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BIBLIOMETRIC REVIEW OF FACILITIES MANAGEMENT AND ITS IMPACT ON ORGANIZATIONAL EFFECTIVENESS





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ABSTRACT

Facilities management (FM) has been adjudged to be critical in all industries both at developed and underdeveloped countries. As such, available literatures seem to agree to the fact that the importance of Facility Management to both service organization competitiveness and manufacturing can never be underestimated. But the knowledge of how FM impact on the organizational effectiveness remains unsearched. Till now, few literatures are available that examined what impact does facilities Management has on organizational effectiveness, how does the FM affect the effectiveness of an organization. Recently in Architecture, Engineering and Construction (AEC) research, bibliometric is becoming more prominent as a quantitative study that examines many characteristics of literature on a particular topic. It aids in the discovery of new information about a phenomenon under inquiry. The use of bibliometrics approaches in a variety of disciplines has resulted in an explosion of bibliometrics and associated literature. To this end, this paper therefore attempts to examine the impact of Facility Management on organization effectiveness using bibliometric approach. Through co-occurrences analysis, of word, author, journal, institution, and country analysis. A total of 309 bibliographic records from the Scopus core collection databases were selected and analyzed. The findings showed that facility Management facilities management has a significant impact on organizational effectiveness, and effective asset management has a significant impact on organizational growth. Moreover, most publication on facility Management came from UK and US than China, Australia and Norway. This study highlighted trends in contributors to highly-cited Facility management development research.



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I. INTRODUCTION

Companies have been obliged to look at all measures of decreasing costs and preserving a market edge due to fierce competition, fluctuating trading circumstances, high energy costs, and other economic factors [1]. Facilities management has been established on all five continents as a result of these circumstances, despite its reputation as a poor related of the property and building professions [2]. Property management, financial management,

change management, human resource management, contract management, health and safety in buildings, engineering services, maintenance, domestic services, and utilities supplies are all topics covered by this subject [3]. Facilities management, according to the Centre for Facilities Management (2010), is the process through which an organization offers and maintains support services in a high-quality environment to meet strategic needs. It's also known as "the process through which an organization guarantees that its buildings, systems, and services support core operations and

procedures while also contributing to the achievement of strategic objectives under changing conditions" [4].

Facility management encompasses the administration of built assets as well as the controlling services required for an organization's successful business operations. It should not just attempt to reduce the operating costs of a developed facility, but also to increase the facility's efficiency [5]. The physical environment has a significant impact on an organization's ability to operate successfully and efficiently; by altering it, an organization's intended efficiency can be reached [6]. To assess the success of facility management, it is required to first gain a thorough awareness of the facility's existing state and then hypothesize improvements in facility management procedures in order to attain the desired results. Poor facility management, according to [7], can lead to insufficient facilities to sustain functioning, excess facilities that aren't contributing to the organization's mission, cost inefficiencies, inadequacy, and facility unavailability for future demands. A solid facility management strategy, on the other hand, provides critical support for the organization's mission, as well as the realization of future facility requirements, increased cost efficiency, and the ability to predict the outcomes of present management decisions.

The Center for Facilities Management (CFM, 2010) emphasizes the importance of focusing resources on satisfying user demands in order to support people's vital role in businesses and works to continuously enhance quality, decrease risks, and assure value for money. Facilities management lays out a company's response to critical concerns such space allocation and charging, environmental control and protection, and direct and contract labor. Facilities management is important in all industries in industrialized, developing, and underdeveloped countries. Facility management is critical to an organization's growth and survival, especially in today's fast-paced culture [8]. The ability of management to guarantee that there is working equipment, lands and buildings, infrastructure, fixtures, and other items is critical to the organization's performance and survival.

Companies have lost their efficacy and production, according to [9], due to poor facility management. He went on to say that a negative attitude toward facilities management makes it difficult for businesses to operate. According to him, facilities management causes management to operate at a lower capacity. Maintaining a good level of facility should be one of the tasks of any good organization's management to ensure efficiency and productivity. However, research have indicated that the majority of businesses have failed in the area of facility management. Companies have a weak maintenance culture, according to statistics. This has contributed to certain business failures and limited business profit.

According to [10], the culture of management and maintenance in Nigeria has gone down the drain, affecting nearly all aspects of our social and economic lives. When facilities are not effectively managed and maintained, it can lead to a variety of defects, which can cause annoyance and disruption to those who use them. Several studies conducted by researchers have demonstrated a link between facilities management and organizational success; for example, [11] discovered a link between facilities management and effective corporate operations. Similarly, research by [12] found that good facility management increased production. Despite these results and recommendations, businesses continue to struggle to successfully manage their facilities, resulting in losses. The paper is organized as follows: the introduction section discusses the historic background and function of Facility Management, Secondly, Literature review on the

measurement and performance concept of FM, is described; thirdly, the methodology used is discussed; and finally, conclusion was drawing from the analysis and review.

II. LITERATURE REVIEW

II.1 REVIEW RATIONALE AND OBJECTIVES

The literature review reveals the established and generally accepted facts of the situation being studied, and enables one to identify and understand the theories or models, which have been used by previous researchers in the field. The literature review assists the researcher in identifying an unsolved problem in the field being studied, which will become the focus of the research study. The review of the literature included an in-depth examination of the material relating to Facility Management and its impact on construction in general. The main purpose and outcome of this was to identify theoretical gaps in the literature which pointed to potential research topics. Although the area of Facility Management is not new, but the constructs of Facility Management are neither well-established nor standardized across and even within Facility Management discipline. There is, therefore, an abundance of areas that require further investigation. This study aims to review the facility management and its impact on the organizational effectiveness.

