Knowmads as Possible Mutants of Knowledge Workers in the Brave post-COVID World

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Abstract: The purpose of the present study is to capture the specific forces that are intensifying in the COVID-19 context, which stimulate the adaptation of some knowledge workers characteristics into mutated traits – the traits of knowmads. Also, the present study aims at exploring how this transformation is presented in the literature. Defined by John Moravec, the term "knowmad" describes those workers that stand out by being proficient in working with anybody, anywhere, at any time. As an autonomous knowledge worker apt to develop business ecosystems in real, virtual, or hybrid working environments, knowmads are not confined to employees of a single organization. A steady evolution in this respect has been visible for the last decade already. Still, it accelerated during COVID-19 pandemics, due to the global economic crisis. Studies show that the trend will continue to develop in the post-pandemic environment, as the prevalence of flexible, remote work during pandemics has increased from a niche occurrence to a widespread practice over the past nearly two years. Because of the COVID-19 pandemic, an unprecedented number of employees worked from remote locations, on flexible schedules, and were not under the direct control of their supervisors. This study aims to explore and capture the main forces powered by COVID-19 pandemics, which stimulated the change of certain knowledge workers characteristics into a mutation towards knowmads characteristics. The authors implemented a critical literature analysis, and a computer-aided bibliometric analysis performed with the help of VOSviewer version 1.6.17 software. Findings demonstrate that the COVID-19 context boosted the transformation of the knowledge workers into knowmads, and the process is not going to end soon. Also, the search performed with VOSviewer shows a significant absence of knowledge concerning the transformation of corporate knowledge workers into self-managed knowmads.

Keywords: knowmad, post-COVID world, knowledge worker, mutation

1. Introduction

Judging by its unprecedented reach, lasting presence, and multilayered impact, COVID-19 is an outlier, a historical action of crisis able to determine a cascade of reactions in all strategic fields of economics, business and social life (Baba et al., 2020; Bratianu, 2020; Bratianu and Bejinaru, 2021; Kumudumali, 2020; McKibbin and Fernando, 2020; Taleb, 2008). In January 2022, a little over two years after the presumed start of the COVID-19 global epidemics, there were more than 298 million confirmed infections of COVID-19 (www.covid19.who.int). It will prove difficult for specialists in various domains to match the impact of this disruptive event to any other similar event in the recent known history. Even though different parts of the world population often face contagious diseases, no other epidemic imposed similar governmental measures as the COVID-19 pandemics did in most of the world's countries. As the World Health Organization (WHO) defined and imposed strict rules to limit the spread of the virus, such as social distancing and prolonged periods of individual and community isolation, multiple domains have been affected drastically in their activities and processes (Baldwin and Weder di Mauro, 2020; Hasanat et al., 2020; Marcão et al., 2020; Ozili and Arun, 2020; Thumiki and Jurcic, 2021; Wang et al., 2020).

The COVID-19 pandemic appeared in China's health system, and then it spread worldwide at an accelerated speed due to globalization. Immediately, the effects of the health systems crisis were made visible in the economic field as the economic activity decreased following the constraints implemented to reduce the spread of the virus. The need for introducing social distancing generated an economic gap between producers, products, and customers, which developed a new business environment (Alvarez, Argente and Lippi, 2020; Aun, Lee, and Shin, 2020; Baldwin and Weder di Mauro, 2020; Chang and Velasco, 2020). Regarding the work-life changes, multiple authors agree that decision-makers and managers faced the tacit requirement to overcome the knowledge gap and help their companies adapt to the new normality of the dynamics of the post-COVID-19 pandemic by developing new knowledge pillars capabilities and emergent knowledge strategies (Bolisani and Bratianu, 2018; Garcia-Perez et al., 2020). In the new reality, both employers and employees faced the unknown, forcing them to put their old ways to the test and undergo specific transformations. Slowly, as isolation at home

became the norm, for the professions allowing it, remote working far from a manager daily, direct supervision became the go-to solution (Ale-Chilet, Atal, and Dominguez, 2020; Alvarez, Argente, and Lippi, 2020).

The remote working for knowledge managers revealed the possibility of getting more liberty in structuring their working programs and in developing their creativity for solving complex problems. Moreover, the pressure of the managerial control decreased, and the feeling of more liberty in the daily program and solution searching increased self-confidence and the level of risk acceptance. Teleworking allows for a new work-life balance (Belzunegui-Eraso and Erro-Garces, 2020), and for a new knowledge entropy of the organizations (Bratianu, 2019). A dramatic consequence of the COVID-19 pandemic is the increasing unemployment rate in the U.S. and European economies, especially among the young generation (Andriyv et al., 2021; Ice et al., 2021; Lambovska et al., 2021; Su et al., 2021). To reduce the pressure of uncertainty generated by the labor force dynamics during economic crises and enjoy the new work-life balance, many knowledge workers decided to work as independent professionals in the remote work system based on their digital competencies. Another phenomenon that attracted the attention of researchers is the "anti-work movement". That phenomenon "reflects millions of workers who have given up their jobs and want to see a new meaning in work and organizations supporting this personal aspiration" (Rocha et al., 2022, p. 2).

This transformation process of knowledge workers from employees of different companies into independent professionals, based on their digital competencies and their desire to eliminate the managerial control pressure practiced in many companies, generated a new typology of knowledge workers called *knowmads* by Moravec (2008). A *knowmad* is defined as "a nomadic knowledge worker – that is, a creative, imaginative, and innovative person who can work with almost anybody, anytime, and anywhere" (Moravec, 2013b, p. 9). Considering an analogy frequently used in science fiction, we may call these knowmads as possible mutants of knowledge workers in a new business environment defined by volatility, complexity, uncertainty, and ambiguity (VUCA) (Mack et al., 2016). However, this mutation process is in its developing stage, and the research focusing on it is scarce. Therefore, understanding it could be a challenge for us, and thus, we formulated the following research question:
RQ: What main forces, intensified in the COVID-19 pandemic, determined many knowledge workers to become knowmads?

