online issn: 1307-6892

irc 2024
XVIII. international research conference
proceedings

open science index 18 2024

january 11-12, 2024 tokyo japan
international scholarly and scientific research & innovation

Open Science

Open Science Philosophy

Open science encompasses unrestricted access to scientific research articles, access to data from public research, and collaborative research enabled by information and communication technology tools, models, and incentives. Broadening access to scientific research publications and data is at the heart of open science. The objective of open science is to make research outputs and its potential benefits available to the entire world and in the hands of as many as possible:

- Open science promotes a more accurate verification of scientific research results. Scientific inquiry and discovery can be sped up by combining the tools of science and information technologies. Open science will benefit society and researchers by providing faster, easier, and more efficient availability of research outputs.
- Open science reduces duplication in collecting, creating, transferring, and re-using scientific material.
- Open science increases productivity in an era of tight budgets.
- Open science results in great innovation potential and increased consumer choice from public research.
- Open science promotes public trust in science. Greater citizen engagement leads to active participation in scientific experiments and data collection.

Open Science Index

The Open Science Index (OSI) currently provides access to over thirty thousand full-text journal articles and is working with member and non-member organizations to review policies to promote and assess open science. As part of the open science philosophy, and by making open science a reality; OSI is conducting an assessment of the impact of open science principles and restructuring the guidelines for access to scientific research. As digitalization continues to accelerate science, Open science and big data hold enormous promise and present new challenges for policymakers, scientific institutions, and individual researchers.

OSI is helping the global scientific research community discover, evaluate, and access high-quality research output. Renowned for its editorially curated and refereed collection of the highest-quality publications, OSI has always been and will remain free-of-charge.

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Open Science Access

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OSI gives one-click access to online full-text PDFs and expands the reach to global society by giving users free access from anywhere around the globe. Through cutting-edge open science collaboration, in an innovative public partnership, the non-profit OSI is devoted to making science open and reusable.

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Open Science

Open Society

An open society allows individuals to change their roles and to benefit from corresponding changes in status. Open science depends to a greater or lesser extent on digital technologies and innovations in structural processes by an open society. When realized, open science research and innovation can create investment opportunities for new and better products and services and therefore increase competitiveness and employment. Open science research and innovation is a key component of thematic open science priorities. Central to the open science digital infrastructure is enabling industry to benefit from digital technology and to underpin scientific advances through the development of an open society. Open science research and innovation can also contribute to society as a global actor because scientific relations can flourish even where global relations are strained. Open science has a critical role across many areas of decision making in providing evidence that helps understand the risks and benefits of different open science choices. Digital technology is making the conduct of open science and innovation more collaborative, more global, and more open to global citizens. Open society must embrace these changes and reinforce its position as the leading power for science, for new ideas, and for investing sustainably in the future.

It is apparent in open society that the way science works is fundamentally changing, and an equally significant transformation is taking place in how organizations and societies innovate. The advent of digital technology is making research and innovation more open, collaborative, and global. These exchanges are leading open society to develop open science and to set goals for research and innovation priority. Open science goals are materializing in the development of scientific research and innovation platforms and greater acceptance of scientific data generated by open science research. Open science research and innovation do not need help from open society to come up with great ideas, but the level of success ideas ultimately reach is undoubtedly influenced by regulation, financing, public support, and market access. Open society is playing a crucial role in improving all these success factors.

Open Science

Open science represents a new approach to the scientific process based on cooperative work and new ways of diffusing knowledge by using digital technologies and collaborative tools. These innovations capture a systemic change to the way science and research have been carried out for the last fifty years. Science is shifting from the standard practice of publishing research results in scientific publications after the research and reviews are completed. The shift is towards sharing and using all available knowledge at an earlier stage in the research process. Open science is to science what digital technology is to social and economic transactions: allowing end users to be producers of ideas, relations, and services and in doing so, enabling new working models, new social relationships and leading to a new modus operandi for science. Open science is as important and disruptive as e-commerce has been for the retail industry. Just like e-commerce, the open science research paradigm shift affects the whole business cycle of doing science and research. From the selection of research subjects to the carrying out of research, to its use and re-use, to the role of universities, and that of publishers are all dramatically changed. Just as the internet and globalization have profoundly changed the way we do business, interact socially, consume culture, and buy goods, these changes are now profoundly impacting how one does research and science.

