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Operations research in tourism: A systematic literature review

Miit Virani
miitviraniv@gmail.com
Anil Surendra Modi School of Commerce, Mumbai, Maharashtra

Mohak Saboo
mohak@saboo.in
Anil Surendra Modi School of Commerce, Mumbai, Maharashtra

Mudit Bagla
mudit.bagla219@nmims.edu.in
Anil Surendra Modi School of Commerce, Mumbai, Maharashtra

Nandini Sarin
nandini.sarin359@nmims.edu.in
Anil Surendra Modi School of Commerce, Mumbai, Maharashtra

Neeharika Khandelwal
neeharika.khandelwal635@nmims.edu.in
Anil Surendra Modi School of Commerce, Mumbai, Maharashtra

ABSTRACT

The tourism sector is extremely competitive and characterized by fierce competition for the discretionary spending of tourists. To effectively compete in the tourism sector, a nation or region must be able to make informed strategic and operational decisions. In this decision-making process, the capacity to predict tourism demand with accuracy in the context of an ever-changing environment may be very helpful. Academic study on tourism is increasingly becoming the main topic as its economic significance increases. Research in this field aids in comparing best practices and spotting new patterns in tourist demand and supply. This is where the exploding use of Big Data in the recent year comes in. Big Data, a relatively newer phenomenon is a complex and huge data set which is derived from a combination of numerous individual data. The main objective of the research is to understand and review the existing research on the application of operation research and big data in the tourism sector for revenue and efficiency maximization, extrapolating data to estimate potential future demand, challenges faced by the hospitality sector and comprehend the latest trends in tourism marketing, among other things. The paper evaluates the available studies on the tourist business sector using various software available.

Keywords *- Tourism, Operations Research, Big Data, Sustainability, Optimization, Covid 19*

1. INTRODUCTION

Operations Research (OR), a method of problem solving, is concerned with quantifying the important parts of a given situation into a framework and manipulating this framework using mathematical, statistical, IT and tech methodologies in order to generate plans, choices, and strategies. Operations Research is characterized by a systems orientation, an interdisciplinary philosophy, and a focus on these three characteristics (Swart et al., 1978a)

The origin of Operations Research dates back to the early stage of World War 2. At the time groups of scientists of various fields were teamed to gather their expertise in order to suggest and assist the military with regards to arriving at strategic choke points and other key locations on time and also increase efficiency while doing the same. The same group also assisted in warning the troops about air raids.

Tourism is one of the sectors that has experienced significant growth over the years as a source of income and the development of new technologies (Ruiz-Meza & Montoya-Torres, 2022). The industry has a significant direct and indirect impact on the global economy, promoting local development through job creation and sustainable use of locally available resources (Mao et al., 2014; van Truong & Shimizu, 2017). According to the description given above, tourism is a leisure activity that requires movement.

Outdoor recreation, which is defined as any leisure activity carried out outside, is one of the key ideas in the field of recreation. For planning reasons, numerous research employs more specific definitions within this broad concept. A resource-based definition of outdoor recreation is used, for instance, in Outdoor Recreation in Florida (1971). According to Lundberg, the term "tourist" originally appeared in England in the 19th century. Tourists are described as "those who travel for the joy of travelling, out of curiosity, because they have nothing better to do, and for the task of boasting about it afterwards" in a dictionary from the 19th century. The word "tourist" first appeared in print in 1811. "Tourist" is defined as "one who makes a tour; one who travels for pleasure" in The New Webster Encyclopedic Dictionary of the English Language (1972). (Var et al., 1975)

The Travel & Tourism Industry contributes to 3.6% of global GDP directly and approximately 10.3% indirectly. With such a vast industry come various problems which exist and solutions which are relatively new or found. It gets important to work on efficiency and scalability with sustainability as the travel and tourism industry is set to grow at over 13.4% CAGR from 2021 to 2026 (Globe Newswire, 2021).

The issues of uncertainty and sustainability in tourism and hospitality industry can be solved using quantitative tools and big data collected over the decade. The approaches in this paper will attempt to solve those problems and strive to reach higher levels of efficiency than traditional methods by reducing wastage of time, efforts and resources.

2. LITERATURE REVIEW

Tourism is a complex activity that requires the availability of certain parameters (accessible road network, standard accommodation, points of interest, etc.) and information about potential and existing points of interest (Eboy, 2017) .