Trying to find some answers to this research question, we explore the literature dedicated to knowledge workers and to knowmads reflecting on those forces which stimulate the transformation of some knowledge workers into knowmads. Also, we analyzed many published works contributing to the COVID-19 pandemic literature to understand how those forces were amplified as a result of government interventions in most countries to flatten the epidemiological curve. In parallel with the literature review, we performed a bibliometric analysis using VOSviewer, a professional software application, for finding the semantic clusters which contain the main concepts for this topic and the links density between them (Donthu et al., 2021; Van Eck and Waltman, 2010, 2011, 2020, 2021; Zupic and Carter, 2015).

The structure of the present paper is as following: after this short introduction, the key concepts and ideas for this research are presented as a result of the systematic literature review. We explain the methodology used and then we present the results and discussion. Finally, there are conclusions and limitations of the present study.

2. Literature review

The knowmad worker concept is a relatively new one, and it makes the subject of interest of many researchers and practitioners of the knowledge management field. The concept and its semantic field were introduced by John W. Moravec (2008) and further developed into dedicated field of the knowledge management literature (Bratianu, Iliescu and Paiuc, 2021; Cobo and Moravec, 2011; Iliescu, 2021a, 2021b, 2021c; Kubik, 2013; Moravec, 2008, 2013a, 2013b; Moravec and van den Hoff, 2015; Orel, 2019, 2020). The complexity of the post-COVID business environment shows that knowmads may constitute some mutants of the knowledge workers capable of better adaptation to the new normal. The concept of "new normal" has been used previously for describing the climate changes, but in the post-COVID context, it is used to show that the complex crises generated by this pandemic are irreversible processes with many residual changes. Understanding these changes will help managers develop emergent strategies that can revitalize their businesses. According to Harilal (2020), the COVID-19 pandemic "has caused major ruptures in the world system, which has serious implications for global

capital accumulation. It, therefore, presents an opportunity to reimagine the global division of labor and the international economic architecture" (p. 14). Knowmads represent one of the new trends in this global division of labor that influence both the managerial practices within the knowledge-intensive businesses and the new sharing economy platforms for knowmads with short-term contracts and the needed competencies for performing specified jobs.

Moravec (2008, 2013a, 2013b) indicates that a knowmad is a knowledge worker who can collaborate with any person, at any hour and from any location. Knowmads are descendants of knowledge workers who seek a new degree of autonomy by leaving behind the traditional gravitational pull of corporate life and carving out their tailored route in the economic world. Compared to knowledge workers, the knowmads are escaping the grip of the organizational limitations. They are becoming autonomous and setting up an entrepreneurial climate inside or outside organizations, in physical, virtual, or hybrid environments. These are the main traits which define the mutation process from knowledge workers to knowmads because the transformation of their mindset is irreversible.

On the other hand, Peter Drucker's knowledge workers (1969, 1993, 2001, 2008) are portrayed in the literature in opposition to industrial workers. They are individuals with extensive training or experience in their field of activity, capable of creating, sharing, and using knowledge (Davenport, 2005; Liu, 2020; Massingham, 2020; Nonaka and Takeuchi, 1995). Given the large-scale reality of that period, the different economic environment, and softer market competitiveness, knowledge workers did not hold the knowmads skills, essential today. In other words, the knowmads are a new generation of employees that have developed from the ranks of knowledge workers as vanguards prepared to prosper in a sophisticated and internationally encompassing knowledge economy (Iliescu, 2021a, 2021b). They fit very well with the requirements of knowledge-intensive business services (KIBS) (Zieba, 2021).

In this post-COVID brave new world, the knowmad worker aims to re-interpret his/her reality and re-contextualize his/her work (Moravec, 2013b). From the physical coordinates, such as the geography or work schedule, and up to their cognitive capabilities, the knwomads will design innovative and inventive solutions to a wide range of complicated challenges specific to the VUCA business environment, characterized by volatility, uncertainty, complexity, and ambiguity (Mack et al., 2016). VUCA is the context where autonomous, creative, and courageous knowmads thrive, as they are showing increased resilience, better adaptation strategies than their predecessors and more competitiveness on a global hyper competitive market (Cobo and Moravec, 2011; Hokanson and Karlson, 2013; Moravec, 2008, 2013a, 2013b; Moravec and van den Hoff, 2015). We can understand how, "knowmads represent both a consequence of the continuously changing technological and social environment and a solution to the volatile business context that these forces create because they are holding the key skills and competencies required by the job market" (Iliescu, 2021a, p. 106).

The post-modern work bricolage that knowmads are self-designing could be explained with the help of the job crafting concept, which is a relatively recent one as well (Bakker and Demerouti, 2007; Demerouti et al. 2001; Grant et al., 2010; Lyons, 2008; Tims and Bakker, 2010; Tims, Bakker and Derks, 2012; Wrzesniewski and Dutton, 2001). According to Wrzesniewski and Dutton's definition (2001), job crafting represents the customization of work implemented by individuals - they can design and arrange their work responsibilities, relationships, and knowledge in a personally meaningful fashion through job crafting processes. Job crafting is based on a personal vision of the evolution of the job market and a better understanding of the customers' behavior in the post-COVID new brave world facilitated by customer knowledge management. Enabled by the increased power and control over their work, the main advantage that job crafting brings to individuals is adding more value and meaning to their tasks and activities. Upcoming authors studying the concept are also considering the scenarios where, for example, job crafting can represent the process of skills acquisition and professional development that are not imposed or supported by the employer (Lyons, 2008). The concept can be best understood with the help of the job demands-resources (JD-R) model (Bakker and Demerouti, 2007; Demerouti et al., 2001). Based on it, Tims and Bakker (2010) define job crafting as utilizing all the permutations that the worker is applying to his/her work activity with the final aim to balance work requirements and resources – on the one hand – and individual competencies and values – on the other hand. Driven by their values of professional excellence but also personal fulfillment, knowmads become geographical and occupational nomads of knowledge (Cook, 2020; Horwizt et al.,2003; Kakihara and Sørensen, 2001; Lee-Kelley et al., 2007; Nelson and McCann, 2010). Therefore, according to Bratianu, Iliescu, and Paiuc, "this new vision of the professional life requires new competencies like

self-management and cultural intelligence, mainly when the work implies collaboration with people from different cultures" (2021, p.90).

