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## HUMAN FACTORS IN THE SERVICE SECTOR: STATE OF RESEARCH

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### ABSTRACT

As business competition becomes tighter and more hostile, the focus on service management becomes a determining success factor. While excellence comprises many organizational factors, the human factor is what makes the difference and service quality translates into people management. This paper presents and analyzes the state of research on service management and human factors, allowing researchers to identify opportunities for future studies. A bibliometric study was carried out with data from the Web of Science database, enabling analyses of the most cited articles, keywords and authors, as well as the most productive institutions and countries. Customer satisfaction and service quality appear as relevant themes of researches on this matter, and the scientific gaps point toward customers' perceptions and frontline employees. The main scientific contribution of this paper is to assist new studies on people management in the service sector by identifying the latest trends, while also expanding the existing theory.

**KEYWORDS:** Service sector, service quality, people management, human factors, state of research.

### 1. INTRODUCTION

The service sector represents the main contributor to the GDP of developed countries (Eichengreen & Gupta, 2013). In developing countries, such as Brazil, Jaakkola et al. (2015) point out that, as the world business competition becomes tighter and the global economy gets more hostile, the concern and hence the focus on the service sector become the determining factors of a promising economy, forcing companies to be prepared to seek quality in their deliveries.

Service quality is closely related to people, also encompassing internal processes, premises and facilitating goods. Excellence comprises many of the organization's factors and inherent variables, but it is the human factor that makes the difference and service quality means quality in people management (Chavan et al., 2014).

As pointed out by Dhar (2015) and Teck-Hong and Yong-Kean (2012), when employees perceive their organization encouraging career planning and the development of their skills, they devote a higher level of commitment to the company. Employees who are committed to an organization and perform volunteer efforts during their activities tend to exceed the expected quality in customer service (Holttinen, 2014).

The creation of a superior and differentiated customer experience is key to maintaining a loyal and satisfied customer base, thus becoming the ultimate organizational goal, be it the service or the manufacturing sector. The customer experience has evolved from an intimate vision, focused on its internal and subjective experiences, to an experience approach as a collective phenomenon and of shared creation during the direct and indirect interactions with service providers (Helkkula et al., 2012).

Employees with direct contact with customer are key in establishing this level of quality and the service provided by them is critical in the development of customer relationships, in the capture of information, and especially in creating customer satisfaction and commitment to the brand (Revilla-Camacho et al., 2015). There is an urgent need in the service literature to integrate the varying conceptualizations of engagement, not only as customer engagement, but also as a supplier, manufacturer, retailer, and provider, to account more fully for its influence of context (Chandler & Lusch, 2015).

In light of the above, this bibliometric study presents and broadly analyzes major publications concerning service management and human factors in the literature, encompassing the period between 1992 and 2021. Whereas traditional reviews are commonly conducted on a narrow topic within certain academic subject, bibliometric analysis is typically performed to gain insights into the intellectual structure of a broad academic discipline (White et al., 2016). By identifying the area's latest trends, researchers will be guided when choosing, amongst the subject's many fields, the area they intend to further investigate. Scientific gap should be interpreted as the absence of more profound and focused studies in a specific theme or area regarding that field, which, after being properly identified within the extant literature, grants other researchers the opportunity to broaden the subject's knowledge (Juliani & de Oliveira, 2016).

The following section gives an overview of the theory this work is based upon. Thereafter, the research method is presented, covering the adopted research parameters as well as the databases and computational tools used in its analysis. Subsequently, the obtained results are analyzed in order to systematize the current scenario and identify trends. Finally, the references are exhibited.

## **2. THEORETICAL OVERVIEW**

In accordance with Ostrom et al. (2010) and Bell (2005), as business pursue long-term relationships with customers to maximize their lifetime value, they need to be particularly concerned with how customers' view of the service offering changes over time. Increased experience and expertise enhance the customers' ability to evaluate service information and draw conclusions about performance relative to competing alternatives.

Companies with perceived high-quality goods and services typically had higher market share, higher return on investment and asset turnover than companies with perceived low quality (Akbaba, 2006). Akroush (2008) states that delivering a high quality of service has become a prerequisite for modern service businesses and an essential requirement for achieving sustainable competitive advantage, while Chen (2008) highlights the importance of customer retention as a major key to the ability of a service provider to generate profits.