II.2 HISTORICAL PERSPECTIVE TO FM

The origins of FM can be traced back to the scientific management era and the expansion of office administration that followed. The trend toward better property management is projected to continue as buildings, their contents, and organizations grow more sophisticated. Several organizations, some of which are based on ideas from more traditional professional fields, have attempted to define the scope of the FM's employment. There are many different definitions of FM, and there is no consensus on what FM entails. According to the US Library of Congress, "the practice of integrating the physical workplace with the people and work of the organization combines the principles of business administration, architecture, and the behavioral and engineering sciences." Because this idea is so broad, it is insufficient as a primary foundation for constructing a facility management model. Nonetheless, it suggests that there are at least three fundamental characteristics of the facilities management role that apply to all cases [13]; (1) It is a support function for an organization's principal business; (2) it focuses on the interaction between the physical workplace and people; and (3) it needs a multi-skilled approach.

FM is defined as "the process by which an organization provides and maintains a quality working environment and delivers quality support services to meet the organization's objectives at the lowest cost," according to the University of Strathclyde's Centre for [14]. The term "working environment" refers to all systems and services that support a company's operations, meaning that FM is primarily demand-driven and should be closely linked to the company's strategic planning. At the heart of FM is the effectiveness of procedures that ensure that non-core activities provide good value for money and how facilities are adjusted to meet company needs [14].

According to [15] recognition of the role of facilities management in business performance has gradually developed over a period of profound change in the public sector and corporate world. Corporate competitiveness strategies – core business, customer responsiveness, and continuous quality improvement –

have necessitated a massive rethinking of all operations and reorganization. Under pressure to rationalize the business, cut costs, and increase flexibility, new techniques to managing the facilities that support the business have emerged. The growth of professional qualifications and focused education and training are supplementing respect for individuals with exceptional skills and abilities in coordinating varied activities and making things happen. Professional and corporate interests in the sector are presently supported by a single professional organisation in the United Kingdom. Packages of contracted services are coordinated within the context of management control to ensure that they meet user needs in terms of quality, cost, and time. The market is currently befuddled, with an increasing number of consultants presenting often contradictory claims. New service partnerships, on the other hand, promise more productive interactions that benefit users, clients, and suppliers alike. The facilities management industry is maturing.

The task of ensuring facilities management's future as a respectable discipline, profession, and corporate service is huge. In times of uncertainty and profound cultural change in the professions, industries that have traditionally served business demands will retain control over how challenges are identified. In order to elevate the role and status of facilities managers, the new professional bodies will define boundaries and enhance qualifying standards to exclude. The services and solutions that the market delivers under the banner of facilities management will be shaped by powerful industrial forces.

In the face of conservatism, defensive hostility, skepticism, and bigotry, the movement need strong and educated leadership. The design of an open profession for the future century must be carefully considered, as must the use of modern communications to develop networks that mirror the "virtual company." These frameworks should take into account the portfolio manager's replacement of the career professional. The facilities management movement can be defined as a conviction in the ability to enhance methods by which workplaces can be managed in order to motivate people to give their best, to support their effectiveness, and, ultimately, to contribute to economic growth and organizational success. A solid program of education and research dedicated to understanding and expanding the discipline, generating and sharing a common knowledge base, and identifying and codifying best practice must be the foundation for the future. We must establish a venue for informed debate as well as the exchange and validation of experience.

Facilities management (FM) is a broad word that refers to a variety of tasks involved in the efficient management of constructed assets. Facilities management, according to Alexander, is the process through which an organization provides and maintains support services in a high-quality environment to meet strategic needs [16]. The International Facility Management Association (IFMA) describes facilities management as a multidisciplinary profession that integrates people, place, procedures, and technology to assure the built environment's functionality [17]. As a result, facility management is a broad phrase that encompasses a variety of property and user-related responsibilities that can be combined for the benefit of the business and its personnel as a whole [5]. It entails the overall management of all services that support the organization's core business [5]. Facilities management services, for example, include real estate management, financial management, change management, human resources management, health and safety management, contract management, as well as building and engineering services, domestic services, and utility supply [18]. Sustainability is the

most recent value-added service in the realm of facility management [19].

II.3 FOUR MAIN FUNCTIONS OF FM

These are referred to as four pillars of FM by [20] and they include: **People, Processes, Building and Technology**. Speaking to the four main pillar of FM according to [20] It has do with People, Process, Building and Technology. **For People**, FM manager provides a conducting environment for workers to work and they act as a bridge between the workers and the employees. The see to good working environment, creating space for new workers, whenever there is accommodation issue, FM comes to provide and ensure workers are settled. *"Facility managers serve as a bridge between the workplace and the employees working within it. Whenever issues of accommodation, safety, or comfort arise, it's up to the facility manager to solve them"* [20].