As we advance in the late and post-pandemic environment, increasingly more work market trends indicate a progressive shift in the workers' preferences towards knowmad-specific work behaviors (Andriyiv et al., 2021; Rocha et al., 2022). The most significant clues lay in the findings of large-scale corporate studies implemented over the past two years or more. The first hints of democratized wishes for more independence, a healthier work-life balance, the desire for a decentralized workplace, as well as a major preference for a flexible office amongst employees can be seen here. Employers seem to be also - to a certain extent – open to developing and integrating new tactics for adjusting their workplaces to contemporary and more agile ways of working (Deloitte, 2021; EY, 2021; McKinsey, 2021).

Further to the "Work Reimagined Employer Survey", Ernst & Young (EY, 2021) analyzed responses of more than 16,000 respondents across 16 countries, representing different industries. Findings indicate that employees' preferences regarding the future of work are changing, and employers' reactions should not delay meeting them. Therefore, while up to 90 percent of employees responded that they are looking for flexibility regarding the place and schedule of work in the post-pandemics' aftermath, less than half of the employers (40%) announced their plans to the employees, and up to 35 percent of employers are keen on having their teams back into the offices after the pandemics. Most of the employees from the last group have their jobs in fields where physical presence is necessary. Fine-tuning between the two groups' views is recommended, as 54 percent of respondents indicated they are ready to quit their current jobs if not provided with the desired flexibility (EY, 2021). The study identifies three typologies of respondents based on their feedback to critical questions: hybrid hopeful, office optimal, and remote ready. While the office represents the traditional work location, the remote ready category is explained by the buzzword of the present: "remote work". According to Google trends, at the date of present research (December 2021), while the interest for remote work existed, a substantial increase is visible as of March 2021.

In February 2021, McKinsey Global Institute published their research named "The future of work after COVID-19", developed over the course of multiple years of analyzing the future of work. The general conclusion of the study indicates that it is likely that not less than 25% more people than before will change their existing activity field in the context of a post-pandemic world, where remote work, automation of tasks, and electronic commerce are increasing their presence at accelerated rates (McKinsey, 2021). Extrapolated from the eight focus countries of the research (United States, Germany, United Kingdom, China, France, Japan, Spain, and India), up to 100 million workers are estimated to change their field of activity by 2030 (McKinsey, 2021). That is a significant trend for the mutation process for the knowledge workers to become knowmads, a trend with many implications for corporate management and possible new forms of virtual management for knowledge ecosystems (Bedford and Sanchez, 2021).

In their own study, "From survive to thrive: The future of work in a post-pandemic world" (2021), Deloitte focuses on companies and their survival, recovery, and thriving strategies in the COVID-19 and post-pandemic environment. Amongst others, one of the important aspects to be considered in the thriving step is the redesign of the workplace to integrate more flexibility. Deloitte's study introduces the idea of phy-gital workplace, "integrating the best of physical space with digital practice while embracing constant change" (Deloitte, 2021).

On top of the trends mentioned above regarding employees' preferences for the post-covid world, an additional knwomad's specific trait can be noticed at a larger scale. The particular ease and speed at which knowmads are changing their workplace, raising challenges for employers for a while now (Horwizt et al.,2003; Lee-Kelley et al., 2007; Nelson and McCann, 2010) can be currently seen at a large scale in the "Big Quit" or the "Great Resignation" phenomena. These expressions incorporate the meaning of a large-scale phenomenon. Identified by researchers as of mid-2021, the "Big Quit" is animated by workers from various sectors, roles, and expertise in the United States and Western Europe quitting their corporate jobs and looking for a more autonomous business environment. According to Peter B. Hirsch (2021), unhappiness related to employment circumstances has triggered a "Great Resignation" across a number of different industries. This phenomenon is convergent with the "Anti-Work Movement" (Rocha et al., 2022). Powered by the sense of freedom gained while designing their work away from crowded offices, employees developed a higher sense of autonomy, better understanding of their desires, and, most importantly, courage to seek meaningful career pathways or only quit the irrelevant ones for a while. Their thinking is dominantly nonlinear (Bratianu and Vasilache, 2009) and

probabilistic (Taleb, 2008) to better understand the complexity of the business environment. There is a significant change in their mindset and their behavior. It is a result of the mutational effect we discussed above.

Based on the above analysis, we may systematize the mutation process of knowledge workers into knowmads by identifying the main characteristics of the knowledge workers' organizational environment, the forces producing the mutation process, and the knowmads work environment as presented in Table 1.

Table 1: The mutation process systematization

Knowledge workers	Mutation forces	Knowmads
Certainty	Employment dynamics	Uncertainty
Long-term contracts		Short-term contracts
Corporate management	Managerial control	Self-management
Organizational performance		Individual performance
Rigid working program	Time management	Flexible working program
Imposed work-life balance		Chosen work-life balance
Job description	Job design	Job crafting
Constrained work framework		Work autonomy

(Source: Authors' research)

3.   Methodology

Present bibliometric analysis has been implemented based on the research strategy presented in Table 2. The authors designed a bibliometric study using VOSviewer software version 1.6.17 software. They discovered research trends and patterns in peer-reviewed publications on the knowledge worker and knowmad topics, available in Scopus database. Following the logic of the research question, a mix of three text mining analyses have been run. The reasons for this approach include the up-to-date process supported by cutting edge technology, the academic field recognition of the method, and the option that bibliometric analysis software enables to sketching a unified and comprehensive visual overview of the researchers' contribution to a specific topic (Donthu et al., 2021; Janik et al., 2020; Janik et al. 2021).

Table 2: Research design

Step	Activity
Step 1: Defining the methodology of the research	1.1. Defining relevant search phrases for the study. 1.2. Defining relevant database considering available publications. 1.3. Defining relevant search parameters and analysis periods 1.4. Defining relevant export features from the selected database.
Step 2: Data definition (preparatory step for the analysis)	2.1. Gathering outputs obtained further to Step 1 parametrizations. 2.2. High-level data assessment. 2.3. Second run and in-depth data screening. 2.4. Establishing study's database list and export in a suitable format for computer-aid analysis.
Step 3: Uploading refined data into the bibliometric analysis software	3.1. Bibliometric analysis of refined data via VOSviewer version 1.6.17 software. 3.2. Building the visual mapping of analyzed data.
Step 4: Findings - presentation discussions	Examining and discussing the research findings.