Collier and Bienstock (2006) reinforced the relevance of quality in the service context by affirming that delivering quality in services has been shown to be an important strategy for marketers who are trying to differentiate their service offerings by establishing customer value and satisfying customer needs. The contribution that a high service quality can make to business performance is unquestioned, considering that, in mature industries characterized by parity

products, very often it is service quality that distinguishes an organization from its rivals (Bell, 2005).

Parasuraman et al. (2005) establish service quality as a comparison of what customers feel a company should offer (i.e., their expectations) with the company's actual service performance. Dagger et al. (2007) agree on that and add that service quality perceptions are generally defined as a consumer's judgment of, or impression about, an entity's overall excellence or superiority.

The unique features of services, such as inseparability of production and consumption, intangibility, and heterogeneity, make quality measuring a complex issue, therefore, firms must rely on consumers' perceptions of service quality to identify their strengths and weaknesses, and design appropriate strategies (Karatepe et al., 2005).

Choudhury (2008) draws the attention to service encounters and human factors, since, due to cultural and environmental differences, consumers in different countries may have different perceptions of what service quality is, and service marketers need to be sensitive to this variation. Frontline employees are normally the key to clients' perceptions of delivering high quality services. They exert major influence on creating expectations and customer experiences, therefore, they cannot be separated from the focal point of the actual service (Ashill et al., 2006).

The centrality of human aspects within the service context, especially the almost mandatory interaction between human and machines these days, have brought the subject of human factors to the spotlight in recent years (Longo et al., 2020; Neumann et al., 2021; Perrow, 1983). The design of equipment and tools in accordance with the operators' physical and mental characteristics, the pairing of human and machine to optimize human brainpower and creativity will be the core of a Fifth Industrial Revolution (Alvarez-Aros & Bernal-Torres, 2021; Nahavandi, 2019; Neumann et al., 2021).

Ultimately, as in Ostrom et al. (2010), there is a growing need to continue to refine and promote global service research agendas that concomitantly draw on the interdisciplinary and cross-functional perspectives of academics and business executives, thereby, the paramount relevance of the present study.

### **3. RESEARCH METHOD**

The present paper is based on the bibliometric analysis of articles on service management and human factors peer-reviewed and published in major scientific journals, enabling a thorough characterization. Bibliometric analysis is being increasingly applied to scrutinize the relationship among keywords, countries, research institutes and authors (Mathias et al., 2021; Reis et al., 2017; Zhuang et al., 2013).

Queries have been executed on both the Web of Science (WoS) and Scopus databases, granting access to scientific articles published in the following journals, to name a few: Elsevier ([www.sciencedirect.com](http://www.sciencedirect.com)), Emerald ([www.emeraldinsight.com](http://www.emeraldinsight.com)), Springer ([www.springerlink.com](http://www.springerlink.com)), Wiley ([www.wiley.com](http://www.wiley.com)). The article's title, abstract and keywords, had been the first search filters applied, and they encompassed different terms related to "service management", namely "service quality", "service employee", "service providing", and "service sector", in addition to the term "human factor".

The software RStudio (RStudio Team, 2020) supported the present scientific mapping to allow the quantitative visualization of data (Alvarez-Aros & Bernal-Torres, 2021; Aria & Cuccurullo, 2017; Forliano et al., 2021), which will be detailed in the bibliometric analysis section. Among the number of options of analysis packages within RStudio, Bibliometrix (Aria & Cuccurullo, 2017) stands out for its descriptive assessment of bibliographic data, therefore, being selected for this research.

Figure 1 illustrates the number of articles throughout the years, with the first publication being placed in 1992. Besides a focal spike in production in 2016, a sharp and steady growth can be seen since 2018.

