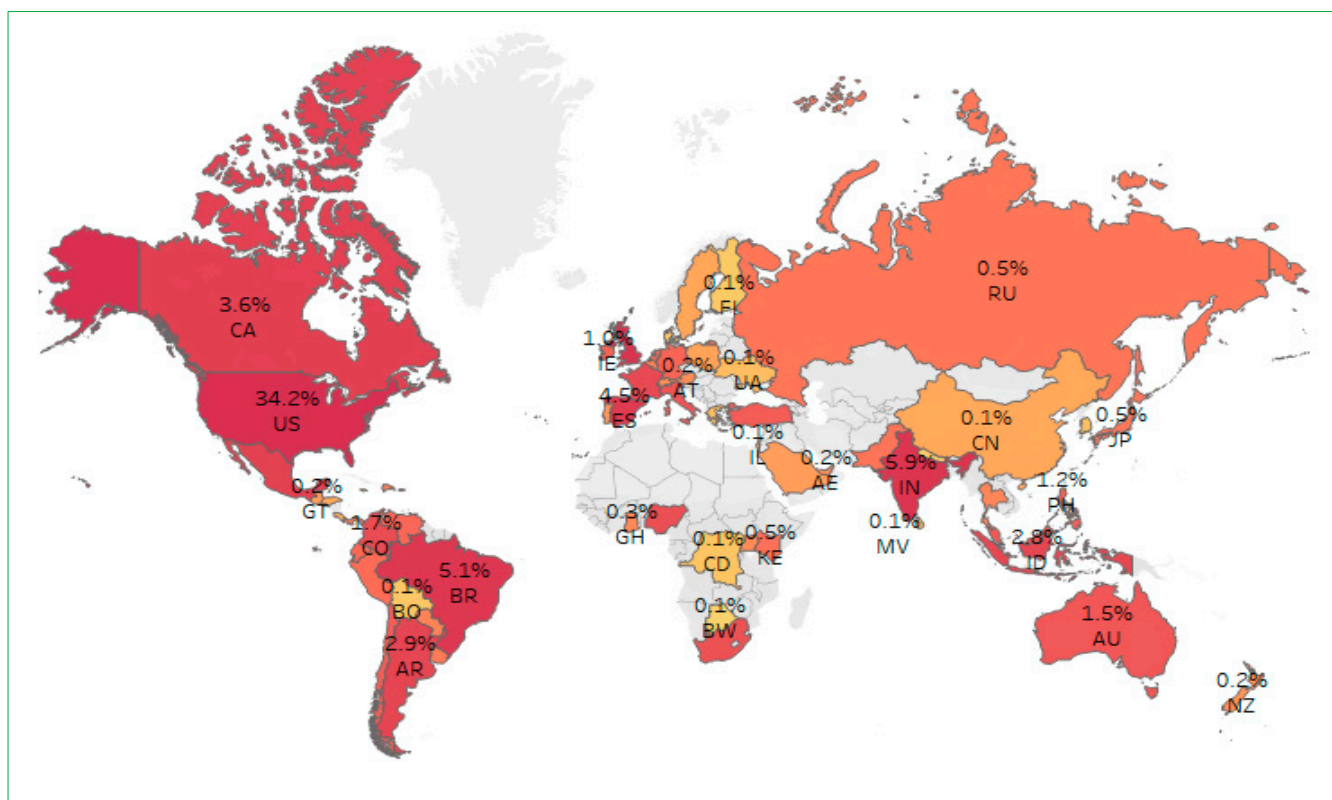


Figure 4. Places where tweets originate.

Figure 5 shows a word cloud of expressed hashtags in a random sample of WFH tweets. A word cloud or a tag cloud is a visual device indicating the frequency of occurrence of a specific word in a document. The higher the frequency of a word, the more prominent will its presence be in the word cloud. This paper presents a word cloud of WFH classified by prominent hashtags such as lockdown, stay home, work from home, or remote work. Moreover, Figure 6 highlights the frequent terms such as covid (27.56%), COVID-19 (20.86%), coronavirus (19.65%), people (4.48%), deaths (3.09%) or health (2.05%).