(Source: Authors' research)

3.1   Step 1 - Defining the methodology of the research

The data for the study has been downloaded from peer-reviewed journals available in the Scopus database. Scopus is one of the most recommended sources for bibliometric analysis (Janik et al., 2021). The search terms have been decided: "knowmad*" and "knowledge worker*" and "knowledge worker* & covid*", and "knowledge workers and knowmads". These search terms have been defined such that the bibliometric analysis will reveal those papers having in their titles and keywords these constructs, among others which contributed to the cluster formation. This analysis aims to map all clusters that integrate semantic fields related to the search terms. The analysis of these clusters helps us understand how researchers studied the mutation phenomenon of knowledge workers into knowmads and the knowledge gaps associated with it. Also, in the next steps, we

read each paper containing the search terms to understand the main ideas and to integrate them in the whole analysis.

All publications containing singular or plural forms of "knowledge worker*" structures were retrieved. This feature has proven helpful for novel concepts like the knowmad concept and more popular ones, like knowledge worker or COVID-19. It ensured us that all variations on the root of these ideas are captured from early stages. All types of publications available on the platform up to date of research (2 December 2021) have been considered eligible, with no restriction on the subject areas. Main reason behind this choice is explained by the fact that knowledge worker, knowmad, and COVID-19 concepts are transdisciplinary, relevant for all research areas.

Temporal minimum and maxim dates of publication have been established for each of the concepts to accurately identify the forces behind the knowledge workers' mutation into knowmads in the COVID-19 context, as follows:
- "Knowmad*": 2013 (date of first publication available on Scopus) – 2 of December 2021 (current research date).
- "Knowledge worker*": 2020 – 2 of December 2021 (current research date).
- "Knowledge worker* & covid*": 2020 (date of first publication available on Scopus) – 2 of December 2021 (current research date).
- "Knowledge worker* & knowmad*": 2013 – 2 December 2021 (like for "Knowmad*").

We see how we defined relevant timeframes for our search terms in this first research step. First, the timescale of publications on the knowmad concept has been focused on the 2013 (year of the first publication available on the database) – 2021 interval. This is helpful because it lets us capture all relevant nuances of the knowmad concept, as known in the publications accessible via the Scopus database.

Second, as regards the knowledge workers concept, following the logic of the research question, we manually restricted the timeframe of research to the period when the effect of the COVID-19 pandemic could have become visible in research papers and peer-reviewed publications. The main objective is to identify possible mutations that knowledge workers have suffered during the COVID-19 pandemics.

Another important argument supporting the limitation of the publications' timeframe of the knowledge worker concept in the database search is represented by the enormous number of publications on this topic. When we considered all-time publications on this topic, we found more than 6,000 documents with thousands of keywords. Moreover, considering the yearly distribution of the publications, we quickly understood the noise risk for our analysis, considering that the relevant publications for the COVID-19 context (596 publications for 2022, 2021, and 2020) represent only 10 percent of the total amount of publications (6,253 publications for the rest of the years) as captured in Table 3.

Table 3: "Knowledge worker*" publications available on Scopus database, all years.

Year	Publications
2022	2
2021	319
2020	275
2019 - 1973	6,253

(Source: Authors' research. Scopus database at 02 December 2021)

Third, to identify the most relevant nuances of the knowledge worker literature in the COVID-19 context, we defined a third search term, "knowledge worker* & covid*" to compare and refine our findings. The purpose of this third search and analysis is to help us focus on even more specific nuances that might be missed in the larger threshold of documents and terms identified in the second research (a total of 596 publications for "knowledge worker*" term search). The search for the "Knowledge worker* & Knowmad*" had the purpose of identifying the interest of researchers for this link and transformation. The search revealed only 5 papers where these concepts appeared together, a situation that demonstrates a lack of interest in this connection between the two concepts.

3.2   Step 2 - Data definition (preparatory step for the analysis)

The previous step revealed 15 publications for "knowmad*" search item, 596 for "knowledge worker*" and 32 for "Knowledge worker* & covid*". These values were considered for the first publications data cleaning, where we aim at focusing on complete publications, having their title, keywords, and abstracts available in English. Enabled by this objective, we removed one, four, and two publications from each group that did not meet our criteria. Next, those publications identified as thematically inconsistent were removed after a more in-depth review, eliminating four more publications from our "knowledge worker*" analysis threshold.

3.3   Step 3: Uploading refined data into the bibliometric analysis software

VOSviewer software version 1.6.17 enables researchers to implement a variety of analysis routes, such as term co-occurrence analysis focused on terms. The full counting option has enhanced this. In this context, a final data cleaning step is required, this time aimed at terms (Van Eck and Waltman, 2020).

Therefore, the authors excluded all terms related to research methodologies, authors, and very general terms from the relevant threshold of terms for analysis. This step allowed us to reduce the noise of the bibliometric study and provided us with direct access to research trends and correlations of novel yet complex concepts. Furthermore, to ensure a clean aspect of the findings, similar relevant terms have been harmonized into the larger concept that they belong to.

As mentioned in previous such studies (Iliescu, 2021c), one can erroneously let the quantitative ratio of terms guide the research. However, many of the most common terms can prove not relevant for the specific nuances of the research topic. Therefore, terms data cleaning is paramount in such endeavors.

4.   Results and discussions

The VOSviewer program yields clusters which contain related constructs and show how those clusters integrate into the whole semantic map. Thus, we present in some tables the program's results structured on keywords, clusters, occurrences, links, and links' strengths. The only intervention we may have is to suggest a name for each cluster. We selected the first keyword as a label for the whole cluster. We can only interpret these data without having the liberty of restructuring them.

We have chosen to consider all terms for the knowmad concept analysis and not only those with a minimum number of occurrences (i.e., 5) due to the novelty of the concept. As presented in Table 4 below, most of the relevant terms have less than five occurrences, yet they represent essential components of our analysis. As such, for the knowmad concept, out of the total 80 initial terms, after data cleaning of terms, we obtained 28 unique and relevant words, grouped in 6 clusters, having 94 links and a total link strength of 108 for our terms co-occurrence analysis.