In tourism, as in other fields, an attempt to argue whether tourism is a discipline, a field of study, or a specialty, as tourists become more fragmented, decentralized, and/or eclectically accepted, has been repeatedly performed (Benckendorff & Zehrer, 2013) .

Therefore, to describe the maturity of tourism, a literature survey was conducted in the tourism field to identify the intellectual structure, academic foundations, knowledge domains, or social structures of the field (Koseoglu et al., 2016; Ye et al., 2013) .

In the research conducted by Wei C., Wang Q., Liu C.(Wei et al., 2021), the problems existing in domestic tourisms are highlighted and the solution has been framed in form of a multilevel structural equation while keeping in mind the factors which influence tourism such as income structures and the household and regional consumption patterns. (Boiko et al., 2017) had discussed the model of innovative tourism clusters as component for increasing the competitiveness of the country as a whole.(Bihun et al., 2022)

With digitalization, there are always new opportunities knocking our doors. Digitalization enables exploration of various newer trends that penetrate different areas of communication, forms of leisure and learning. Hence, we can say that tourism has also been revolutionized.(Keferova, 2020)

There are multiple types of big data which are applied to the tourism industry while using various different resources. However, these types of data can be divided into three main categories (Tan & Despotis, 2021) firstly one of the most used and available categories of data is the one which is provided by different users on online platforms ranging from social media to forums. Due to its availability and large amount, this data is undoubtedly one of the most frequently used. User-generated (produced) material, most commonly referred to as UGC data, is the name of this category. We also have device data that is connected to data produced by automated devices. High-quality data that was gathered for this category's storage and transmission was made possible by sophisticated networks and software. Last but not least, transaction data, a highly regarded source of information for tourism research, is concerned with the many operations and transactional behaviours that are frequently employed in website traffic, marketing tactics, and tourist prediction (Becha et al., 2021).

While Big Data technologies are taking over the global tourism business, with huge companies maximising the data dynamics (Zhang et al., 2019). British Airways is one of the most well-known instances of a tourism industry company that operates internationally and has recently launched initiatives and measures for the integration of Big Data technologies. This airline has created and incorporated into its operations software and technological tools that enable the individual approach of the tourist and the comprehension of the internal and external elements that affect the decisions of all stakeholders (Tower data, 2018)(Belias et al., 2021).

The latest innovations in tourism marketing put a special emphasis on "marketing intelligence," or the use of data to guide market-related decisions. Recent research demonstrates that the 5Ps of the marketing mix—people, product, promotion, price, and place—can be utilised to manage Big Data, fostering innovations that require considerable alterations to product design, promotion, and pricing (Fan et al., 2015).

The research conducted by Swart, William W.; Var, Turgut; Gearing, Charles E. (Swart et al., 1978a) outlines the applications of operations research to the tourism industry and divides them into four categories: projecting tourist numbers, estimating visitor flows, assessing the implications of facilities and activities geared toward the industry, and modelling decision-planning and policy issues. Each category is further divided into time series analysis, causal and qualitative approaches; Evaluating the effectiveness of classical economic, derived value, alternative, and longitudinal approaches and also decision-making models in prescriptive and descriptive approaches. The relevant findings from the study of the literature are applied and presented to that subdivision.
The overall area of study relevant to the development of theory and understanding of scheduled events has historically been referred to as "event studies" in the tourism and hospitality literature. (Getz & Page, 2019). However, the term is more frequently used by

academics from the broader business disciplines, such as economics, finance, marketing, and management, to describe a very specific methodological approach that uses data from the securities markets to econometrically measure the impact of an event on a firm's value. (MacKinlay, 1997).

In recent years, there has been increased interest in the examination of tourist destinations as territorial agglomerations, i.e., industrial districts and clusters. Porter (2000) a geographically close-knit network of interrelated businesses and local organisations in a certain industry with connections that are mutually beneficial. (Swart et al., 1978b)

Demand from tourists has a big impact on how governments establish their policies for the industry. The Grey-Markov model has been used in study by Yi-Chung Hu, Peng Jiang, and Ping Chuan Lee, which used historical annual data from the Taiwan Tourism Bureau and China National Tourism Administration to anticipate tourism demand (Hu, 2021).