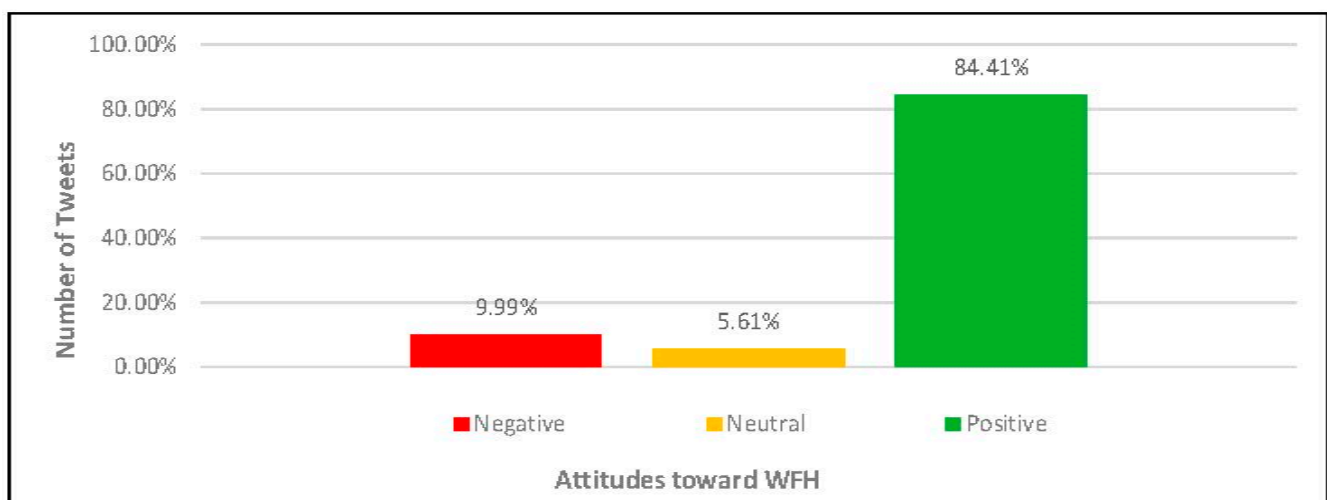


Figure 7. Sentiment analysis for WFH.

5.4. Google Trend Analysis

You can apply Google Trends Analysis for “I like work from home” and “I do not like work from home” for the year 2020, including for the study period (March 2020 to October 2020), through Google Trends and can examine whether the findings support the above sentiment analysis for this study. Google Trends works based on Google search results to represent the public interest in specific keywords or statements [63]. Moreover, it outlines the volume for a given search term relative to the total number of searches on Google on a scale of 0 to 100. Accordingly, researchers use Google Trends to analyse extensive data covering large-scale information [58,63,64]. Based on these implications, this study uses Google trends to predict WFH decisions for liking and disliking. The result compares the attitudes toward WFH as captured in Figure 8, supporting the positive response of Figure 7. However, it is essential to mention that the scale on Google Trends is conventionally set at 100% for the highest frequency of a specific search term over a predefined time horizon, irrespective of the absolute search volume. The analysis in this study primarily emphasizes tracking the relative change in search interest over time rather than delving into absolute values. The principal objective here is to highlight trends and shifts in user interest, thus diminishing the significance of specific search volume metrics.