Table 4: Knowmad concept clusters by VOSviewer 1.6.17, after terms data cleaning.

Keyword	Cluster	Occurrences	Link	Link strength
Innovation; globalization; character strengths; cognitive values; creativity; grit; persistence	1 - Innovation (red)	3; 2; 1; 1; 1; 1	13; 12; 6; 6; 6; 6	13; 12; 6; 6; 6; 6
Education; learning; knowledge; competencies; information communication technology; leadership; sustainable development	2 - Education (green)	4; 3; 3; 1; 1; 1; 1	15; 10; 9; 4; 4; 2; 2	19; 13; 10; 4; 4; 2; 2
Digital nomadism; labor culture; collaboration; wellbeing economics; work-leisure relations	3 - Digital nomadism (dark blue)	3; 2; 2; 1; 1	10; 7; 7; 2; 3	11; 8; 7; 2; 3
Social changes; computer applications; social skills; holistic education	4 - Social changes (yellow)	4; 3; 2; 1	10; 6; 2; 5	15; 9; 4; 5
Knowmad; multicultural literacy; motivation	5 - Knowmad (purple)	6; 2; 1	15; 7; 2	21; 8; 2
Change management; value creation	6 - Change management (light blue)	2; 1	7; 4	8; 4

(Source: Authors' research)

While the bibliometric analysis software has determined the cluster and the terms distribution, the cluster labels have been chosen by the authors following the term that had the most occurrences for each cluster: Innovation (cluster 1), Education (cluster 2), Digital nomadism (cluster 3), Social changes (cluster 4), Knowmad (cluster 5) and Change management (cluster 6). Occurrences show how many times a concept appear in the searched publications. The higher the value, the more attention that concept received from researchers in connection with the searched item "Knowmad"Links show how many connections an item (i.e. a concept) has with other items. For instance, "Knowmad" has 15 connections with all the other mapped concepts, while "Multicultural literacy" has only 7, and "Motivation" has 2. Link strength is a number computed by the software based on the number of occurrences and the distance between two items on the map. The higher the link strength, the higher the interest for researchers to study those items connected by the respective link. The links strength values reveal the total occurrences of an item across all publications analyzed (Van Eck & Waltman, 2020) and the weight its links have in the relationships established with other items (Van Eck & Waltman, 2021). In other words, when enabling a co-occurrence term analysis as we did, the link strength values indicate the full count of documents where the reference term appears simultaneously with other terms from the analysis database. Moreover, the link strength value has a direct representation in the maps indicated by the size of each concept's sphere and the distance between different concepts – this shows the nature of their direct correlation (Van Eck & Waltman, 2010). Therefore, the link strength can indicate the concepts' affinity to one another, as a more significant value suggests a higher connection with other concepts in the cluster. As such, link strength values are helping us understand the conceptualization of the "knowmads" item in the studied publications. Looking for the values in the column of Link strength, we realize that "knowmad" has a quite high value by comparison with the other items, which demonstrates an increasing interest of researchers in studying its semantic connections with other concepts.

Comparing the information from Table 1 and Table 4 shows that the mutational forces yield new features for knowmads. Employment dynamics (Table 1) is associated with globalization, digital nomadism, labor culture, collaboration, and social change (Table 4). Managerial control (Table 1) is associated with leadership, wellbeing economics, change management, and value creation (Table 4). Time management (Table 1) is associated with character strength, grit, persistence, work-leisure relation, and multicultural literacy (Table 4). Job design (Table 1) is associated with creativity, cognitive values, knowledge, competencies, and computer applications (Table 4). Also, forces mentioned in Table 1 can be associated with motivation, education, and holistic education (Table 4). All of these connections contribute to a better understanding of the changing process from knowledge workers to knowmads, although they focus on the final results and not on the whole mutation process, that remains a challenge of our interpretation.

Van Eck and Waltman (2020, 2021) explained that the visual distribution is directly related to the link and link strength values. As such, the higher the number of correlations between terms, the higher the value of their links and the closer to terms are on the visual map. Therefore, while the "knowmad" concept is placed at the relative center of the map, it is equally close to the transformational forces that we identified above. An important note would be that in the knowmad literature, education often relates to a holistic, informal, and continuous education, even accessible free of cost. In other words, knowmads' education, until designed specifically for the future requirements of the job market, is often a synonym of knowledge sharing networks that individuals create in virtual or hybrid environments in order to foster their skills and competencies.

Another interesting term highlighted by our analysis is the "labor culture" that has the second most powerful values in its cluster (cluster 2 – Education) and indicates that the philosophy of work itself, that knowmads tend to redefine in their self-creation and self-management processes.
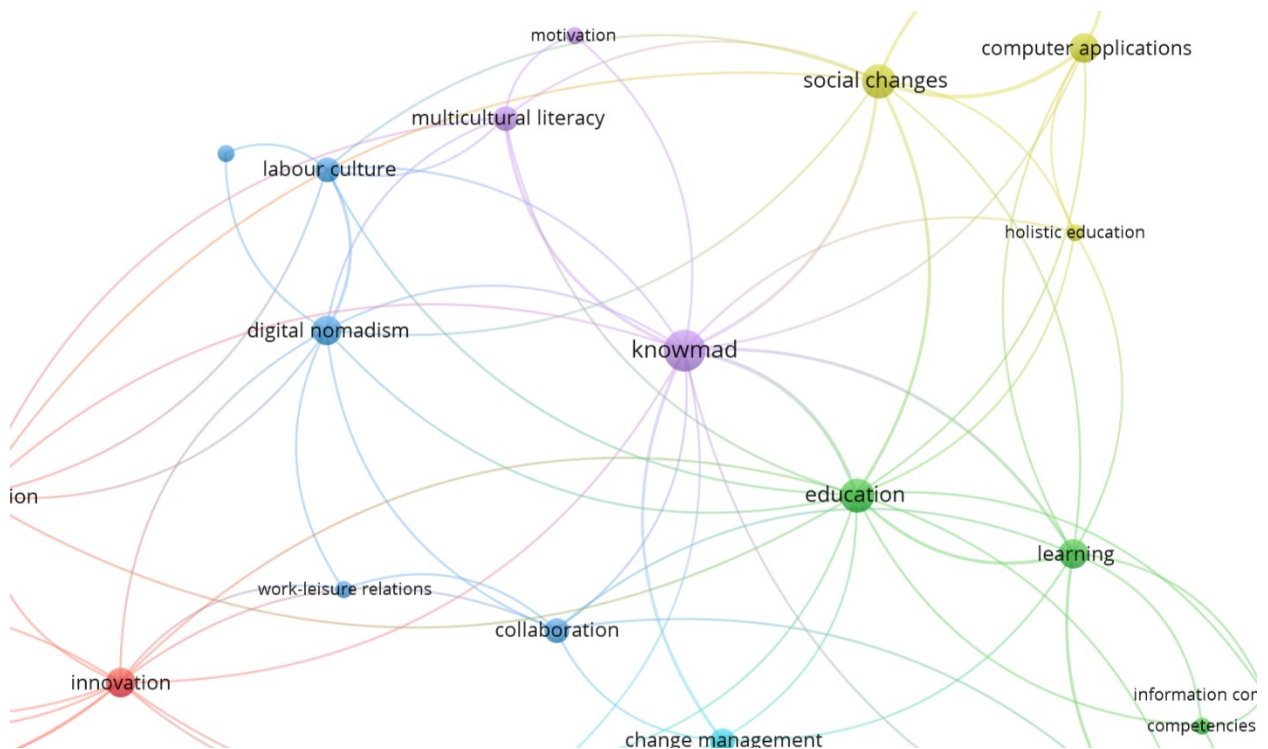
Figure 1: Network visualization by VOSviewer software version 1.6.17 for knowmads concept.