COVID-19 has created economic shocks in the tourism industry that had a multiplier effect (Dube, 2022) . The COVID-19 pandemic can wreak havoc on the world's tourism industry, as seen by the 22% decline in visitor numbers in the first quarter of 2020 (compared to the same quarter of 2019) and the potential for a 60% to 80% decline overall in 2020 (compared to 2019) (Sharma et al., 2021) . The pandemic had a negative impact on every subsector, sector, and support service for the whole tourism value chain, leading to the loss of employment, lives, and means of subsistence (Dube, 2022) .

As the travel industry fills in monetary significance, it is turning out to be increasingly more the focal point of scholastic examination. Research in this space helps think about prescribed procedures and recognize arising patterns sought after and the travel industry supply. The task shows that while worldwide the travel industry is developing, laid out objections are endeavouring to keep up with their piece of the pie, while new objections are anxious to foster their items. Objective improvement is viewed as a drawn-out endeavour in which ecological contemplations need to assume a part in the general the travel industry procedure. In fact, future research should try to focus on creating a well-defined relationship between macro-tourism and micro-tourism issues. In other words, explaining the success of local tourism from the perspective of tourism theory (Ingram, 1996).

3. RESEARCH METHODOLOGY

This study is based on utilization of bibliometric methods in order to analyse, interpret and present existing research of Operations Research in Tourism. By using advanced mathematical and statistical tools we will assess the existing literature and issues in tourism industry.

Research Design of the Study

The following databases were referred to review literatures;
1) EBSCO Host
2) Research Gate
3) Science Direct
4) Google Scholar

Vos viewer was used to conduct an analysis of keywords in the research papers. This helped to interpret the interlinkages between the keywords and hence, focus on the key research areas of the existing research in the field.

To conduct this analysis, a RIS file was formed combining all the research papers we had collected from the above-mentioned sources. These were then put into Vos viewer to get the desired results. Keywords which appeared the most were then put into perspective for further analysis in the study. The total list of papers with the details were also inserted into excel to review the journals which were used to publish these research papers along with their years of publication in order to help us analyze the recency of the research components.

4. ANALYSIS AND FINDINGS

The given section talks about the bibliometric analysis, which was conducted on the topic of operations research on tourism. From detailed literature search process, the following results were deduced based on a total of 150 research articles related to tourism – In figure 1, keyword network obtained from the keywords used in each of the contributing articles is displayed using the VOS Viewer Software. We can observe that Tourism, Big Data, Sustainability and Covid 19 are some of the most prominent key words used.