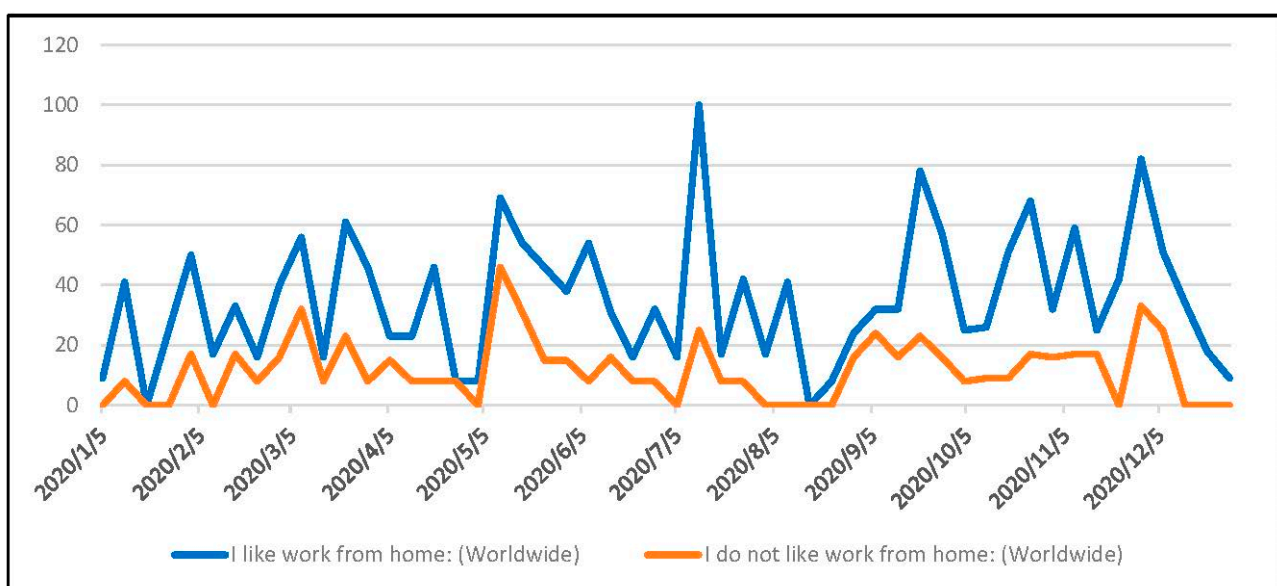


Figure 8. Google Trend analysis for WFH.

6. Discussion and Implications

Twitter generates extensive data and allows scholars, researchers, organisations, and practitioners to gain insights into new studies and business performance. For example, organisations can use social media (e.g., Twitter, LinkedIn, or Facebook) to determine how their stakeholders, such as employees or customers, think about any situation, topic, or event and what they want. As a result, researchers can now answer essential questions in a way that was difficult a few years ago. However, these new methods require careful data collection, preparation, and analysis. This exploratory study demonstrates the possibility of using Twitter data, social media analytics tools, and techniques to collect, analyse, and answer questions about employee attitudes toward business solutions.

This paper performed several Twitter data assessments, including country-specific (Figure 4), cloud-based (Figure 5), and frequency-wise (Figure 6) hashtag analyses, as part of this exploratory study to provide insights into the concept and practice of WFH. The pandemic has raised new questions about WFH's future and current practice since 2020. As part of the WFH policy and strategy review, this study provides HR professionals and managers with evidence that can be used to adjust future work options post-pandemic. Research suggests that frequency and sentiment analyses of Twitter data can serve as radical text transformations to answer research questions [11,52]. Figure 7 depicts the distribution of polarity scores for positive, negative, and neutral opinions over the total studied tweet data. Of the total sample tweets (755,882,104), 84.41% expressed a positive attitude toward WFH. In contrast, 9.99% of negative and 5.61% of neutral tweets totalled under 15.6%. Thus, the study results suggest that employees with 84.41% tweets who worked from home from March 2020 to October 2020 positively assessed their work experiences. However, whilst many employees wanted to work from home, WFH may cause job losses and instigate more suffering for others. For example, less than 10% of tweets in this study showed a negative attitude toward WFH, which may have several reasons, including additional workload [65], work–life balance [66], or even job loss [67]. According to McDowell et al. [62], 2303 US adults who switched to WFH and lost their jobs due to the COVID-19 pandemic spent more time sitting and watching screens than those whose unemployment remained unchanged. However, 5.61% of people were neutral or had no positive or negative reasons for their attitude toward WFH. The overall findings of this paper align with previous studies [65,67,68] that express employees' positive attitude toward WFH. For example, Dubey and Tripathi [63] argued that employees' neutral opinions expressed via Twitter during the COVID-19 pandemic are generally lower than positive or negative sentiments. Lastly, the increasingly positive attitude to WFH was also confirmed using Google trend analysis, as shown in Figure 8.