For process, [20] went further to say that an organization cannot run effectively without the process. Processes are to be in place to ensure orderliness and moderation. Process ensures that there is order in doing thing. Order creates a system of expectation [20] **For Building** aspect of the FM function, this is where FM derives her name; it entails keeping the physical structure in good shape and bringing improvement in the existing structure. This is one of the robust aspects of Facility management. It is worthy of note to state that, Facility management goes beyond just maintaining physical asset but making sure the same asset serves the expectation of the users (that is keeping the structure in shape, maintaining and keeping it up to date so that the user will enjoy using it). *"It involves not only tending the building, but cultivating partnerships, future planning, and asset management"* and *"Facilities are the second largest expense behind the workforce—it's the job of a facility manager to turn the workplace into a competitive advantage, instead of a cost center. It's about ensuring facilities meet the needs of the people using them"* [20].

For Technology: We mean technology integration. Gone are the days when anyone we say I do not need technology. We are the world of technology or in the era of global use of technology. Technology cuts across virtually all section of industries. The use of technology is becoming inevitable for any business to thrive. For facility managers too, they are expected to embrace technology for the delivery of their duty. *"Identifying and implementing the right technology is the chief responsibility of a facility manager"* [20]

II.4 PERFORMANCE EVALUATION AND MEASUREMENT CONCEPT IN FM

The necessity of measurement has long been emphasized. It's a topic that's gotten a lot of attention in recent years, and the adages "you can't manage what you can't measure" and "what gets measured gets done" are all too prevalent in management books. [21] demonstrate the importance of measurement in enabling good planning and control, change management, communication, continuous improvement, resource allocation, motivation, and long-term focus, deeming it a "legitimate management instrument." As a result, measuring is now widely used to aid in the dissemination of fundamental values within organizations. Although there is a lot of literature on performance assessment, relatively little of it gives solid evidence that the concepts work in the real world, particularly in fields like FM. According to a recent assessment of FM literature, there is a trend toward performance measurement, particularly for strategic development. Furthermore, the FM organization creates a conducive environment for

performance measurement research. According to a review of FM literature, performance measurement in FM will be seen in two ways. The first is as a "key success factor" in the strategic planning process, and the second is as a learning process within the FM company. The latter refers to a process in which an FM organization aligns itself with its environment by gathering information, either from the marketplace or via scientific knowledge generation, and applying it to organizational development processes.

II.5 WHY PERFORMANCE MEASUREMENT?

The identification of KPIs and the implementation of performance measurement of a portfolio of buildings, according to [7], focuses on assessing overall performance toward an organization's objective. Furthermore, performance measurement considers the buildings or facilities owned, their current state, extra facilities required to meet organizational goals, concerns to be addressed, and the outcomes of investment or no-investment decisions. As a result, the goal of performance measurement is to understand the effects of management decisions on portfolio success and failure, as well as to suggest changes [7]. According to [22], the facility management unit's capacity to make basic judgments, as well as its ability to create a convincing case for its recommendations, is harmed when it lacks reliable and comparable data on building performance and costs.

Performance measuring aims, according to [23], include determining the extent to which a facility caters to its residents and detecting key concerns affecting its performance negatively. Performance measurement is critical, according to [24] Kincaid (1994), especially for comparisons and developing development methods. Furthermore, it must focus not only on expenses, but also on issues that affect the organization's physical environment. One of the primary reasons for performing performance assessment, according to [25], is to drive performance improvement decision-making techniques by looking into the past, present, and future. Furthermore, one of the driving reasons behind performance measurement is assessing an organization's growth, recognizing the current state of an organization's facilities, making future plans, and producing blueprints to carry out those plans. According [26], quick feedback regarding the building's condition is critical for consistent and continuous improvement in building performance.

According to [5] and [26b] building performance is related not only to the building's functional excellence, but also to the building's contribution to the organization's goals. As a result, buildings assist businesses in achieving their long-term business and other objectives. Facility managers, according to [27], must assess facilities in detail in order to make appropriate management decisions. Building evaluations could take the form of a comprehensive performance evaluation that takes into account architectural and technical characteristics, or a predictive evaluation that links buildings to organizations by detecting performance issues [27]. [28] underlines the relevance of facility performance measurement in evaluating strategies in terms of results and allowing management teams to identify critical issues impacting the organization as well as concerns relating to specific operations.

Sustainable and green construction practices are frequently promoted by facility managers [19]. Sustainable development is described by the World Commission on Environment and Development, also known as the Brundtland Commission, as development that fulfills current demands without jeopardizing future generations' ability to meet their own. Sustainable or "green"

construction is a subset of sustainable development that adheres to the three pillars of sustainable development: economic, social, and environmental advantages. "An outcome of a design that focuses on increasing the efficiency of resource use energy, water, and materials while reducing building impacts on human health and the environment during the building's lifecycle, through better siting, design, construction, operation, maintenance, and removal," according to the definition of green building [29]. Furthermore, a sustainable building "uses a careful integrated design strategy that minimizes energy use, maximizes daylight, has a high degree of indoor air quality and thermal comfort, conserves water, reuses materials and uses materials with recycled content, minimizes site disruptions, and generally provides a high degree of occupant comfort," according to [30] As a result, there is little doubt that integrating sustainability and green construction techniques to buildings will benefit an organization in terms of increased financial returns, improved community standing, increased productivity, and less negative environmental effects [31].