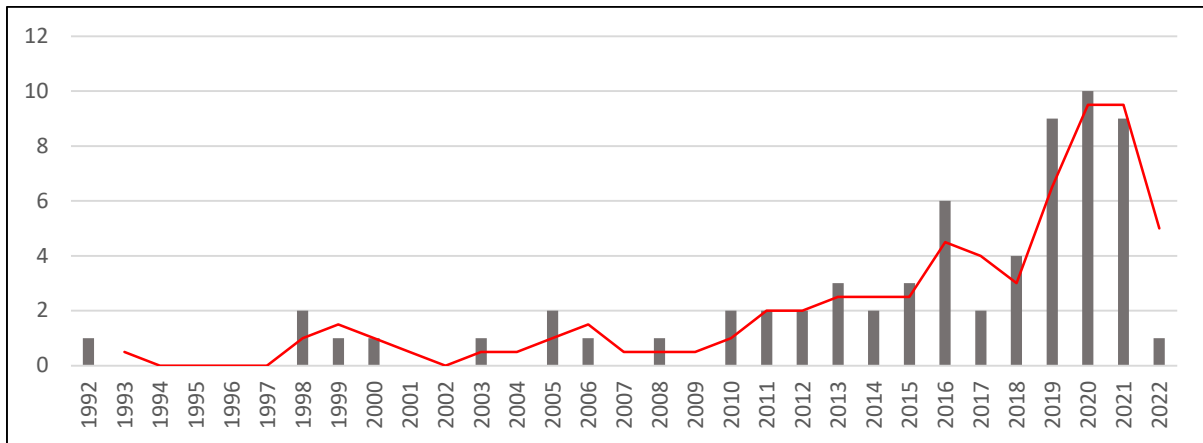


Figure 1 - Number of articles on service management and human factors published from 1992 to 2021 (data extracted from the WoS database)

The inquiry had been confined to “articles”, instead of permitting the analysis of any type of document. They are recognized for their understandably more reliable and accurate nature when identifying scientific gaps.

Table 1 presents the search filters and number of resulting articles in both databases.

Table 1 - Search filters used in the research

Search fields	Databases	
	WoS	Scopus
Article title	“service management”; or “service quality”; or “service employee*”; or “service provid*”; or “service sector”; and “human factor*”;	
Period	All	All
Language	English	English
Document type	Article	Article
Results	76	131

For practical purposes, given the authors’ ease of access to those articles’ relevant information, this study will mainly regard the WoS database for the following bibliometric analysis. Therefore, a careful content analysis of its 76 articles revealed 9 documents outside this research’s scope, then resulting in 67 eligible articles.

#### 4. BIBLIOMETRIC ANALYSIS

As previously stated in White et al. (2016), a bibliometric analysis is typically performed to gain insights into the intellectual structure of a broad academic discipline. In analyzing trends through bibliometric and text mining analyses, some of the potential pitfalls associated with subjective bias inherent to a researcher’s work could be avoided.

Correspondingly, Gomez-Jauregui et al. (2014) declared that a bibliometric analysis might be described as the application of mathematics and statistical methods to books and other communication media that permit the exploration of any research field’s impact and the

influence of a group of researchers or institutes. Bibliographic references of a scientific paper are often considered to be important in the research development to signal their influences, so they can serve as the study’s theoretical and empirical foundations (Hsiao & Yang, 2011a).

The present work derives from a state of research review on “service management” and “human factors”. Consistent analyses of the most cited articles, keywords, authors and their recent published papers on the subject have been performed after the extraction of data from the WoS database.

Firstly, this section will present the most cited keywords, considering the 67 resulting articles, through a world cloud. Next, the most cited articles, authors, journals, institutions and countries are analyzed, followed by reviews of the articles’, the authors’ and the journals’ co-citation networks.

Ercan and Cicekli (2007) considered keywords as brief summaries of a text and, even though they are not exact replacements for summarization, they should be seen as alternative representations that could be consumed by other applications more easily. The review of the most cited keywords, as part of the characterization of the publications, prompted the uncovering of the most addressed matters on the subject. Among the 288 identified keywords, “human factors” appeared as the most commonly found, representing 4.8% (14 articles) of the total, as presented in Figure 2. Next, the second most frequent keyword was “satisfaction”, comprising 1.7 % (5 articles), followed by “service quality”, 1.3% (4 articles). The fourth place is occupied by “patient safety”, with three articles.

“Customer satisfaction” appears on equal terms to “air traffic control”, “climate change”, “cybersecurity”, “healthcare”, “loyalty”, and “safety”, all representing 0.7% (2 articles) each. Therefore, the relevance of customers and their satisfaction with the service management, as well as the quality of services, are evident in four out of the 10 most cited keywords.