The discussion on broadening the footprint of science and on novel ways to produce and spread knowledge gradually evolved from two global trends: Open Access and Open Source. The former refers to online, peer-reviewed scholarly outputs, which are free to read, with limited or no copyright and licensing restrictions, while open source refers to software created without any proprietary restriction and which can be accessed and freely used. Although open access became primarily associated with a particular publishing

or scientific dissemination practice, open access already sought to induce a broader practice that includes the general re-use of all kinds of research products, not just publications or data. It is only more recently that open science has coalesced into the concept of a transformed scientific practice, shifting the focus of researchers' activity from publishing as fast as possible to sharing knowledge as early as possible. Open science is defined as the idea that scientific knowledge of all kinds should be openly shared as early as is practical in the discovery process. As a result, the way science is done in the future will look significantly different from the way it is done now. Open science is the ongoing evolution in the modus operandi of doing research and organizing science. This evolution is enabled by digital technology and is driven by both the globalization of the scientific community and increasing public demand to address the societal challenges of our times. Open science entails the ongoing transitions in the way research is performed, researchers collaborate, knowledge is shared, and science is organized.

Open science impacts the entire research cycle, from the inception of research to its publication, and on how this cycle is organized. The outer circle reflects the new interconnected nature of open science, while the inner circle shows the entire scientific process, from the conceptualization of research ideas to publishing. Each step in the scientific process is linked to ongoing changes brought about by open science, including the emergence of alternative systems to establish a scientific reputation; changes in the way quality and impact of research are evaluated; the growing use of scientific blogs; open annotation; and open access to data and publications. All institutions involved in science are affected, including research organizations, research councils, and funding bodies. The trends are irreversible, and they have already grown well beyond individual projects. Theses changes predominantly result from a bottom-up process driven by a growing number of researchers who increasingly employ social media in their research and initiate globally coordinated research projects while sharing results at an early stage in the research process.

Open science is encompassed in five schools of thought:

- the infrastructure school, concerned with technological architecture
- the public school, concerned with the accessibility of knowledge creation
- the measurement school, concerned with alternative impact assessment
- the democratic school, concerned with access to knowledge
- the pragmatic school, concerned with collaborative research

According to the measurement school, the reputation and evaluation of individual researchers are still mainly based on citation-based metrics. The h-index is an author-level metric that attempts to measure both the productivity and citation impact of the publications of a scientist or scholar. The impact factor is a measure reflecting the average number of citations to articles published in an academic journal and is used as a proxy for the relative importance of a journal.

Numerous criticisms have been made of citation-based metrics, primarily when used, and often misused, to assess the performance of individual researchers. These metrics:

- are often not applicable at the individual level
- do not take into account the broader social and economic function of scientific research
- are not adapted to the increased scale of research
- cannot recognize new types of work that researchers are performing

Web-based metrics for measuring research output, popularized as altmetrics, have recently received much attention: some measure the impact at the article level, others make it possible to assess the many outcomes of research in addition to the number of scientific articles and references. The current reputation and evaluation system has to adapt to the new dynamics of open science and acknowledge and incentivize

engagement in open science. Researchers engaging in open science have growing expectations that their work, including intermediate products such as research data, will be better rewarded or taken into account in their career development. Vice-versa, the use, and reuse of open data will require appropriate codes of conduct requiring, for example, the proper acknowledgment of the original creator of the data.

These ongoing changes are progressively transforming scientific practices with innovative tools to facilitate communication, collaboration, and data analysis. Researchers that increasingly work together to create knowledge can employ online tools and create a shared space where creative conversation and collaboration can occur. As a result, the problem-solving process can be faster, and the range of problems that can be solved can be expanded. The ecosystem underpinning open science is evolving very rapidly. Social network platforms for researchers already attract millions of users and are being used to begin and validate more research projects.

Furthermore, the trends towards open access are redefining the framework conditions for science and thus have an impact on how open innovation is produced by encouraging a more dynamic circulation of knowledge. It can enable more science-based startups to emerge thanks to the exploitation of openly accessible research results. Open science, however, does not mean free science. It is essential to ensure that intellectual property is protected before making knowledge publicly available in order to subsequently attract investments that can help translate research results into innovation. If this is taken into account, fuller and broader access to scientific publications and research data can help to accelerate innovation. Investments that boost research and innovation in open science would benefit society with fewer barriers to knowledge transfer, open access to scientific research, and greater mobility of researchers. In this context, open access can help overcome the barriers that innovative organizations face in accessing the results of research funded by the public.

Open innovation

An open society is the largest producer of knowledge, but the phenomenon of open science is changing every aspect of the scientific method by becoming more open, inclusive, and interdisciplinary. Ensuring open society is at the forefront of open science means promoting open access to scientific data and publications alongside the highest standards of research integrity. There are few forces in this globe as engaging and unifying as science. The universal language of science maintains open channels of communication globally. Open society can maximize its gains through maintaining its presence at the highest level of scientific endeavor, and by promoting a competitive edge in the knowledge society of the information age. The ideas and initiatives described in this publication can stimulate anyone interested in open science research and innovation. It is designed to encourage debate and lead to new ideas on what and open society should do, should not do, or do differently.