[32] provides a long-term perspective from the early beginnings of facility management to present integration and standardization in his article. A assessment of facility management progress and competency reviews by significant professional associations are presented in order to offer a road ahead for integration in a simplified manner with global potential for impacts. With facility management having matured over the last four to five decades, it's essential to make a stronger link between research findings and their implementation in practice. Focusing on core competencies rather than minute variances in practice will benefit the sector as a whole by giving senior executives a greater grasp of the value facility professionals bring. The importance of sharing best practices around the world is also emphasized. Focus is a significant issue for more advancement and connectedness of research into practice in the facility management sector, according to additional synergy from an investigation of global skills. The author makes suggestions for facility management's further progress and professionalization.

III. RESEARCH METHODOLOGY

The research approach used is similar to [33] notion of discovery through literature, which stresses the development of new knowledge through the use of bibliographic information found in peer-reviewed papers, conference proceedings, and other forms of valid literature. This method is gaining popularity and is being employed in a growing number of research investigations [34-36]. An exhaustive literature search was conducted, which included published books, articles in peer-reviewed journals and conference proceedings, federal facility assessment reports, and presentations at facility management seminars.

III.1 SEARCH STRATEGY

First search TITLE-ABS-KEY ("FACILITY MANAGEMENT" OR "ORGANIZATIONAL EFFECTIVENESS") = **8445**.

Second search TITLE-ABS-KEY ("FACILITY MANAGEMENT" OR "ORGANIZATIONAL EFFECTIVENESS") AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp")) AND (LIMIT-TO (SUBJAREA, "ENGI")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j") OR LIMIT-TO (SRCTYPE, "p")) = **447**.

Third search: TITLE-ABS-KEY ("FACILITY MANAGEMENT" OR "ORGANIZATIONAL EFFECTIVENESS") AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp")) AND (LIMIT-TO (SUBJAREA, "ENGI")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j") OR LIMIT-TO (SRCTYPE, "p")) AND (EXCLUDE (DOCTYPE, "cp")) AND (EXCLUDE (LANGUAGE, "Japanese")) AND (EXCLUDE (SRCTYPE, "p"))=309.

After First Search,

THE SECOND SEARCH limit the search to Facility Management in Open Access Journal, Engineering as subject area, articles in English language, publish journal, conference papers which return: TITLE-ABS-KEY ("FACILITY MANAGEMENT" OR "ORGANIZATIONAL EFFECTIVENESS") AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp")) AND (LIMIT-TO (SUBJAREA, "ENGI")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j") OR LIMIT-TO (SRCTYPE, "p")) AND (EXCLUDE (DOCTYPE, "cp")) AND (EXCLUDE (LANGUAGE, "Japanese")) AND (EXCLUDE (SRCTYPE, "p"))).

III.2 METHODOLOGICAL REVIEW USING VOSVIEWER

Accordingly, a database topic search was done using the "Scopus" electronic publications repository which is considered as one of the largest databases which provide online access to more than 74 million records in over 21,000 peer-reviewed journals. As one of the most popular and comprehensive databases, Scopus yielded the highest number of documents for the keywords search in this study. Using several databases for bibliometric analysis was not feasible due to overlapping of the results and complexity in comparatively analysing bibliometric networks. Hence, the Scopus was selected as the optimal database from which to draw a representative and adequate set of relevant papers for bibliometric analysis. Keywords used to search the relevant papers for this review are: "Facility Management" OR "Organizational Effectiveness". The aforementioned keywords combination was used to access the most suitable papers for the study. To ensure the quality of the review, the researchers considered only the published articles in journal papers, proceedings papers, and book chapters. While other publication categories such as reviews, editorial material, and book reviews were excluded. Accordingly, the initial or first search returned: **8445** results, and after exclusion, analysis was based on (**n= 309**) published papers that were identified.