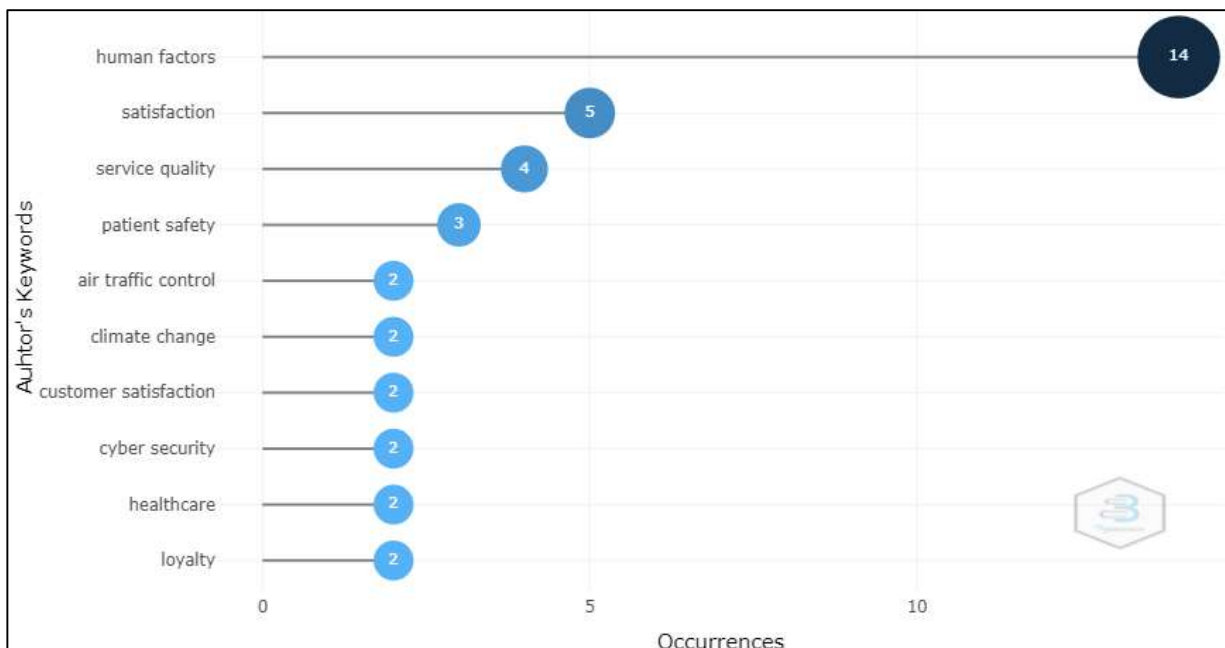


Figure 2 - The 10 most relevant authors' keywords

Word clouds provide an effective way to visually summarize fundamental keywords from a large collection of text (Liu et al., 2015), in which the more frequently used words are highlighted by occupying a more prominent place within the representation (McNaught & Lam, 2010). There are several fast and user-friendly word cloud generation programs available for free, such as TagCrowd, MakeCloud, ToCloud and Wordle.

The word cloud depicted in Figure 3 was developed using the versatile Wordle, and represents the main keywords cited in the studied articles. The ten terms previously detailed in the histogram are standing out in comparison with the others.



Figure 3 - Word cloud of the most cited keywords on service management and human factors

The next relevant analysis concerned the most cited articles on service management and human factors, since their first joint appearance in 1992. The dominance of topics related to service quality assessing tools and the focus on customers and their perceptions is evident, corroborating the former analyses of the most discussed issues. Table 2 exhibits the 20 most cited articles. Out of the 941 total citations of all 67 articles in the WoS database, these 20 articles sum 801 citations, representing more than 85% of those articles’ impact on the subject.

Six of the most influential articles are featured in publications directly related to the area of Ergonomics, while other two studies derive from the healthcare field of knowledge. Additionally, the areas of computer science and robotics are also represented by six documents, reflecting these fields’ great interest in contributing with the coupling of services and human factors.