An open society can lead to a research powerhouse; however, open society rarely succeeds in turning research into innovation and in getting research results to the global market. Open society must improve at making the most of its innovation talent, and that is where open innovation comes into play. The basic premise of open innovation is to open up the innovation process to all active players so that knowledge can circulate more freely and be transformed into products and services that create new markets while fostering a stronger culture of entrepreneurship. Open innovation is defined as the use of purposive inflows and outflows of knowledge to accelerate internal innovation. This original notion of open innovation was primarily based on transferring knowledge, expertise, and even resources from one company or research institution to another. This notion assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they seek to improve their performance. The concept of open innovation is continually evolving and is moving from linear, bilateral transactions and collaborations

towards dynamic, networked, multi-collaborative innovation ecosystems. This means that a specific innovation can no longer be seen as the result of predefined and isolated innovation activities but rather as the outcome of a complex co-creation process involving knowledge flows across the entire economic and social environment. This co-creation takes place in different parts of the innovation ecosystem and requires knowledge exchange and absorptive capacities from all the actors involved, whether businesses, academia, financial institutions, public authorities, or citizens.

Open innovation is a broad term, which encompasses several different nuances and approaches. Two main elements underpin the most recent conceptions of open innovation: the users are in the spotlight and invention becomes an innovation only if users become a part of the value creation process. Notions such as user innovation emphasize the role of citizens and users in the innovation processes as distributed' sources of knowledge. This kind of public engagement is one of the aims of open science research and innovation. The term 'open' in these contexts has also been used as a synonym for 'user-centric'; creating a well-functioning ecosystem that allows co-creation and becomes essential for open innovation. In this ecosystem, relevant stakeholders are collaborating along and across industry and sector-specific value chains to co-create solutions for socio-economic and business challenges. One important element to keep in mind when discussing open innovation is that it cannot be defined in absolutely precise terms. It may be better to think of it as a point on a continuum where there is a range of context-dependent innovation activities at different stages, from research to development through to commercialization, and where some activities are more open than others. Open innovation is gaining momentum thanks to new large-scale trends such as digitalization and the mass participation and collaboration in innovation that it enables. The speed and scale of digitalization are accelerating and transforming the way one designs, develops, and manufactures products, the way one delivers services, and the products and services themselves. It is enabling innovative processes and new ways of doing business, introducing new cross-sector value chains and infrastructures.

Open society must ensure that it capitalizes on the benefits that these developments promise for citizens in terms of tackling societal challenges and boosting business and industry. Drawing on these trends, and with the aim of helping build an open innovation ecosystem in open society, the open society's concept of open innovation is characterized by:

- combining the power of ideas and knowledge from different actors to co-create new products and find solutions to societal needs
- creating shared economic and social value, including a citizen and user-centric approach
- capitalizing on the implications of trends such as digitalization, mass participation, and collaboration

In order to encourage the transition from linear knowledge transfer towards more dynamic knowledge circulation, experts agree that it is essential to create and support an open innovation ecosystem that facilitates the translation of knowledge into socio-economic value. In addition to the formal supply-side elements such as research skills, excellent science, funding and intellectual property management, there is also a need to concentrate on the demand side aspects of knowledge circulation, making sure that scientific work corresponds to the needs of the users and that knowledge is findable, accessible, interpretable and reusable. Open access to research results aims to make science more reliable, efficient, and responsive and is the springboard for increased innovation opportunities, e.g. by enabling more science-based startups to emerge. Prioritizing open science does not, however, automatically ensure that research results and scientific knowledge are commercialized or transformed into socio-economic value. In order for this to happen, open innovation must help to connect and exploit the results of open science and facilitate the faster translation of discoveries into societal use and economic value.

Open Science

Collaborations with global partners represent important sources of knowledge circulation. The globalization of research and innovation is not a new phenomenon, but it has intensified in the last decade, particularly in terms of collaborative research, international technology production, and worldwide mobility of researchers and innovative entrepreneurs. Global collaboration plays a significant role both in improving the competitiveness of open innovation ecosystems and in fostering new knowledge production worldwide. It ensures access to a broader set of competencies, resources, and skills wherever they are located, and it yields positive impacts in terms of scientific quality and research results. Collaboration enables global standard-setting, allows global challenges to be tackled more effectively, and facilitates participation in global value chains and new and emerging markets.

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Open Science

Scholarly Research Review

The scholarly research review is a multidimensional evaluation procedure in which standard peer review models can be adapted in line with the ethos of scientific research, including accessible identities between reviewer and author, publishing review reports and enabling greater participation in the peer review process. Scholarly research review methods are employed to maintain standards of quality, improve performance, provide credibility, and determine suitability for publication. *Responsible Peer Review Procedure:* Responsible peer review ensures that scholarly research meets accepted disciplinary standards and ensures the dissemination of only relevant findings, free from bias, unwarranted claims, and unacceptable interpretations. Principles of responsible peer review:

• Honesty in all aspects of research
• Accountability in the conduct of research
• Professional courtesy and fairness in working with others
• Good stewardship of research on behalf of others

The responsibilities of peer review apply to scholarly researchers at all stages of peer review: Fairness, Transparency, Independence, Appropriateness and Balance, Participation, Confidentiality, Impartiality, Timeliness, Quality and Excellence, Professionalism, and Duty to Report.