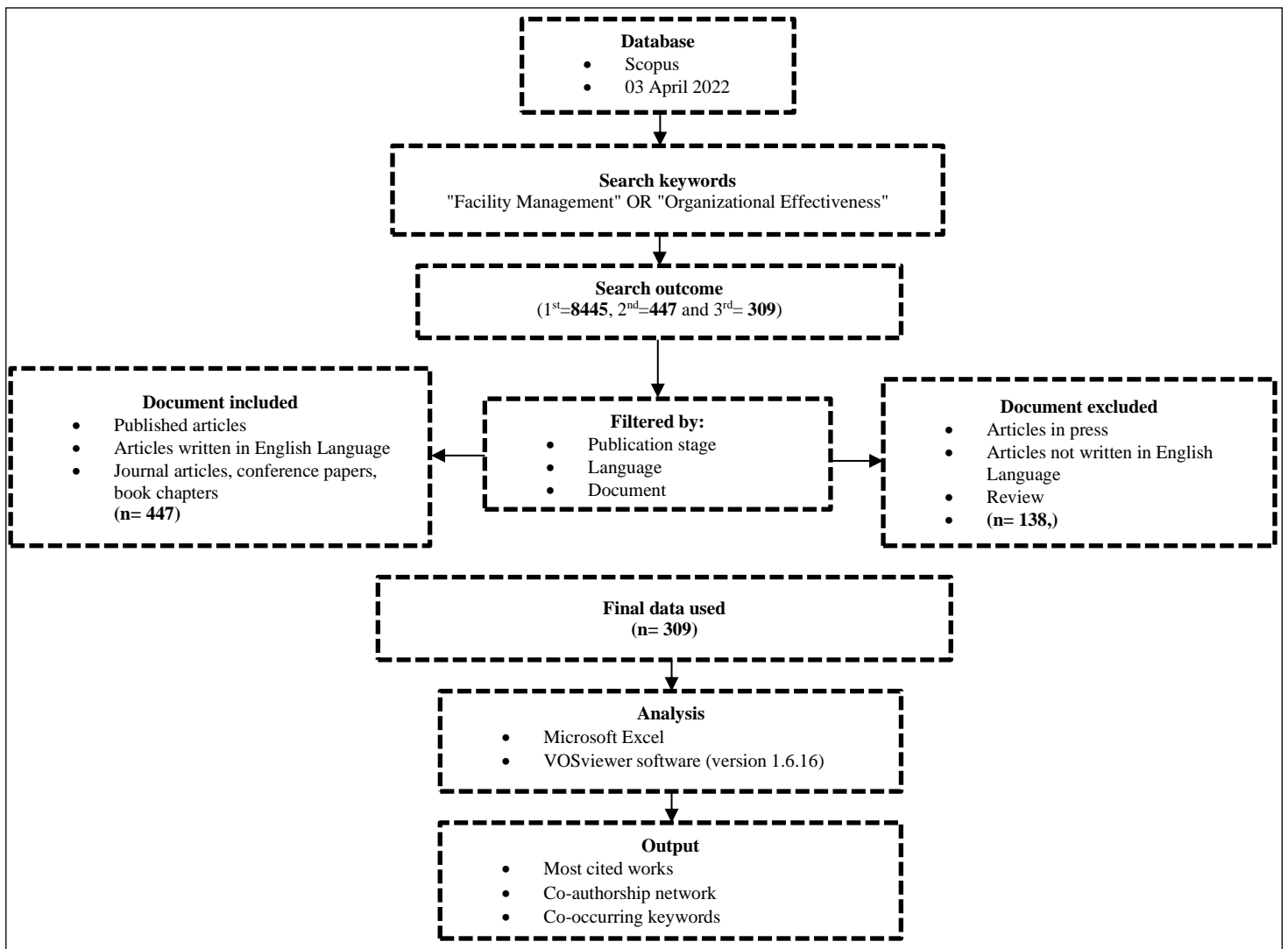


Figure 1: Search flow chat process.
Source: Authors, (2022).

Subsequently, the bibliometric analysis was conducted with the aid of “VOS Viewer” software package which is popular amongst researchers and freely available to download and use, hence widely tried and tested with many available guidelines. VOS viewer is powerful enough, user friendly and provides enough dimensions for the intended bibliometric analysis. Hence, this software package was selected for the study. All the identified ($n= 309$) papers were utilised for the review under the “full counting” approach. “Fractional counting” approach was not used due to the complexity of handling fractional values when counting the papers under the journals and geographical locations. According to the focus of the review, the authors limited the bibliometric analysis variables to keywords, journals and geographical distributions while excluding the more narrowed authorship and organisational level analysis approaches. Next, a comprehensive methodological review was done by selecting the most relevant papers which are directly related to each objective from the search were considered. Wherein, the researchers examined the full text of the ($n= 309$) downloaded papers to identify the best matching studies.

Correspondingly, 309 specific papers were identified for the study. Even though initially identified 309 papers fulfilled the criteria for keywords search, some studies do not fall within the exclusion criteria and this was deselected in the methodological review. Further, some of the papers have not directly addressed the objectives aims. Hence, the authors specifically applied the aforementioned two conditional criteria to select the most suitable papers and identified 309 papers to carry out the methodological review. These papers were categorised into different knowledge categories as the first step of analysis. Each of these papers was then analysed to specifically identify data collection and analysis techniques, network visualisation methods, statistical and software platforms used by researchers.

V. DISCUSSION AND ANALYSIS

V.1 PUBLICATION PER YEAR

Table 1: Publication per year.

Year	Document
1990-1995	2
1996-2001	6
2002-2007	13
2008-2013	31
2014-2019	143
2020-2022	114

Source: Authors, (2022).

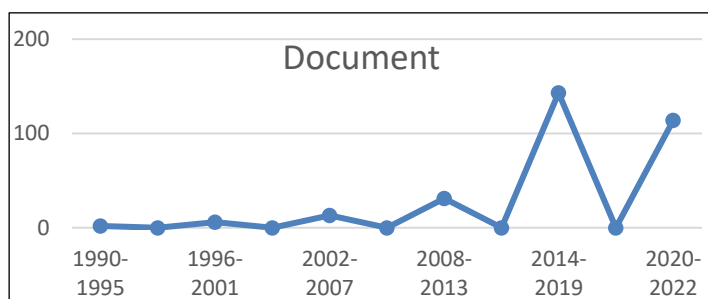


Figure 1: Publication per year.

Source: Authors, (2022).

V.2 PUBLICATION PER CITATION

Evaluating the publication and citation per country in this study is important, this reviews the country showing more interest

in this area of study. Total number of 12 countries were involved. The inclusion criteria were set at 10 minimum document and 10 minimum citations, wherein, 12 countries fall within this threshold. Here, the interest was to determine the number of citations received from each country. It will be interesting to note that, only UK and USA retained their position in order of ranking. Citation shows the impact of a particular publication. Some countries that have large number of documents may not receive as much as citation as some that have less publication. In this case, United Kingdom and USA has the highest number of documents with corresponding citation respectively. As can be seen from the table 2 below, Hong kong has just 18 documents but with 461 citations, meanwhile China has 22 documents but with 364 citations which is less than HK. The same can be witnessed in the remaining as depicted in the table.

Table 2: Document by Citation.