Table 2 - The most cited articles on service management and human factors

#	Authors	Title	Journal/ SJR (2015)	Citations	Year
1	Sherchan, W. et al.	A Survey of Trust in Social Networks	ACM Computing Surveys	349	2013
2	Botta-Genoulaz, V. & Millet, P. A.	An investigation into the use of ERP systems in the service sector	International Journal of Production Economics	89	2006
3	Lemmink, J. & Mattsson, J.	Warmth during non-productive retail encounters: the hidden side of productivity	International Journal of Research in Marketing	36	1998
4	Li, D. et al.	The dynamics of sand-Stabilization services in Inner Mongolia, China from 1981 to 2010 and its relationship with climate change and human activities	Ecological Indicators	28	2018



5	Shorrock, S. T. & Williams, C. A.	Human factors and ergonomics methods in practice: three fundamental constraints	Theoretical Issues in Ergonomics Science	27	2016
6	Phithakkitnukon, S. et al.	Behavior-Based Adaptive Call Predictor	ACM Transactions on Autonomous and Adaptive Systems	26	2011
7	Miguel-Dávila, A. et al.	Operations in banking: the service quality and effects on satisfaction and loyalty	Service Industries Journal	25	2010
8	Kolb, P. et al.	The effects of temperature on service employees' customer orientation: an experimental approach	Ergonomics	23	2012
9	Golightly, D. et al.	Manufacturing in the cloud: A human factors perspective	International Journal of Industrial Ergonomics	22	2016
10	Engelbrecht, H. et al.	A SWOT Analysis of the Field of Virtual Reality for Firefighter Training	Frontiers in Robotics and AI	20	2019
11	Nuviala, A.	Perceived quality of school sports as predictor of sports dropout in adolescents	Revista Internacional de Medicina y Ciencias de la Actividad Fisica y del Deporte	20	2012
12	Drury, C. G.	Human factors and quality: Integration and new directions	Human Factors and Ergonomics in Manufacturing	18	2000
13	Strawderman, L. & Koubek, R.	Human factors and usability in service quality measurement	Human Factors and Ergonomics in Manufacturing	18	2008
14	Sun, F. & Carson, R. T.	Coastal wetlands reduce property damage during tropical cyclones	Proceedings of the National Academy of Sciences of the United States of America	17	2020
15	Shanmugam, A. & Robert, P. T.	Ranking of aircraft maintenance organization based on human factor performance	Computers & Industrial Engineering	15	2015
16	Zuo, W. et al.	Quality management of B2C e-commerce service based on human factors engineering	Electronic Commerce Research and Applications	14	2013
17	Newton, R. C. et al.	Making existing technology safer in healthcare	Quality & Safety in Health Care	14	2010
18	Huguenin, K. et al.	A Predictive Model for User Motivation and Utility Implications of Privacy-Protection Mechanisms in Location Check-Ins	IEEE Transactions on Mobile Computing	14	2018
19	Waring, J. J.	Patient safety: new directions in the management of health service quality	Policy and Politics	13	2005
20	Harper, J. G. et al.	Human factors in technology replacement: a case study in interface design for a public transport monitoring system	Applied Ergonomics	13	1998

Table 3 presents the 10 most relevant journals with their h-indexes, SJR, number of articles and citations. Self-citations by all authors had been excluded to avoid any bias. It should be noticed

that the journals are ranked according to their number of citations, regardless of any other variable in this table.

Table 3 - The 10 most relevant journals on service management and human factors

<b>Journal</b>	<b>h-index</b>	<b>SJR</b>	<b>Articles</b>	<b>Citations</b>
ACM Computing Surveys	163	2.08	2	358
International Journal of Production Economics	142	1.91	1	89
Human Factors and Ergonomics in Manufacturing	39	0.41	2	36
International Journal of Research in Marketing	102	3.73	1	36
Ecological Indicators	127	1.32	1	28
Theoretical Issues in Ergonomics Science	50	0.56	1	27
ACM Transactions on Autonomous and Adaptive Systems	41	0.44	1	26
Service Industries Journal	66	1.18	1	25
Ergonomics	110	0.82	1	23
International Journal of Industrial Ergonomics	79	0.57	1	22

Surprisingly, the “ACM Computing Surveys” assumes a prominent position, presenting, by far, the highest citations and h-index. The “International Journal of Production Economics” appears next, with less than 25% of the first place’s impact, followed then by “Human Factors and Ergonomics in Manufacturing” and “International Journal of Research in Marketing”, both with barely 40% of the second place’s influence. Nevertheless, it should be highlighted that 4 of these 10 journals are linked to Ergonomics, which translates into 108 citations (13.5%) on the subject.

The 15 most distinguished institutions are exposed in



Table 4 with their respective countries of origin and number of articles on service management and human factors. Only institutions that produced at least 2 articles on the subject are being presented, which justifies the selection of these 15 universities. Self-citations have been carefully removed to avoid any bias.