Scholarly Research Review Traits:
• Scholarly Research Review Identities: Authors and reviewers are aware of each other's identity

• Scholarly Research Review Reports: Review reports are published alongside the relevant article

• Scholarly Research Review Participation: The wider academic community is able to contribute to the review process

• Scholarly Research Review Interaction: Direct reciprocal discussion between author(s) and reviewers, and/or between reviewers, is allowed and encouraged

• Scholarly Research Pre-review Manuscripts: Manuscripts are made immediately available in advance of any formal peer review procedures

• Scholarly Research Review Final-version Reviewing: Editorial revision of the language and format is conducted on the final version of the manuscript for publication

• Scholarly Research Review Platforms: The scholarly research review process is independent of the final publication of the manuscript and it is facilitated by a different organizational entity than the venue of publication

All submitted manuscripts are subject to the scholarly research review process, in which there are three stages of evaluation for consideration: pre-review manuscripts, chair-review presentation, and final-review manuscripts. All submitted full text papers, that may still be withstand the editorial review process, are presented in the conference proceedings. Manuscripts are tracked and all actions are logged by internal and external reviewers according to publication policy. External reviewers' editorial analysis consists of the evaluation reports of the conference session chairs and participants in addition to online internal and external reviewers' reports. Based on completion of the scholarly research review process, those manuscripts meeting the publication standards are published 10 days after the event date.

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TABLE OF CONTENTS

Work System Design in Productivity for Small and Medium Enterprises – A Systematic Literature Review

S. Halofaki, D.R. Seenivasagam, P. Bijay, K. Singh, R. Ananthanarayanan

***Abstract*—**This comprehensive literature review delves into the effects and applications of work system design on the performance of Small and Medium-sized Enterprises (SMEs). The review process involved three independent reviewers who screened 514 articles through a four-step procedure: removing duplicates, assessing keyword relevance, evaluating abstract content, and thoroughly reviewing full-text articles. Various criteria such as relevance to the research topic, publication type, study type, language, publication date, and methodological quality were employed to exclude certain publications. A portion of articles that met the predefined inclusion criteria were included as a result of this systematic literature review. These selected publications underwent data extraction and analysis to compile insights regarding the influence of work system design on SME performance. Additionally, the quality of the included studies was assessed, and the level of confidence in the body of evidence was established. The findings of this review shed light on how work system design impacts SME performance, emphasizing important implications and applications. Furthermore, the review offers suggestions for further research in this critical area and summarizes the current state of knowledge in the field. Understanding the intricate connections between work system design and SME success can enhance operational efficiency, employee engagement, and overall competitiveness for SMEs. This comprehensive examination of the literature contributes significantly to both academic research and practical decision-making for SMEs.

***Keywords*—**Literature review, Productivity, Small and medium-sized enterprises-SMEs, Work system design.

I. Introduction

In academic research, bibliometric analysis has emerged as a powerful tool for the objective and quantitative assessment of bibliographic materials. It assists in the systematic organization of information within specific academic fields. This analytical approach, which employs keywords for investigation, allows for a thorough exploration of research domains, providing a nuanced understanding of topics and connections at a detailed level [1]. The current study follows a structured methodology as outlined by Castillo-Vergara et al., [2] embarking on a systematic journey that encompasses well-defined phases: defining the research domain, selecting appropriate databases, refining research criteria, categorizing gathered materials, and conducting a comprehensive analysis.

Although small -medium enterprises (SMEs) are currently coping with the global competition of larger organizations ever expanding capacities [3], it does not mean that the modern global landscape isn't witnessing a significant acknowledgment of the pivotal role Small and Medium-sized Enterprises (SMEs). These small organizations play a crucial role in fostering sustainability and competitiveness [4]. As countries increasingly embrace SMEs as catalysts for social and economic development, these enterprises are acknowledged for their contributions to employment, economic vitality, innovation, and entrepreneurial spirit, as underscored by notable figures such as Supachai Panitchpakdi, the Secretary-General of the United Nations Conference on Trade and Development [5]. SMEs, which constitute a substantial majority of registered businesses, not only possess the potential to transform developing economies but also bridge the gap between informal family enterprises and formalized corporate sectors, fostering competition and entrepreneurship.

Given the growing significance of SMEs, this systematic review aims to explore the potential implications and applications of Work System Design (WSD) on productivity within the SME sector. Systematic reviews, characterized by their rigorous methodology for consolidating knowledge, play a vital role in summarizing the current state of knowledge, identifying research priorities, addressing complex questions that extend beyond individual studies, and formulating theories about phenomena [6]. Through the lens of a systematic review approach, our objective is to provide an impartial and comprehensive analysis [7], thereby contributing to a deeper understanding of how WSD influences productivity in SMEs.