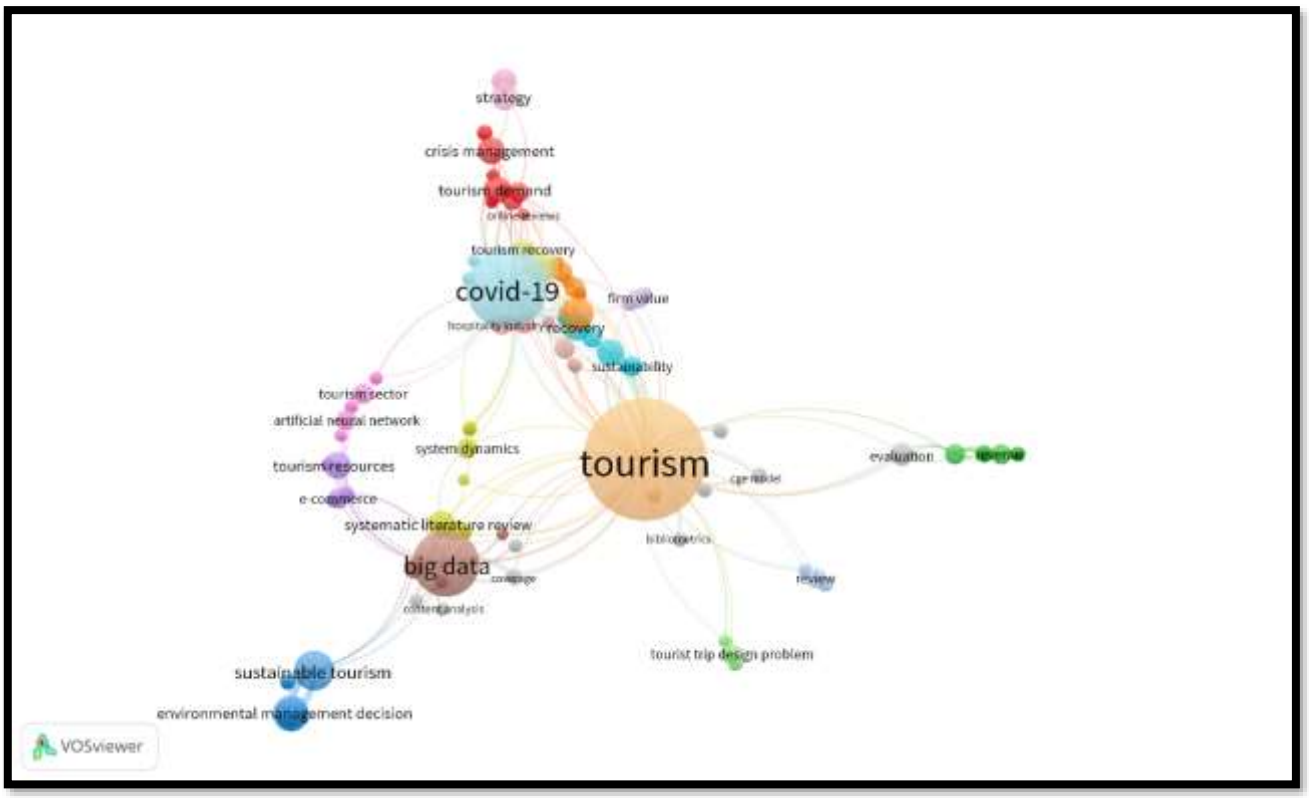

Figure 1: - Keywords Co-occurrence found in the articles (Source – VOS Viewer)

Figure 2 and Figure 3 represent the occurrence of citation network used by several authors in their respective articles. The leading authors in these figures are Kyle Christianson, Suresh Acharya, James Fuller, Kathleen Mallery and many more.