The UK not only occupies the first place with the University of Nottingham, but also appears with a total of three other institutions, the Kingston University London and the Imperial College London, totaling nine articles. Despite coming second with four articles from the same institution, Australia is tied up with the USA and China in terms of total production. However, Iran stands out as the major surprise with its five articles from two different universities, namely the “Isfahan University of Medical Sciences” and the “Islamic Azad University”.

Perhaps as another unusual and startling member, Vietnam has conquered its place among this selective group with two published articles on the subject, the same amount as other four notorious and well-known contributors within the scientific community, that being India, Sweden, Denmark, and New Zealand.

Table 4 - The 15 most distinguished institutions on service management and human factors

<b>Institution</b>	<b>Country</b>	<b>Articles</b>
University of Nottingham	UK	4
University of Sydney	Australia	4
Isfahan University of Medical Sciences	Iran	3
Kingston University London	UK	3
Islamic Azad University	Iran	2
Lulea University of Technology	Sweden	2
National Institute of Industrial Engineering	India	2
National University of Tainan	China	2
Pennsylvania State University	USA	2
RMIT University Vietnam	Vietnam	2
South China University of Technology	China	2
Stanford University	USA	2
Technical University of Denmark	Denmark	2
University of Canterbury	New Zealand	2
Imperial College London	UK	2

Considering the authors' countries of origin, which means both the defined main authors and their supporting fellow researchers, listed as direct contributors within the authors' field, the 15 most prominent countries on service management and human factors are ranked in Table 5. Their correspondent productivity, or the number of articles (A), and their respective citation profile (C) are also presented. They are being exhibited according to the multiplication factor (A\*C) between the countries' number of articles and citations.

Table 5 - The 20 most prominent countries on service management and human factors

<b>Country</b>	<b>Articles (A)</b>	<b>Citations (C)</b>	<b>A*C</b>
USA	21	67	1407
UK	17	79	1343
China	16	51	816
Australia	17	32	544
France	4	89	356
Spain	6	52	312
India	6	28	168
Ireland	7	18	126
Germany	4	29	116
Netherlands	3	36	108
Italy	5	17	85
Switzerland	5	14	70
Iran	6	3	18
Portugal	3	6	18
Malaysia	3	5	15

Japan	4	2	8
South Africa	3	2	6
Sweden	4	1	4
Vietnam	3	1	3
Denmark	3	0	0

According to Wang et al. (2012), citation analysis is a mature quantitative research method in bibliometrics/scientometrics, applied to many disciplines to describe their evolution. Cross-citations between core documents and clusters are used to detect new growing clusters or changing topics (Glanzel & Thijs, 2012).

Co-citation analysis provides objective and quantitative means to meet research goals, since there are different analysis' levels: document, author and journal co-citation analysis (Hsiao & Yang, 2011b). Bibliometrix also provided the necessary for this study's co-citation analyses (Aria & Cuccurullo, 2017). The first analysis concerned the articles' co-citation, which has been defined in Hjørland (2013) as the frequency with which two documents are cited together.

A minimum of twenty citations per document has been set for them to be represented in the map of Figure 4. Among the 26 papers ranked, two studies from Parasuraman are presented in highlighted positions: Parasuraman et al. (1988) and Parasuraman et al. (1985).