II. Literature Review

A. Systematic Approach

To gain a better understanding of the study's nature, it was necessary to address and formulate several key questions. When reviewing the literature, it's essential to have a clear understanding of the research's direction and scope to ensure an objective and methodical process. The current study encompassed the following steps, as outlined by Hanley and Cutts [7]:

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1. Establishing clear objectives with predefined eligibility criteria for studies.
2. Employing an explicit and reproducible methodology.
3. Conducting a systematic search aimed at identifying all studies that meet the eligibility criteria.
4. Assessing the validity of the findings from the included studies.
5. Systematically presenting and synthesizing the characteristics and findings of the included studies.

B. Predefined Objectives

The study's initial focus is on comprehending its title to establish how data collection and analysis will align with appropriate eligibility criteria. This is crucial for exploring the implications and applications of Work System Design (WSD) within the context of Small and Medium Enterprises (SMEs), requiring a comprehensive, multi-faceted approach carried out through specific screening procedures.

Firstly, it is imperative to discern the key implications and applications of work system design within SMEs, examining how task, process, and resource organization impacts these enterprises. This insight allows for a deeper exploration of effective operational strategies for SMEs. Subsequently, the study investigates the specific impact of work system design on SME productivity, exploring successful cases and mechanisms through which productivity enhancements can be measured.

The establishment of clear study objectives informs the creation of eligibility criteria, adding structure to the data selection process.

C. Eligibility Criteria

This study analyzes publications from 1997 to 2023, encompassing the present date to capture the early emergence of Small and Medium-sized Enterprises (SMEs) in the global market. The eligibility criteria were carefully designed to promptly identify relevant documents required for this study. To achieve this, specific keywords were identified, including "work system design", "job design", "designing job", "work design", "management work systems", and "productivity", along with "small and medium-sized enterprises" or "SMEs". Special attention was given to avoid using words that could introduce ambiguity in determining document relevance, such as "Lean Management", "Entrepreneurship", "Innovation", "Business Management", and "Quality Control/Management", among others.

With these keyword criteria established and clarified, the next step involves determining the data selection and retrieval process.

D.Selection Process for the Data

The process of data retrieval in systematic reviews is of paramount importance, as it must be explicit and reproducible, a practice recommended by Hanley and Cutts [7] to facilitate potential verifications. In this study, all data were extracted from Scopus, a database within the Elsevier platform. Scopus was chosen for its extensive collection of regularly updated and diverse journals, providing researchers with the flexibility to refine, sort, and prioritize their searches effectively.

With our stringent eligibility criteria in place, the ability to further refine and sort searches by applying specific limitations becomes crucial. Scopus offers this functionality seamlessly. Additionally, it is readily accessible through our institution. The following search key was applied to retrieve information in this study:

((“work system design” OR “job design” OR “designing job” OR “work design” OR “designing a work system”) AND (productivity) AND (“small and medium-sized enterprises” OR smes))) AND (LIMIT-TO (SUBJAREA, “BUSI”)) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “ch”) OR LIMIT-TO (DOCTYPE, “cp”)) AND (LIMIT-TO (LANGUAGE, “English”)) AND (LIMIT-TO (SRCTYPE, “j”) OR LIMIT-TO (SRCTYPE, “p”)).

The search, conducted on 11/8/2023 at 4:30 PM, included the application of search limitations and keywords. These restrictions were put in place to ensure a focused exploration of ‘Business, Management, and Accounting’, aligning with the study's primary objective of investigating the impact of Work System Design (WSD) on SMEs. This category encompassed the majority of relevant articles. Additionally, specific document-type restrictions were implemented, encompassing articles, conference papers, and book chapters. The source type considered both journals and conference proceedings. Furthermore, only documents in the English language were considered. To facilitate record screening, all data were then extracted in CSV format, with citation information and abstract & keywords information selected for exportation. This format choice was made to streamline the screening process.

E. Screening of the Literature

Following the application of the search key and defined limits, the search returned 514 records spanning from 1993 to 2023. All 514 records were initially exported for sorting and screening, and upon a preliminary review, two duplicates were identified and removed, leaving 512 records for further scrutiny.

To ensure unbiased screening, the process engaged multiple individuals. The screening procedure consisted of three stages: firstly, screening records based on author keywords; secondly, evaluating abstracts against the eligibility criteria, and lastly, a thorough examination of the full texts.

Records were systematically evaluated using a three-tiered rating system: 0 for articles lacking discernible relevance to the review's objectives, 1 for those closely aligned with the review's focus, and 2 for articles that appeared related but required further scrutiny for potential inclusion in the PRISMA review. This method facilitated efficient categorization during the screening process, setting the stage for streamlined subsequent review and analysis stages.