This paper sheds light on the importance of WFH, a need of the 21st century and essential for organisations to be competitive in this digital era, particularly during the pandemic. The study found that Twitter content containing WFH-related words showed different attitudes (positive, negative, or neutral) among people during COVID-19. Scholars have indicated that Twitter can be understood as a platform or tool across various study areas, including marketing [11], tourism [25], and linguistics [51]. However, there needs to be more evidence for HRM to apply Twitter data for HR practitioners, particularly from the employee perspective [11,69,70]. This paper indicates that Twitter is used mainly for marketing and promotion-related purposes for businesses [11,25] but has yet to see its intervention for HRM. From an individual or employee perspective, Twitter data could provide valuable information about the decision-making process of organisations and HR managers. For example, this paper can contribute to understanding future strategic HRM strategies by uncovering experiences and preferences related to WFH. Information regarding WFH from an employee perspective can be a valuable resource for effective HRM and strategic management. Hence, this paper can provide primary information to HRM professionals on how employee WFH may have affected negative (e.g., work stress) outcomes and positive (e.g., work engagement and productivity) outcomes. There is

evidence that a positive attitude to work has a favourable effect on work engagement [33] and productivity [71], and a negative attitude tends to cause work stress [66].

This paper has several macro- and micro-level implications. The macro-level implications of this paper will help policymakers across all business sectors to understand how they can manage employees and flexible workplaces in the future. Moreover, several service sectors such as banks, insurance, or call centres may understand how their jobs are perceived while serving WFH for their employees. This paper presents a further research opportunity to examine the effectiveness of WFH at the country and sector levels, including customer satisfaction, compared to the traditional office setup. Scholars have suggested that WFH is a new opportunity for workplace effectiveness, particularly in challenging times [61,72,73].

For the micro-level implications, the following points can be emphasised. First, this paper indicates the positive attitude toward WFH, which can be helpful for strategic HRM to comprehend employee choice for future work alternatives. For example, HR practitioners can observe and implement the WFH strategy by examining employee social media posts on Twitter, Facebook, or LinkedIn. Several scholars have emphasised the significance of these digital media platforms for collecting research data and suggesting further empirical studies to justify the contemporary and traditional research methods and findings [61,62,68]. Second, previous studies have been overly focused on the implications of traditional research settings using interviews or survey data to understand employee motivation. However, very little is known from their informal conversation and sharing through social media such as Twitter [61,62]. Hence, this paper expands employees' perceptions of WFH to help HR managers and future research explore employee motivation for the greater prospect of WFH. Third, this paper extends the research opportunity for employee attitudes toward WFH, which may also be linked with work–life balance and mental health projections. For example, previous studies found that employees reported less work–family conflict and stress and experienced higher work engagement and performance on WFH days [70,72,73]. Lastly, the findings of this paper contribute to policymakers and HR managers' ability to anticipate future WFH opportunities, promoting workplace flexibility [74,75] as it is currently being more frequently employed and utilised for the pandemic situation. Therefore, this paper assists future researchers and practitioners to maximise the cost effectiveness and sustainability of their business by applying WFH more strategically.