(Source: Authors' research)

Regarding the "knowledge worker*" search term, the initial 3,822 terms identified have been restricted to the 126 terms with a minimum of five times occurrences. Therefore 126 terms resulted, and they have been subject to terms data cleaning unifying similar terms, and removing irrelevant terms for conceptual analysis. After data cleaning of terms, we obtained 32 unique and relevant terms, grouped in 6 clusters, having 261 links and a total link strength of 846 for our terms co-occurrence analysis, presented in Table 6 below.

We notice how immediately after "knowledge worker", "knowledge management" and "knowledge work", the highest values in the occurrences, link, and link strength fields are registered by knowmad-specific ideas, such as "working from home" or "telecommuting", "work-life balance" or "wellbeing". The context for this shift of interest is, of course, the "COVID-19" context, powered by the rise of "digital technologies", "information communication technology" and "artificial intelligence". "Competition" is another incentive that is recently bringing much attention towards "productivity", "performance," and "personal knowledge management" of knowledge workers, just as it usually does for knowmads.

The bibliometric analysis results reveal how the knowledge workers are forced to transform and adapt in the COVID-19 context to stay relevant in a new, competitive job market shaped by technological advances and disruptive changes. Knowledge workers face a "work-life balance" dilemma, further to the imposed, long-term telecommuting experience. As such, they are presented in the literature as promoters of flexible working setups, similar to knowmads, as indicated by findings grouped in cluster 1 - Working from home. In cluster 5 we see another interesting phenomenon: the opposition between "knowledge hiding" and "knowledge sharing". Traditionally, as Davenport (2005) showed, knowledge workers generations were more likely to hide their knowledge. However, in the research papers published as of 2020 and indexed in the Scopus database, we see how the "knowledge sharing" concept's popularity is much higher than the one of "knowledge hiding". This represents another mutation of knowledge workers into knowmads, in the context of increased information sharing via "digital technologies" and "information communication technology".

Table 5: Knowledge worker concept clusters by VOSviewer 1.6.17, 2020-2022, restricted to minimum 5 occurrences after terms data cleaning.

Keyword	Cluster	Occurrences	Link	Link strength
Working from home; work-life balance; well-being; working conditions; COVID-19; digital technologies; motivation; education; collaboration	1 - Working from home	33; 29; 16; 12; 12; 13; 8; 16; 6	24; 22; 17; 18; 18; 14; 15; 9; 8	79; 64; 50; 42; 35; 22; 22; 12; 11
Knowledge worker; knowledge management; human resource management: knowledge-based system; performance; personal knowledge management; knowledge transfer; creativity	2 - Knowledge worker	189; 112; 37; 23; 18; 7; 8; 5	30; 30; 19; 23; 12; 8; 8; 4	283; 227; 83; 64; 31; 17; 14; 9
Knowledge work; information communication technology; artificial intelligence; decision making; business process management	3 - Knowledge work	82; 26; 28; 16; 11; 9	26; 19; 17; 15; 11; 9	104; 55; 54; 39; 24; 17
Knowledge; telecommuting; competition; knowledge economy; sustainable development; learning	4 - Knowledge	53; 18; 8; 14; 10; 6	24; 21; 28; 17; 13; 17	84; 54; 28; 24; 23; 17
Knowledge sharing; knowledge hiding	5 - Knowledge sharing	26; 5	19; 6	49; 8
Productivity	6 - Productivity	28	17	47

(Source: Authors' research)