Document by Citation	Citation	Number
United Kingdom	1973	80
United States of America	548	36
Hong Kong	461	18
Australia	364	21
China	233	22
South Korea	266	17
Italy	266	17
Norway	143	21
Spain	105	12
Denmark	65	10
Netherlands	50	14
Malaysia	34	16

Source: Authors, (2022).

V.3 PUBLICATION PER COUNTRY

Evaluating the publication and citation per country in this study is important, this reviews the country showing more interest in this area of study. Total number of 12 countries were involved. The inclusion criteria were set at 5 minimum documents wherein, 12 countries fall within this threshold. United Kingdom has the highest number of documents which is 80, followed by USA with 36 documents, China has 22 documents, Australia and Norway has 21 each, Hongkong has 18 documents while South Korea and Italy has 17 documents each and Denmark has the least minimum number of documents. This can be seen from the table 3 and Figure 2 below.

Table 3: Document by Country or Territory.

Sno	Document by Country	Number
1	United Kingdom	80
2	United States of America	36
3	China	22
4	Australia	21
5	Norway	21
6	Hong Kong	18
7	South Korea	17
8	Italy	17
9	Malaysia	16
10	Netherlands	14
11	Spain	12
12	Denmark	10

Source: Authors, (2022).

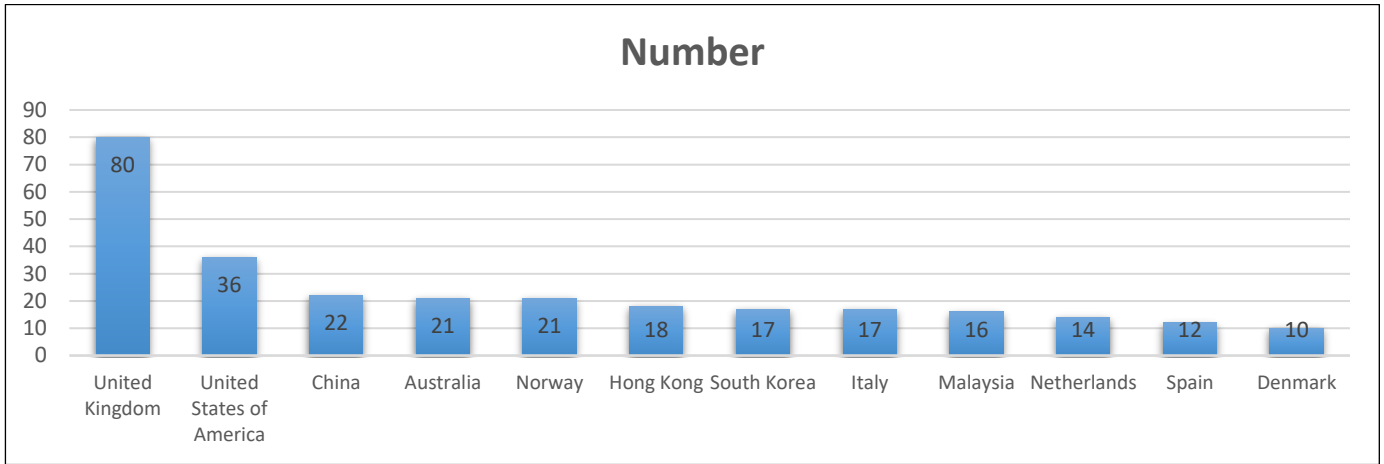


Figure 2: Document by Country or Territory.
Source: Authors, (2022).

V.4 CITATION PER SOURCE

The number of papers taken from each source title was counted. The 309 retrieved papers were published in 12 distinct journals, book chapter and conference proceedings. Only those sources having at least 5 published publications as appear in the Figure 3. IEEE access has 44 citations, the Journal of Automation

in Construction topped the list with 672 citations followed by Journal of facilities with 668 citations. This is followed by Journal of Building (253 citations), Journal of Built environment project and Asset (211 citations). While Advances in Civil Engineering has 156 citations, Building and Environment has (148 citations), and Journal of Building Engineering has (21 citations).

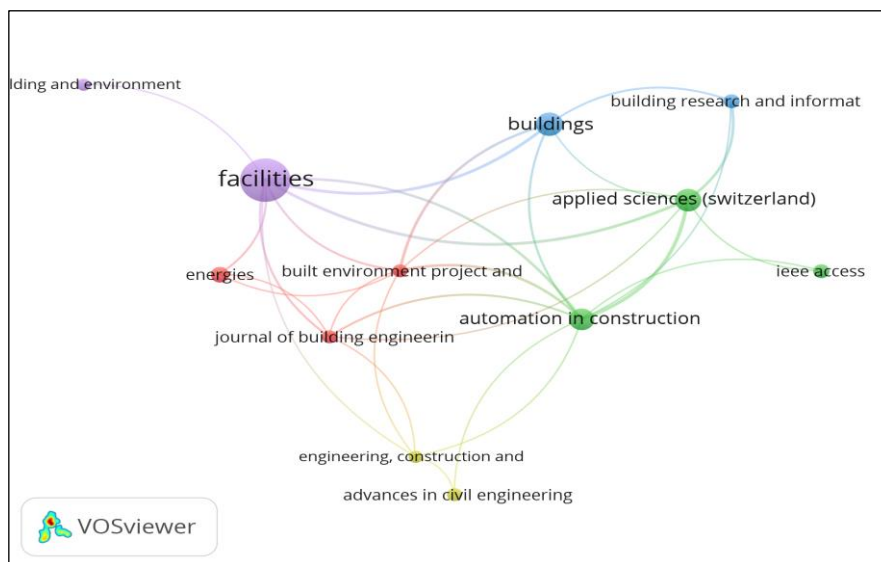


Figure 3: Citation per source.
Source: Authors, (2022).