F. Analysis and Synthesis of Retrieved Data

After retrieving pertinent records, a meticulous quality assessment is imperative for enhancing the review's credibility. It serves to identify variations in methodologies, populations, and outcomes across studies, aiding in the understanding of heterogeneity in the research landscape [6]. This scrutiny

encompasses highlights, limitations, gaps, innovative ideas, study designs, and potential biases across all retrieved records.

To amplify data analysis, Leximancer software is utilized, offering a systematic approach to categorize words into concepts and uncover latent themes within the text. This tool generates a two-dimensional map, visually representing concept relationships and strengths. It aids researchers in data interpretation by offering a tangible representation of the semantic structure of concepts.

In Leximancer's thematic analysis process, researchers can adjust the thematic size parameter, influencing the number of themes generated. This parameter ranges from an initial setting of 50% (resulting in six themes) to 55% (yielding four themes) and, finally, 100% (identifying two highly connected themes: risk and confidentiality). The software employs color coding, with red denoting the primary theme, and cooler colors indicating diminishing significance. All initial concepts remain visible but tend to collapse under dominant themes. The resulting map showcases the underlying concepts contributing to dominant themes, highlighting connectivity [8]. Analyzing pathways reveals specific examples of these connections, offering insights into the overall conversation.

III. Results

A. Study Selection

It was diligently adhered to the PRISMA flow chart (Fig. 1) to ensure a comprehensive screening process. At each stage of the screening, careful consideration was given to the eligibility criteria established at the outset of the study.

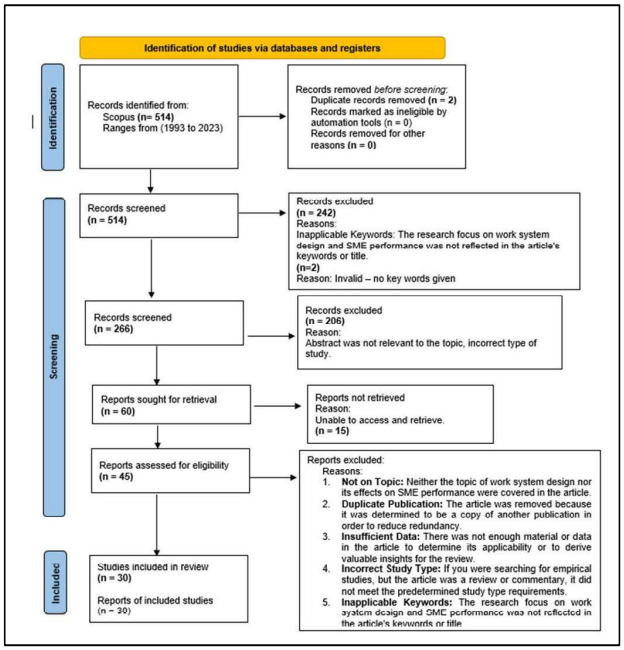

Fig. 1 PRISMA flow chart

The initial screening phase involved a meticulous evaluation of the authors' keywords. Commencing with 512 records (after duplicates were removed), the average number of records meeting the eligibility criteria from all three students was 266. Unfortunately, 246 studies were excluded as they did not contain any of the required eligibility keywords. The subsequent screening stage involved the assessment of each of the 266 study's abstracts. In this stage, all abstracts were thoroughly read and rated accordingly using the three-tiered system. At the end of this screening process, only 60 were found to be relevant and closely accurate to the eligibility criteria and the objectives of the study. These 60 were then processed for further screening and assessment.

The final screening stage included the assessment of the articles' full text to determine the true relevance of their contexts. During the retrieval process of the articles, 15 were found to be unretrievable from the available databases and were promptly removed. However, 45 were retrieved, and their full texts were screened. At the end of this process, only 30 articles were left, which were processed further in an extensive quality assessment.

B. Risk of Bias in Studies – Quality Assessment

PRISMA Flow chart illustrates a reduction of records from 514 to 30 studies. This reduction underscores the rigor employed in the data selection process to ensure strict adherence to eligibility criteria. Moreover, the process continued to address potential heterogeneity across the retrieved data, achieved through an additional quality assessment of the final 30 selected records. The template for the rigorous evaluation of each article is provided in Table I.

TABLE I
CRITICAL EVALUATION TEMPLATE FOR EACH ARTICLE

Title	*Author*	*Location*	*Published Date*	*Methodology*		*Key Findings*		
				Data Collection Method	*Study Design/ Type*	*Highlights*	*Gaps*	*New Ideas*
-	-	-	-	-	-	-	-	-

To mitigate bias in the data collection process, each of the 30 records underwent further evaluation for content, authorship similarities, location, and year of publication. They were graded for their risk of bias using a three-point system, with 3 representing the lowest level of bias [6]. Quality assessments for the specific areas of focus in the systematic literature review can be found in Table II through Table VI. Potential sources of bias in these studies may arise from various factors. These include the possibility of authors conducting research in locations or among populations to which they have a sentimental connection. This potential bias is inferred from the author's known affiliation with a specific location. Additionally, the study design can influence bias, with methods like cross-sectional studies typically exhibiting more heterogeneity compared to randomized study designs.