Figure 2 below presents the "knowledge worker*" clusters and terms color-grouped by year of publication. This approach enables us to identify the most novel concepts in a literature block associated with a topic of interest.
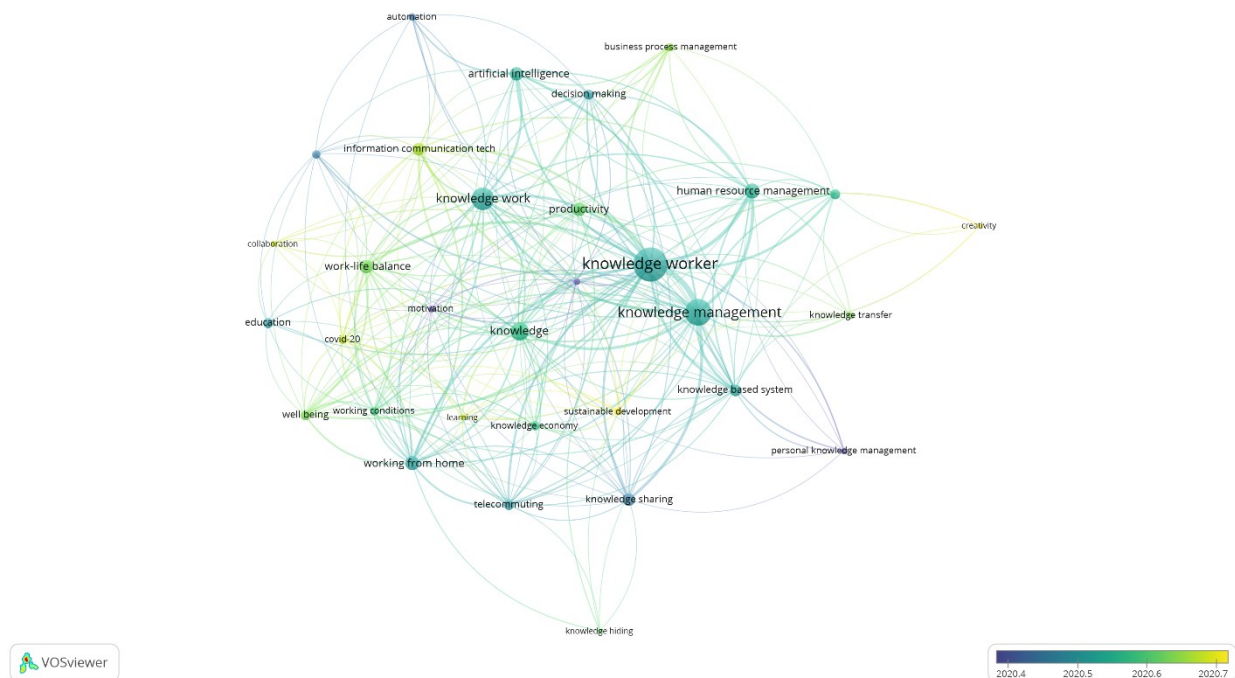

Figure 2: Overlay visualization by VOSviewer software version 1.6.17 for knowledge workers' concept

(Source: Authors' research)

In our case, terms like "collaboration", "wellbeing", "learning", "sustainable development", "creativity" and "business process management" are the concepts approached by researchers in the second half of 2020 – beginning of 2021. The timeline distribution gives us an understanding of the academic interest evolution and trends.

Since we guided our previous analysis through high amounts of publications and terms associated with the "knowledge worker*" search phrase, we decided to limit our analysis threshold even more by creating a new search term: "knowledge worker* & covid*". Out of the total 241 terms, we obtained 55 unique and relevant words after data cleaning of terms, grouped in 7 clusters, having 301 links and a total link strength of 374 for our terms co-occurrence analysis, presented in Table 6 below.

Table 6: Knowledge worker & COVID-19 concepts intersection clusters by VOSviewer 1.6.17, after terms data cleaning.

Keyword	Cluster	Occurrences	Link	Link strength
Knowledge work; social aspects; organizational ethics; information systems; digital nomadism; hypermobility; computer applications; human resource management; moral attitudes; future workplace; virtual work	1 - Knowledge work	14; 4; 3; 3; 3; 1; 1; 1; 1; 1; 1	36; 18; 17; 14; 13; 7; 6; 6; 6; 2; 1	67; 23; 21; 19; 14; 7; 6; 6; 6; 2; 1
Knowledge management; behavioral patterns; collaboration; e-democracy; face-to-virtual interaction; hybrid systems; motivation; power structures; system value; virtual reality	2 - Knowledge management	5; 1; 1; 1; 1; 1; 1; 1; 1; 1;	30; 10; 10; 10; 10; 10; 10; 10; 10; 10;	39; 10; 10; 10; 10; 10; 10; 10; 10; 10;
Covid-19; digital work; communication tools; virtual collaboration; agile; face-to-face interaction; affordance; smart working	3 – Covid-19	14; 4; 3; 2; 1; 1; 1; 1	43; 12; 11; 11; 7; 7; 6; 4	69; 17; 15; 13; 7; 7; 6; 4
Well-being; knowledge; telecommuting	4 - Well-being	4; 2; 31; 1; 1; 1; 1; 1	16; 17; 10; 10; 10; 10; 10; 10	23; 19; 13; 10; 10; 10; 10; 10
Experience; workplace transformation	5 - Experience	2; 31; 1; 1; 1;	16; 14; 8; 8; 8; 8; 8;	18; 16; 8; 8; 8; 8; 8;
Remote work; work-life balance; flexible work; resilience; hybrid workplace	6 - Remote work	13; 3; 3; 2; 1	36; 16; 5; 3; 3	64; 19; 6; 3; 3
Future of work; individual factors; creativity; knowledge-sharing; perceived stress	7 - Future of work	2; 2; 2; 1; 1	14; 11; 10; 9; 4	16; 13; 11; 9; 4

(Source: Authors' research)

By implementing this additional run, we see how entire clusters indicate the knowledge worker's mutation to knowmads. For instance, in cluster 1 there are the following significant keywords: digital nomadism, hypermobility, moral attitude, and virtual work. Digital nomadism refers to the transformational phenomenon of knowledge workers as employees to knowledge workers as self-employed who can change the workplace, geography, and countries by becoming nomads. This mutation process contributes to developing knowmads hypermobility in time and space. Changing the status from a company's employee to self-employment means a different moral attitude and a total virtual work. In cluster 2, the mutation process's significant keywords are behavioral patterns, motivation, and system value. Knowmads have a different behavioral pattern than the knowledge workers who are long-term employees. Knowmads are self-employed and work based on short-term contracts with different companies in a global market. From this point of view, their motivation is much stronger than those who work as employees because of the higher risks of getting contracts. Their value system is different than of those who work as employees because they need full working autonomy, time flexibility, trust, and attractive problems to solve. Cluster 3 contains as significant keywords communication tools, virtual collaboration and smart working. All of these constructs show new competencies knowmads should have in order to remain competitive and successful. Cluster 4 refers to a new conceptualization of wellbeing and the availability for telecommuting. Cluster 5 reveals a workplace transformation both as content and geography, in a global market. Cluster 6 re-iterates the need for flexible and remote work, and a new work-life balance in concordance with the new value systems of each knowmad. Finally, cluster 7 suggests the importance of individual factors in this mutation process and a high level of creativity to construct solutions for any new and complex problem. Knowmads should be better prepared for knowledge sharing and perceived stress as a result of increased uncertainty and hypermobility.