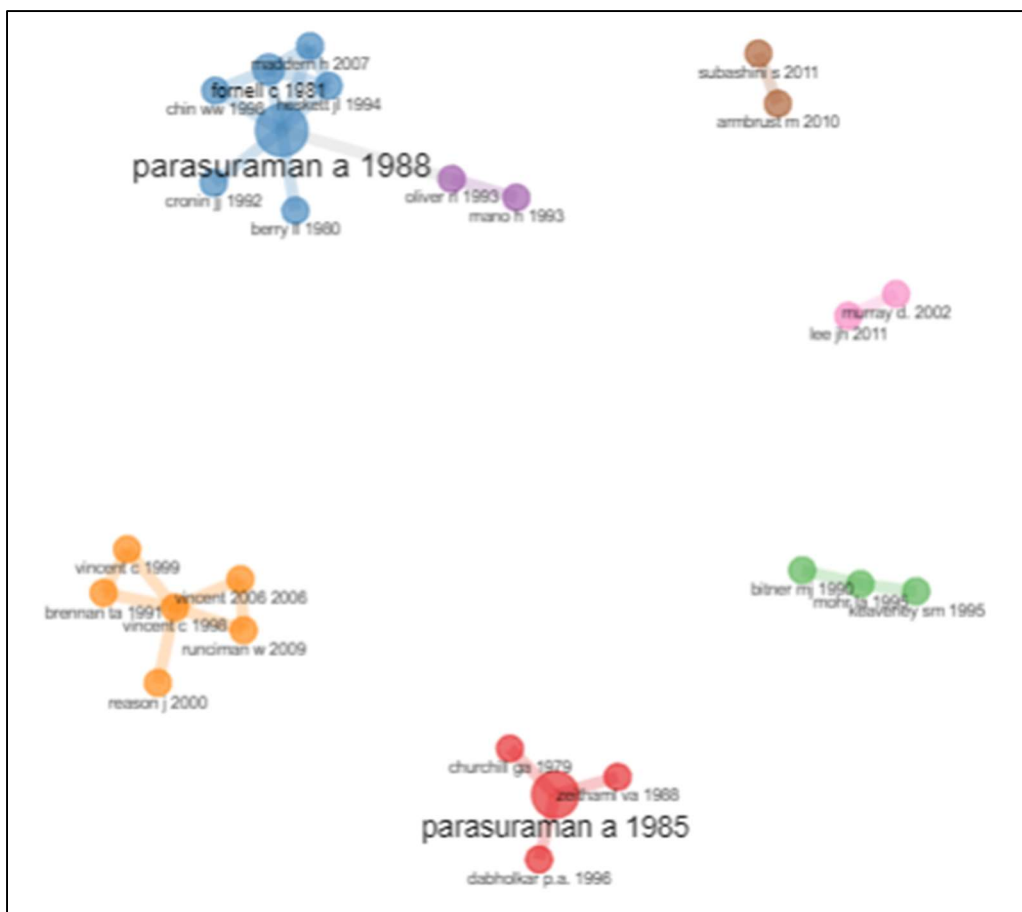


Figure 4 - Articles' co-citation network on service management and human factors

Conversely, authors' co-citation analyses produce maps of prominent authors within a field using computational and graphic displays techniques (Hsiao & Yang, 2011b). By setting a minimum of twenty citations per author, 16 authors figured in the network, as showed in Figure 5.

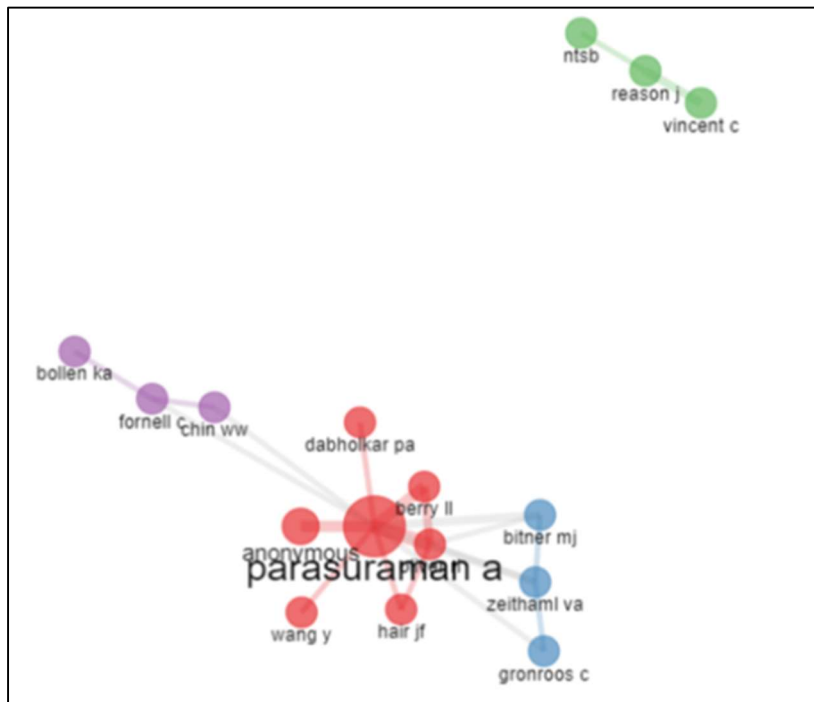


Figure 5 - Authors' co-citation network map on service management and human factors