Table 4: Citation Per Source.

Item	Article Source Type	Citation
1	Automation in Construction	672
2	Facilities	668
3	Building	253
4	Built Environment project and Asset	211
5	Advances in Civil Engineering	156
6	Building and Environment	148
7	Applied Sciences (Switzerland)	90
8	Engineering, Construction and Architecture	85
9	Building and Research Information	57
10	IEEE Access	44
11	Energies	35
12	Journal of Building Engineering	21

Source: Authors, (2022).

V.5 MOST CITED AUTHOR AND PUBLICATION

Evaluating the most cited authors from the total numbers of authors involved in this study is crucial, this will enable us to know the working strength of the other authors, minimum citation criteria was set at 3, where in 10 authors falls within this category as seen in Figure 4. Analyzing the retrieved papers to see the most referenced documents and their areas of specialization was important to completely grasp the understanding of researches in the domain of facility management. From the analysis of most cited published works, the study revealed that Dawood and Kassem are the most cited authors with 186 citations each, followed by 138 citations received from Wang and Haugent, has the least citation of 34 as depicted below.

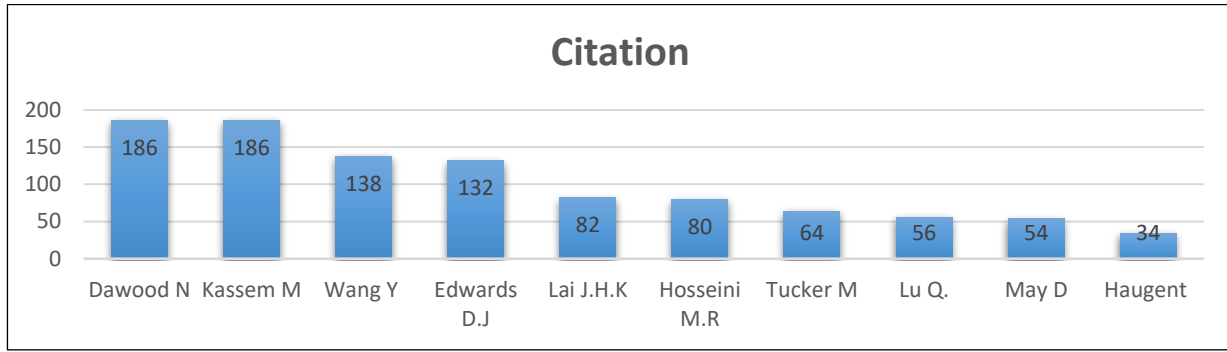


Figure 4: Citation per source.
Source: Authors, (2022).

Table 5: Most Cited Author.

Item	Most Cited Author	Citation
1	Dawood N	186
2	Kassem M	186
3	Wang Y	138
4	Edwards D.J	132
5	Lai J.H.K	82
6	Hosseini M.R	80
7	Tucker M	64
8	Lu Q.	56
9	May D	54
10	Haugent	34

Source: Authors, (2022).

V.6 CO-OCCURRENCE KEYWORDS

The detailed information of the journal publications was then imported in to VOSVIEWER for further analysis. Keyword co-occurrence networks embody the development of Facility Management over time and displays important themes of the field. Figure 5 and 6 show the overall keyword co-occurrence network (Network and Overlay Visualization). Different nodes in the map represent identified keywords that were used to summarize the nature and core of each publication. Links between nodes express relationships of co-occurrence, meaning two different keywords are used together in the same publication. The color of nodes and lines represents different years, and the size of the nodes shows the frequency of keyword co-occurrence. Out of the 2047 keywords,

only 30 meet the threshold. The network visualisation map for the 30 co-occurring keywords and their 4 separate clusters is shown in Figure 5 and 6. The terms "Facility management" and "Office building" are at the heart of it, and all other keywords are linked to these. Cluster 1 has 9 items or co-occurrence keywords, Cluster 2 has 9 items, cluster 3 has 7 items, for cluster 4 and only 5 items.

Figure 5 and 6 below show the keywords that occurred most frequently. First, the frequency of "facilities management" was the highest, which was determined by the theme of this study. Other keywords in the cluster are "Building Information Modelling, Decision Making, Digital Twin, Facility Management and Internet of Things, Asset Management, Information Management, Information Theory, Life Cycle and Maintenance, Buildings, Energy Efficiency, Energy Utilization, Intelligent Buildings, Office Buildings, Sustainability, and Sustainable development, Architectural Design, construction Industry, Design Methodology, Frequency Modulation, Project Management and Survey, Operation and Maintenance, Decision making, Stages, Organization effectiveness, Human Resource Management, Air conditioning, Data transfer, Integration, Semantic, etc." **Facility Management and Facilities Management.**

Information is critically important for supporting efficient and effective building maintenance and day-to-day operations. However, the FM sector continues to struggle with information management. Stakeholders waste a huge amount of money looking for, validating, and/or recreating facility information that should be readily available [37].