C. Results of Synthesis (ROS) – Applications of Corporate Social Responsibility

Work System Design (WSD) involves the intentional organization of tasks, processes, human resources, and machinery to achieve specific objectives. Implementing WSD in small and medium enterprises (SMEs) can enhance efficiency and productivity, but it presents challenges. The collected data places significant emphasis on corporate social

responsibility (CSR), which pertains to ethical and responsible organizational operations concerning the environment and society. The research discusses the potential difficulties SMEs face when striving to implement WSD while maintaining CSR commitments [9]. It becomes a delicate balance of financial resources. While WSD prioritizes profitability and cost-efficiency, CSR may necessitate additional funding for sustainability.

TABLE II
CSR QUALITY ASSESSMENT

Quality Assessment				
Author	Study Design	Risk of Bias	Grading	Rationale
Chen [9]	Survey (Cross-Sectional)	High	2	The study highlights CSR's importance in SMEs' business model innovation, despite being survey-based and having acknowledged limitations. It also recognizes the need for a larger sample size, reflecting objectivity

Among the 30 retrieved articles, only one addressed the potential impact of CSR on WSD, whose quality assessment is displayed in Table II. It can be observed from Table II that the study received a (possible) high-risk ranking due to the limited generalizability of its sample population. The article was assigned a rating of 2, recognizing that some bias may exist in the method of sample collection. However, the author exhibited objectivity by acknowledging the need for a larger sample size, thus justifying their sound judgment in interpreting and analyzing the study's results despite the limitations in the study's design.

D. ROS – I4.0 Technology

TABLE III
I4.0 QUALITY ASSESSMENT

Quality Assessment				
Author	Study Design	Risk of Bias	Grading	Rationale
Reiman et al., [10]	Survey (Cross-Sectional)	Medium	3	Qualitative analysis carried out extensively covered a wide range of literature on workplace arrangements across five decades.

The study further underscores the importance of human factors in conjunction with Industry 4.0 (i4) when implementing Work System Design (WSD) in SMEs. Industry 4.0 involves digital technology, automation, and data analytics integration. Adapting to new technologies is vital for SMEs to stay competitive in today's dynamic market. Implementing i4 technologies enhances work systems' efficiency and safety. However, it presents challenges like resistance to change, significant capital investment, and intensive employee training for human-machine collaboration [10]. Table III shows the quality assessment for I4.0 technology in WSD to validate information reliability. The study, which covered workplace arrangements across five decades, received a medium bias ranking due to the population size, but a 3 for grading, highlighting its comprehensive literature coverage.

E. ROS-Lean Systems in SMEs

Another pertinent concept from the literature is the application of lean principles in SMEs concerning work system design. Lean focuses on waste reduction, process optimization, and operational efficiency. Creating an optimized work system goes beyond just developing one. Implementing lean in WSD offers numerous advantages, including process optimization, reduced manufacturing lead time, and enhanced overall productivity. SME employees are typically versatile, engaging in various tasks, aligning well with the lean philosophy [11].

TABLE IV
LEAN SYSTEM QUALITY ASSESSMENT

Quality Assessment				
Author	Study Design	Risk of Bias	Grading	Rationale
Jadhav et al., [11]	Case Control Study	Low	1	This qualitative study recognizes the limitations of literature reviews and provides valuable insights into potential job trends. It highlights the importance of consistently maintaining accurate concepts, enhancing its overall value, and underscores the need for clear conceptual definitions.

Table 4 presents a quality assessment of the lean system in WSD conducted by Jadhav et al. [11]. This study, a case-controlled one, processed results qualitatively, systematically controlling the information's cross-referencing across case studies and literature. Consequently, the study exhibits a low risk of bias, rendering the information reliable and valid. The study's consistent efforts to ensure accurate results warrant a grade of 3, enhancing the study's value and result clarity.

F. ROS – High Performance Work Systems (HPWS)

The literature highlights the crucial role of human resource (HR) practices in high-performance work systems, with a focus on factors like employee engagement, skill development, and overall organizational performance, all closely connected to HR practices [12]. Among the 30 reviewed articles, around 66.67% of them explored aspects of high-performance work systems (HPWS) and their impact on Work System Design (WSD) in small and medium-sized enterprises (SMEs). Specifically, Werner's [13] study identified several HPWS elements, such as strategy, management practices, organizational structure, HR systems, and more. In this context, 20 out of the 30 articles discussed these HPWS elements and their implications for SMEs.