5. Conclusions, implications and the limits of the study

5.1 Conclusions

This paper aims to find the main forces, intensified in the COVID-19 context, which stimulate the adaptation of specific knowledge workers characteristics into mutated traits – the traits of knowmads. Also, the paper is searching how literature reveals the process of transformation of many knowledge workers into knowmads. By implementing a systematic literature review and using VOSviewer software for data processing, we identified the main forces that enabled knowledge workers to go through a mutation process towards knowmads, during the COVID-19 pandemics. These forces are the following: employment dynamics, managerial control, time management, and job design. Employment dynamics is a phenomenon that has been amplified during the COVID-19 pandemic due to many restrictions introduced by governments to control the epidemiologic curves, like social distancing, teleworking, and closing down many businesses. The dramatic increase in the unemployment rates in U.S. and European economies stimulated many knowledge workers to become self-employed, changing the long-term working contracts with short-term ones. The managerial control force, which puts a lot of pressure on employees to contribute to the organizational economic performance, determined many knowledge workers to choose self-management and look for individual performance metrics. Related to this change is the force of time management that offers to knowmads a flexible working program and the liberty to realize a new work-life balance. This change has been accelerated by the teleworking solutions found during the COVID-19 pandemic. Finally, the force of job design made the transformation of a constrained job description and rigid requirements into a job crafting and work autonomy situation. Job crafting constitutes a powerful motivation for many knowledge workers because it allows a sustainable convergence between individual competencies and job requirements.

The bibliometric analysis performed with the Vosviewer software helps us in learning how the literature reveals this process of transformation of many knowledge workers into knowmads. Using metaphorical thinking, we call this process a mutation because it is almost irreversible. Once the knowmads enjoy the freedom of self-management, flexible working programs, new work-life balance, and full work autonomy, it is hard to go back to accepting a corporate status again. Figure 1 shows us all the most important concepts linked to knowmad, and all the main semantic clusters we may have. Table 4 offers details concerning the values attributed to these items' occurrences, links, and links strengths. Looking more closely, one may remark the main concepts searched in relation to the knowmad and published in the journals indexed in Scopus. Thus, researchers can learn about digital nomadism, education, collaboration, work-leisure relations, labor culture, multicultural literacy, social change, learning, and change management. These findings can be connected to specific traits of knowmads like digital competencies, social intelligence, emotional intelligence, cultural intelligence and change management. The search for "knowledge worker & covid-19" shows in Table 6 new features of the forces that accelerated many knowledge workers' transformation into knowmads.

Until now, knowmads represented a niche, trans-generational workers group, bravely surfing the global job market, relying on their capacity to re-construct their knowledge at fast paces, on their self-management skills, creativity, and multicultural literacy. Nevertheless, during COVID-19 pandemics, the democratization of knowmad philosophy towards work started to be visible. Therefore, the initial office knowledge workers, who enjoyed secured working arrangements, began to adapt to the disruptive and insecure reality. As shown by the results of our literature analysis, knowledge workers enabled the perks of digitalization and virtual collaboration tools to gain more independence and flexibility in their careers. Moreover, just like knowmads, they are empowered by the value of their knowledge, creativity, and individual assets and started to embrace the idea of flexibility and independence associated with work.

From the knowledge management perspective the transformation process of knowledge workers into knowmads has some significant implications on the whole dynamics of management and organizational behavior. Knowmads leave the companies to work independently. That means a serious human resources loss for the companies, and a change in the organizational knowledge entropy. From knowmads perspective, there is a significant increase in knowledge sharing and knowledge creation. Also, knowmads should develop new knowledge strategies, with the stress on emergent strategies.

Why it is important to study about knowmads and their relationship with the knowledge workers? Because it is a real phenomenon that has been amplified by the COVID-19 pandemic and it will continue to develop in the

post-pandemic new normal. Knowmads will challenge the corporate management and will request new forms of virtual management which already can be seen in the new sharing economy. Also, knowmads demonstrate that space and time are not anymore barriers in the global business and that instead of having job designs by corporate management, knowledge workers can enjoy job crafting environments and new work-leisure balances. They will induce changes in social life and business education.

The contribution of the present study consists in performing a critical literature search for exploring the forces which contribute to the transformation of many knowledge workers into knowmads. Because this transformation looks to be irreversible, we introduced the analogy with a mutation process that yields some specific attributes for knowmads. Both the critical literature search and the VOSviewer analysis show a clear trend of corporate knowledge workers' transformation into free knowmads capable of working from everywhere, at any time, and with anybody based on new managerial philosophies.

5.2 Implications

For researchers, the main implication is to focus on the transformation process of employed knowledge workers into self-employed knowmads, a process that can be metaphorically considered as a mutation process. It is important to understand the forces that power that process and the traits knowmads should have, for both the business environment and business education. The present analysis showed a significant absence of knowledge concerning knowmads and how they will change the business environment by creating new ecosystems based on the information technology infrastructure and contributing to the digitalization processes. The fact that VOSviewer searched for "knowledge worker* & knowmad*" founding only 5 publications demonstrates the need to focus on this research area. For practitioners, the implications are in understanding the new rules of the game and the mutations in the whole business environment. Also, it is important to develop the competencies for job crafting and the new work-leisure balance.

5.3 Limitations

The potential limitations of the present study reflect that both knowmads and COVID-19 concepts are relatively new notions that have been introduced into the literature. As a result, the knowmads occur in just a limited number of articles indexed in Scopus and a few proceedings and book chapters. While the academic interest in the COVID-19 crisis provides larger volumes of resources, specific effects of this particular phenomenon are still due to be experienced and understood. Finally, as proven by the findings of this research, the knowledge worker concept is currently a fluid one, shaped by disruptive forces like digitalization, automation of tasks, fierce global competitiveness, continuous learning and development, and evolution of organizational power-distance reports. The relatively small number of publications dedicated to knowmads and their mutation traits make it difficult to reach solid conclusions. Also, it is necessary in further research to apply quantitative methods to get a better synergy with the critical literature search.

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