Journal co-citation analysis treats representative journals of each field as analysis' units, focusing primarily on journal-journal relationships to evaluate the citations' importation and exportation between all given pairs of journals (Hsiao & Yang, 2011b). Figure 6 zooms in on the most relevant connections among the 49 identified sources. It reinstates the relevance of journals such as “Journal of Marketing”, “International Journal of Service Industries management”, “Journal of Service Marketing”, “Applied Ergonomics”, “Ergonomics”, “Human Factors”, and “Computer-Human Behavior”.

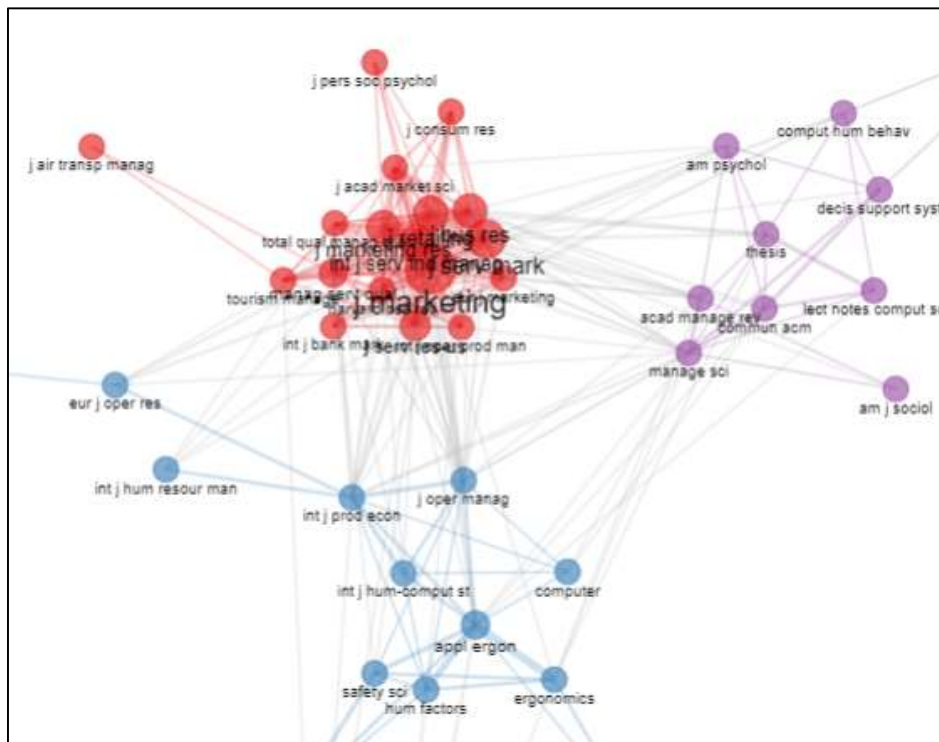


Figure 6 - Journals' co-citation network map on service management and human factors

## 5. CONCLUSION

The present bibliometric study enabled the characterization of the state of research on service management and human factors since these themes' first joint appearance in 1992 until December of 2021. By analyzing the most cited keywords, it has been identified the focus on “customer satisfaction” and “service quality”, even though they may have appeared through different terms. It reinforces the relevance of the customers and their satisfaction with the service management. Another product of those keywords' analysis was the generation of a word cloud, visually evidencing the impact of the aforementioned terms. Analyses concerning the most cited articles, journals, institutions and countries have also been performed, followed by reviews of the articles' co-citation network, as well as the networks of the authors' and the journals' co-citation.

The ranking of the most distinguished institutions, journals and countries, in addition to the identification of high-impact articles, could be considered as the biggest scientific contribution of the present study, since it will promote and guide new studies on the subject. The papers analyzed through this bibliometric study provide new methodologies and tools that could be used by the corporations in real market scenarios, therefore, standing as the work's main applied contribution.

Considering there are many other academic databases that could have been used for the purpose of a bibliometric research, future studies should focus on broadening the data sources and varying the searched terms, as well as investigating the most recent papers of those authors to identify research trends. Another suggestion would be to deepen the understanding of the scientific gaps, which opens a whole new range of opportunities for future researches.

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