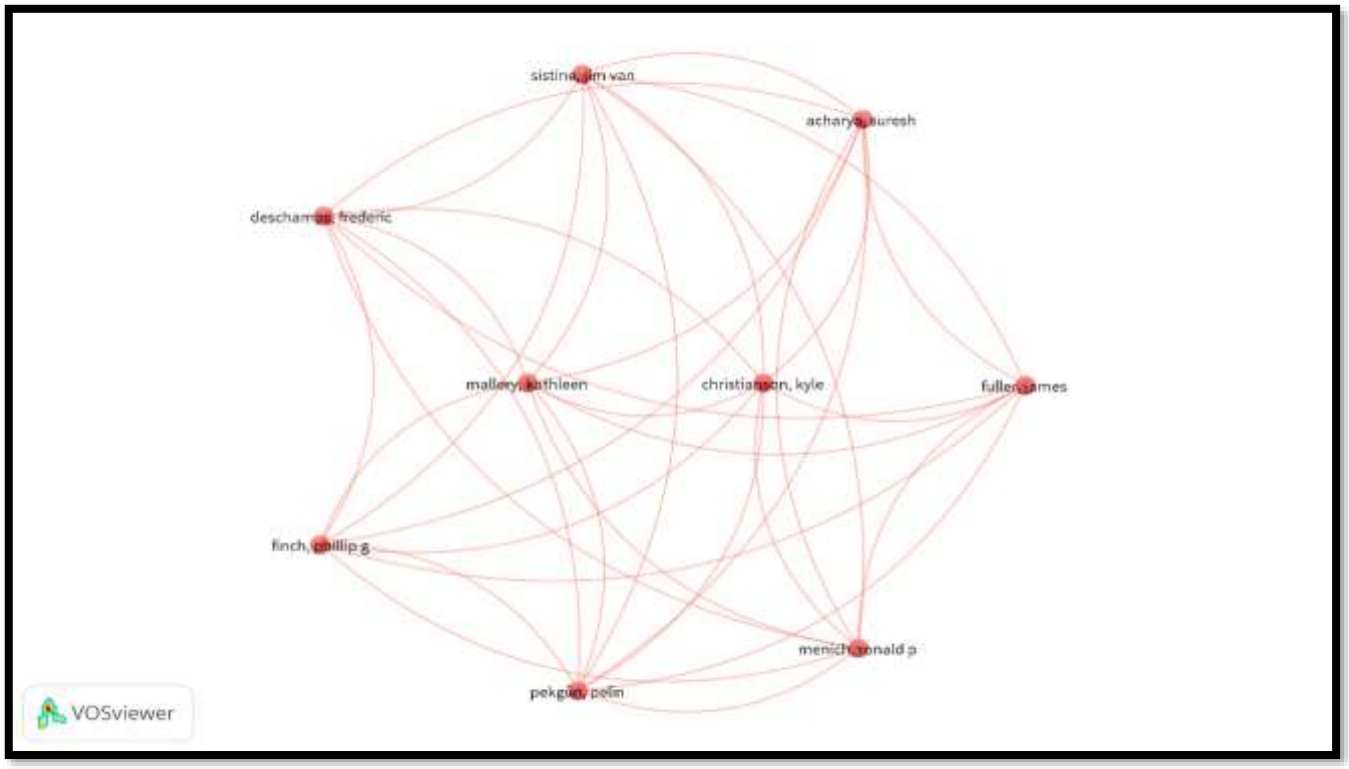

Figure 2: - Author Citations Co-occurrence in the selected articles

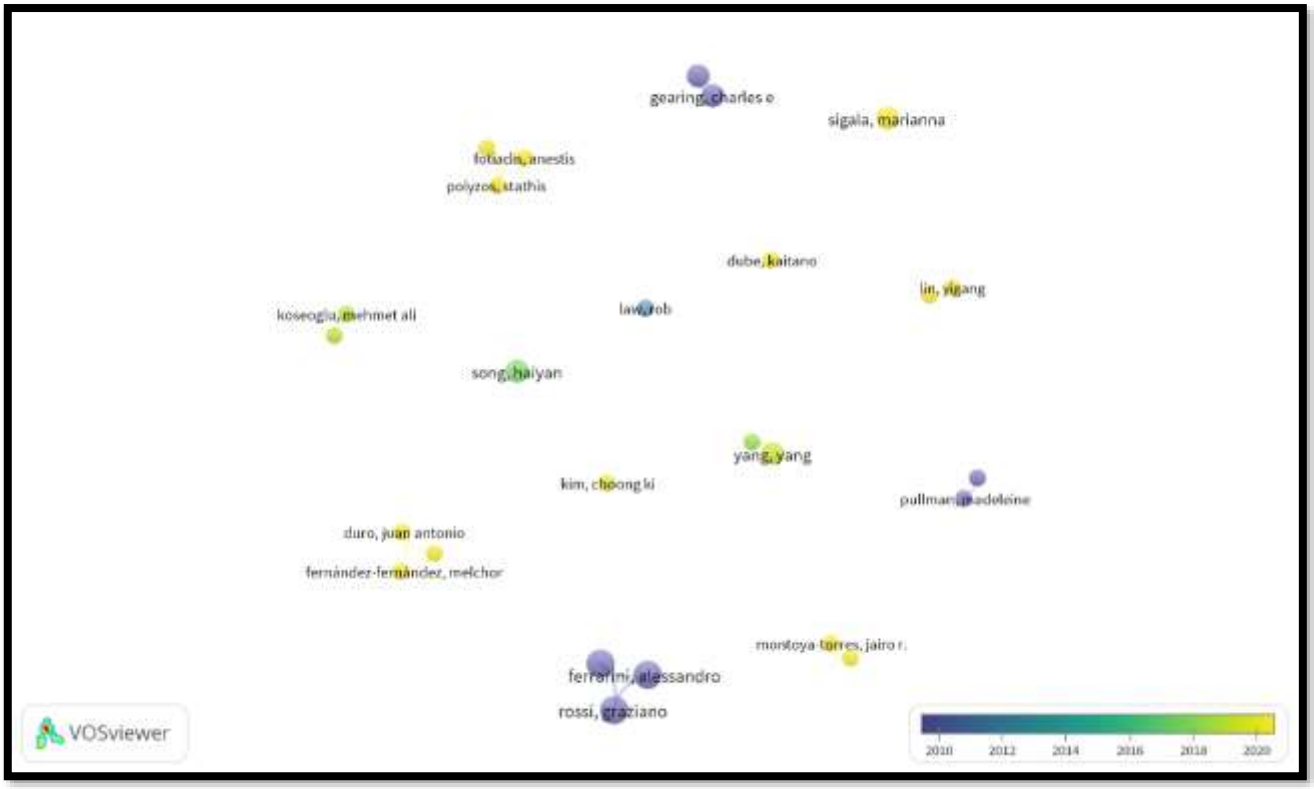

Figure 3: - Author Citations Co-occurrence in the selected articles

When we take a look at the figure 4, we can see that it represents the cumulative number of research articles which were published in each of the following years, i.e., from 2010 to 2022. It is observed that the graph shows an upward trend and we can conclude that the amount of articles published on tourism has increased substantially over the years. In addition, an increased interest in Big Data and Sustainability is also observed, which are key research areas in tourism.