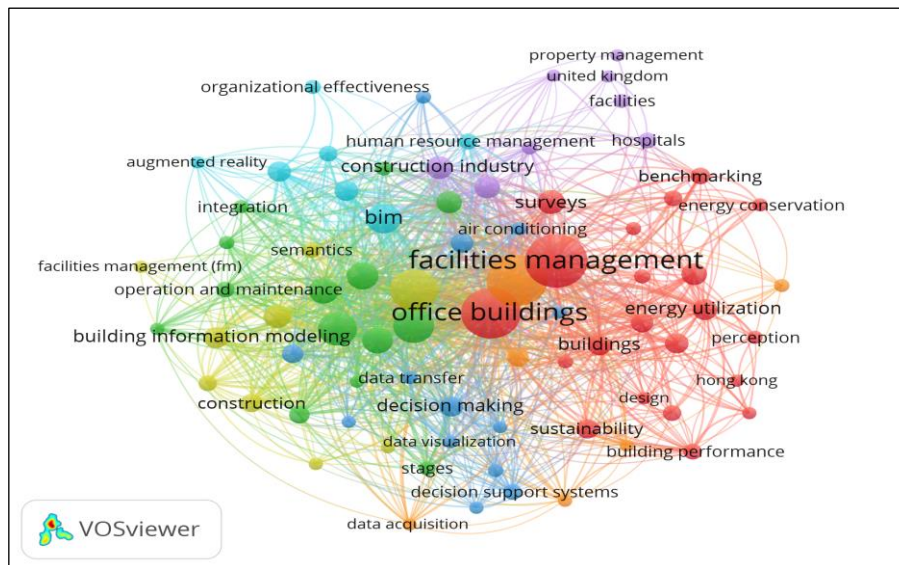


Figure 5: Network Visualization.
Source: Authors, (2022).

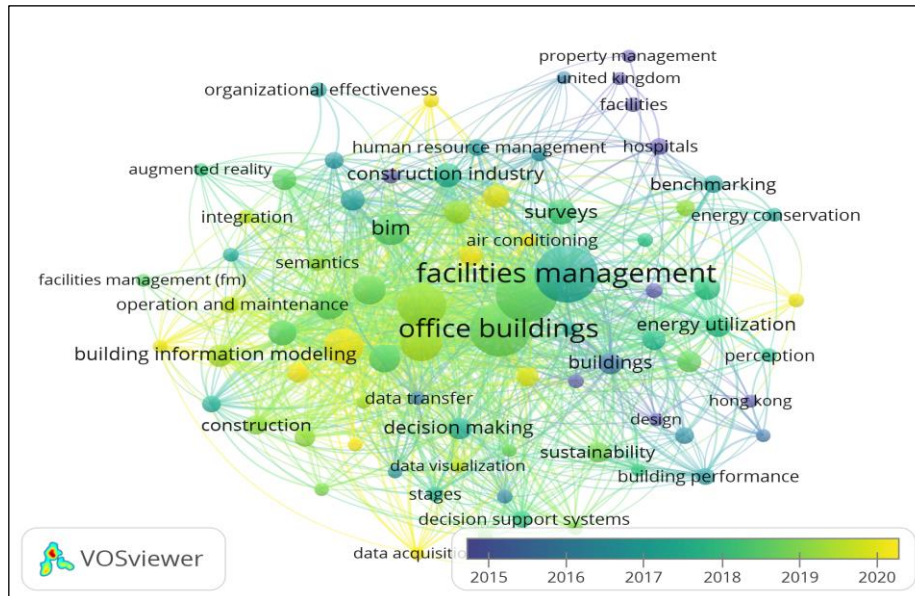


Figure 6: Overlay Visualization.

Source: Authors, (2022).

VI. CONCLUSIONS

Facilities Management research has gotten a lot of attention throughout the world, and with new technologies from allied sectors in the construction business, efforts and research will continue to try to innovate and improve global construction practice in service delivery. This research looked at the bibliometric data from relevant published journals on Facilities Management and how it affects organizational effectiveness studies around the world. The papers came from a variety of nations and were exported from Scopus' core collection of indexed research documents. Yearly publication, publication by document source, publication by citation. The analysis looked at frequency analyses, co-authorship, and co-occurrence among the authors, publication sources, organizations, and countries/locations.

According to the findings of the literature review, there is a need to increase communication between in-house departments and outsourced providers and the Facility Function. facilities management has a significant impact on organizational effectiveness, and effective asset management has a significant impact on organizational growth, which is consistent with [38] assertion that facilities management encompasses the concepts of cost-effectiveness, productivity improvement, efficiency, and employee quality of life. Moreover, some research studies have demonstrated a link between facilities management and organizational effectiveness; for example, [11] discovered a link between facilities management and effective business operations. Similarly, research by [12] found that good facility management increased productivity. Also, the result of the analysis carried out on VOSVIEWERS found that, in terms of overall productivity and contribution among authors, Dawood, N, Kassem M., Wang Y., Edward D.J, Lai J.H.K, Hosseini M.R and Tucker M, Lu Q., May D.H and Haugent as the top ten lead and most cited authors in the field. Meanwhile, the bulk of journal articles on sustainable procurement development came from the United Kingdom, United States, Hong Kong, Australia, China, South Korea, Italy, Norway, Spain, Denmark, Netherlands and Malaysia according to the distribution of the publications.

VII. AUTHOR'S CONTRIBUTION

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