7. Limitations, and Future Research

This paper contributes to the fields of HRM and organisational studies. It applied Twitter research data and utilised social media analytics as a tool for extensive data analysis to explore further exploratory research avenues. Twitter posts can only be 280 characters long. However, it has been argued that millions of daily tweets can accurately represent employees' views regarding a specific subject [11,27]. Accordingly, tweets related to WFH were accumulated, and social media analytics were utilised to extract valuable intelligence regarding employees' attitudes toward WFH. The overall results of this paper will help scholars and practitioners explain and justify future decisions related to WFH assessment. Furthermore, this novel approach to collecting Twitter data as research data and analytical techniques can complement traditional research and data analysis [22,25]. Future research endeavours should aim to replicate these findings across diverse national and sectoral samples. Thus, the results would be more valid and generalisable, and the phenomenon under investigation would also be better understood. While categorising tweets into these essential sentiments may appear simplistic, it is an essential foundation for our study. This initial categorisation allows us to gain insights into the prevailing emotional tone of the discourse during an unprecedented time. Importantly, the paper acknowledges the necessity of moving beyond this initial categorisation. We intend to use this foundation as a springboard for a more in-depth investigation into the underlying factors, determinants and influences shaping these sentiments. This includes a closer examination of the impact

of emotions, ideologies, and trending hashtags on participants' responses, as highlighted by the reviewer. This is a valuable direction for future research iterations that align with the evolving landscape of human resource management (HRM) studies. In the future, researchers can explore the factors behind sentiments and the behavioural responses that may result from the sentiments expressed on Twitter. This comprehensive approach will contribute to a more profound understanding of the intricate dynamics at play during significant events like the COVID-19 pandemic, making this research more robust and pertinent to HRM studies in the contemporary context.

Despite this contribution, this paper highlights some limitations for future research opportunities. First, Twitter data collection could be extended over a longer period. Although this does not affect the overall findings of this study, the results might be more generalisable if data were collected for extended periods. Second, this research followed an exploratory approach and used Twitter data. However, future researchers can utilise Twitter data analysis to extend HRM theories (e.g., theoretical frameworks or hypotheses). Thirdly, since the users generated the Twitter data, this study disregarded both the validity and reliability of the Twitter data [75]. Fourth, this paper considered employees' perspectives, but future research studies should consider both management and employers' perspectives and consider discipline-specific theoretical justifications. Fifth, social media analytics has evolved into the broad field of archiving and analysing unstructured data with several techniques, including opinion mining and sentiment analysis [27]. Hence, future researchers will benefit from extensive data analytics methods and techniques. Academics and practitioners, for instance, could benefit from advanced social network analysis and topic modelling [72,73]. Moreover, scholars and practitioners could benefit from advanced social network analysis and probabilistic topic modelling [74,75]. Finally, future researchers should develop guidelines for HR practitioners and organisations to strategically use Twitter and other social network platforms. For example, future studies can use theoretical frameworks such as eWOM (electronic word-of-mouth) [75] and the IDM (information diffusion model) [73].

8. Conclusions

This paper analyzed the polarity of 755,882,104 tweets expressing attitudes toward WFH. The perceptions of employees expressed in social media have significant implications. Until the third quarter of 2020, Twitter had 187 million active daily users worldwide [74]. Among all user nations, Twitter is most prevalent in the United States. As of January 2021, Twitter's microblogging service reached 69.3 million users, followed by Japan (50.9 million) and India (17.5 million), with the second and third positions, respectively [75]. Since 2020, the beginning of the COVID-19 pandemic, WFH and Twitter users have increased significantly. This paper explored how WFH was perceived by the employees and found higher employee wellbeing during the COVID-19 pandemic and better organisational engagement. However, these benefits are accompanied by challenges such as work insecurity and difficulties in balancing work and family. From 2020 to 2021, WFH may last longer than organisations ever expected. So, the best thing they can do to set an HR strategy and policy for success in 2022 and beyond is to commit to changing employee mindsets for WFH to focus on effective workplace effectiveness and organisational sustainability. The implementation of WFH now is imperative to improve work–life balance, achieve significant social benefits, and implement sustainable business practices.

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