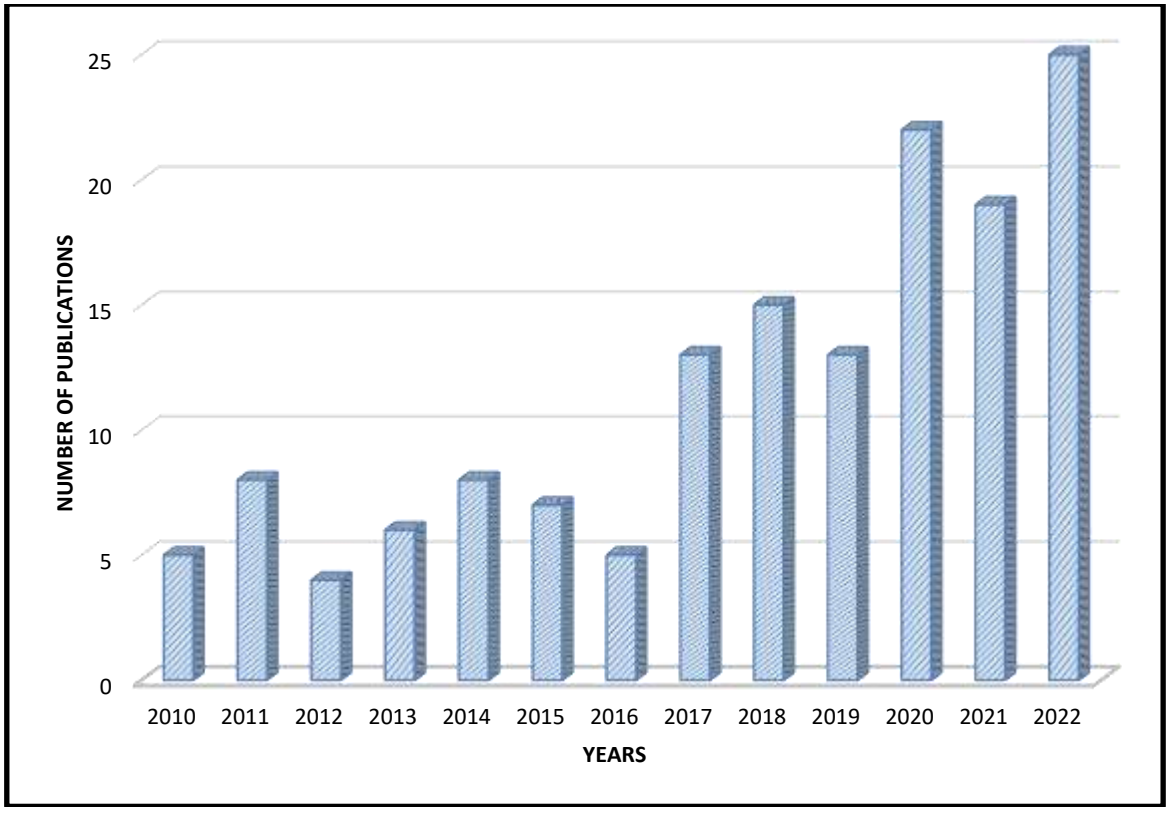

Figure 4: - Number of articles published from 2010 to 2022

In Figure 5, The Journal, "Annals of Tourism Research" has published the highest number of articles based on Tourism (11). It is followed by the "International Journal of Contemporary Hospitality Management" (8), "Tourism Management" and "International Journal of Hospitality Management" (6) and "Annals of Operations Research" and "Journal of Destination Marketing and Management" (5).

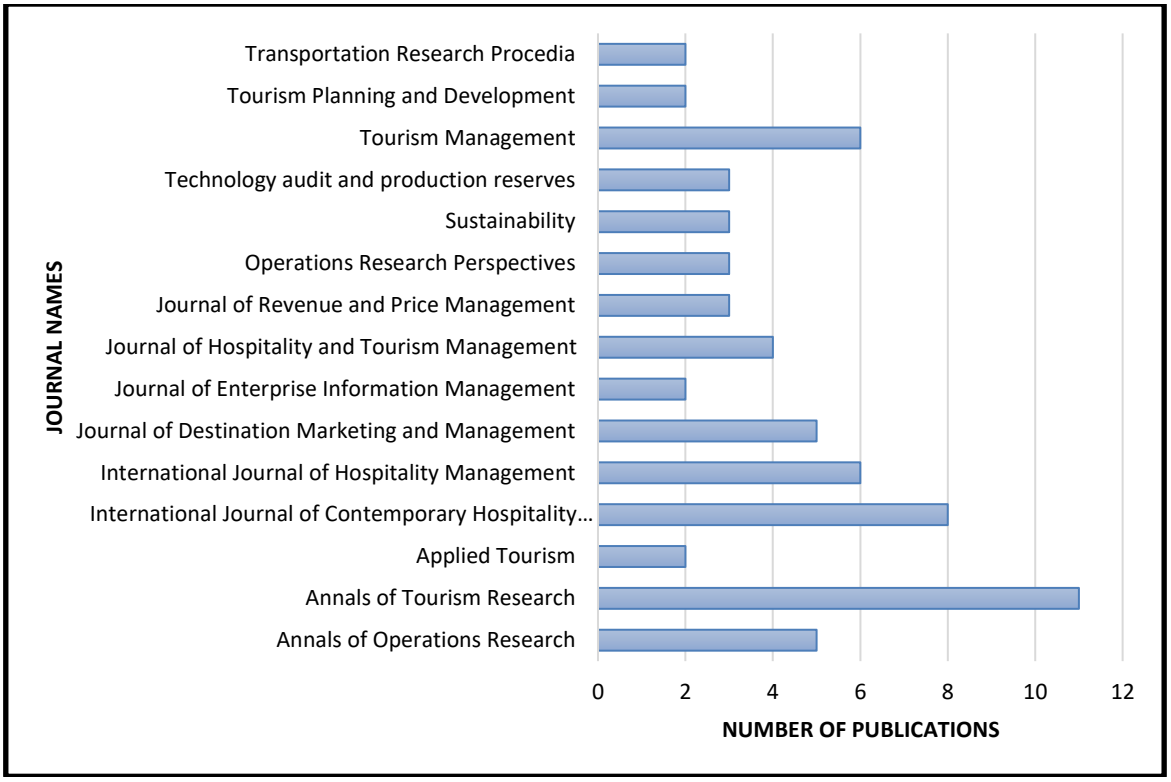

Figure 5: - Number of articles published in various Journals (N >= 2)

6. CONCLUSION AND FUTURE WORK

The aim of this work was to examine the disciplinary structure of tourism studies using co-citation analysis. Using suitable graphs, deductions were made regarding the increased awareness of Big Data, Sustainability and Optimization in the Tourism industry and sufficient data was provided.

The tourism industry is growing at the global stage, but there exist some gaps in the industry which cause inefficiencies and improper allocation of resources. This study showed us the key research areas under the head of tourism and how big data helps us solve it.

The sustainable path of tourism is a very complex which requires a diverse source of data collected and analysis which is what this research paper sets to analyse. We saw the linkages between different components and factors which affect tourism and hence form a base layout for future research.

Future Work: In the past 3 years, we have seen an unprecedented change both in the tourism industry itself and the factors surrounding it. These changes have resulted in a new reason to and a new dimension to study in the same industry. Post COVID-19 the research has to be bounded to certain environmental constraints as we are witnessing the rising need of a greener society. There is also scope to research on how the tourism industry can prepare for the next big shocks. This is where we can apply Big Data in tourism. Big Data is growing exponentially and its benefits are very apparent. When applied in tourism, it can improve efficiency and help with risk management. There is room to study how big data when combined with statistical tools can prevent damage to an extent where the tourism industry won't take a drastic fall as it did during the pandemic.

As the travel industry fills in monetary significance, it is turning out to be increasingly more the focal point of scholastic examination. Research in this space helps think about prescribed procedures and recognize arising patterns sought after and the travel industry supply. The task shows that while worldwide the travel industry is developing, laid out objections are endeavouring to keep up with their piece of the pie, while new objections are anxious to foster their items. Objective improvement is viewed as a drawn-out endeavour in which ecological contemplations need to assume a part in the general the travel industry procedure. In fact, future research should try to focus on creating a well-defined relationship between macro-tourism and micro-tourism issues. In other words, explaining the success of local tourism from the perspective of tourism theory.

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