Several key findings emerged from these studies. First, to achieve organizational goals, it is essential to establish

performance assessment systems [14] to evaluate employee motivations, with extrinsic motivation playing a crucial role in enhancing performance [15], [16]. Furthermore, intrinsic motivation is equally significant, as it drives employees to perform tasks to achieve personal satisfaction [17]. However, the interplay between extrinsic and intrinsic motivations must be carefully considered [18].

Moreover, the literature extensively covered the use and development of human resource management (HRM) in SMEs. HRM bundles, including training, development opportunities, and incentives, were found to enhance employee performance and their sense of ownership for the organization [19]. Additionally, a skilled, flexible, and committed workforce can effectively manage aligned processes [20]. Knowledge sharing through HRM practices was identified as a means to enhance employee performance [21], [22]. Positive intra-organizational relationships, driven by good HRM, contribute to critical processes such as communication and innovativeness [23], [24].

Additionally, transformational leadership and stress reduction at the managerial level were noted as factors affecting employee retention. The willingness of employees to perform is influenced by lower task formalization and the trustworthy behavior of management. These HPWS elements are interconnected and can be constructed into an effective system benefiting both employees and employers, ultimately contributing to a firm's productivity. A study by Fabi et al. [25] confirmed that HRM capabilities exert the most influence on SME productivity.

A quality assessment of these HPWS studies (Table V) reveals that many exhibit a medium to high risk of bias due to various factors such as study design, authors' connection with the sample population, and study location. This risk does not necessarily discount the studies but provides insight into the authors' potential influence on the results. For example, Muhammad and Yasir [24] had a low bias risk due to their randomized sampling method, while Glińska-Neweś et al. [22] had a higher risk due to survey sampling, which allowed more author control over sample selection.

TABLE V
HPWS QUALITY ASSESSMENT

Quality Assessment				
Author	Study Design	Risk of Bias	Grading	Rationale
Chadwick and Li [12]	Survey	Medium	2	The design study is a critical analysis of previous data where the biggest detriment is data from 2002
Tatila et al., [14]	Survey (Cross-sectional	Low	3	This study focuses on motivation while introducing fresh concepts connected to performance-measuring systems utilizing a qualitative methodology.
Andrade and Westover [15]	Cross-sectional	High	1	The study has no significant data extraction besides the extraction of existing data.
Chowdhury et al., [16]	Survey	Medium	2	Research relies heavily on external data and lacks quantitative analysis
Diamantidis and Chatzoglou [17]	Cross sectional	High	1	This study examines the job-related factors that affect employee performance in SMEs.
Baule and Soost [18]	Survey	Low	3	Since the survey was distributed through master's students, there is a bias of only highly qualified employees answered the survey.
Liu et al., [19]	Cross-sectional	Medium	2	This study focuses on the relationship between HRM bundle and job performance in SMEs in China.
Lee et al., [21]	Convenience Sampling	Medium	1	This study addresses the influence of roles of trust and knowledge sharing on organizational performance.
Glinska-Newes et al., [22]	Survey	High	1	The focus of this study is mostly on the role of positive relationships at work and internal communication in stimulating innovation creation in organizations.
Hassan et al., [23]	Cross-sectional	Medium	1	It focuses primarily on transformational leadership, compensation and rewards and employee retention in the private sector.
Muhammad & Yasir [24]	Simple random sampling	Low	3	This study focuses on how functional flexibility and job autonomy affect the performance of employees in SMEs in Pakistan.
Fabi et al., [25]	Cross-sectional	Medium	2	This study uses structural equation modelling to shed light on how strategic capabilities relate

				to the productivity of SMEs.

G.ROS – Challenges of WSD Applications in SMEs

The literature delves into challenges associated with implementing Work System Design (WSD) in SMEs, including financial constraints, resistance to change, and limited data availability. Financial limitations, as the most common obstacle, stem from the significant investment required for WSD, which includes technology, upskilling, and worker training. SMEs often operate on tight budgets, making the long-term return on investment from WSD discouraging. Successful WSD implementation necessitates cooperation among all firm-level stakeholders, but resistance often arises from employees due to the uncertainty and disruption of routines. Employee engagement plays a crucial role in SMEs, so clear communication and reasoning are crucial to mitigate resistance.

TABLE VI
QUALITY ASSESSMENT ON WSD IMPLEMENTATION CHALLENGE

Quality Assessment				
Author	Study Design	Risk of Bias	Grading	Rationale
Utrilla et al., [26]	Cross-sectional	Medium	1	The grade of 1 was given based on the study's lack of generalizability of study as the study design was cross-sectional.

The challenge of limited data availability for WSD implementation is only addressed in one study by Utrilla et al. [26] However, the quality assessment of this study shown in Table VI indicates potential bias due to its specific sample. Conducting a longitudinal sampling approach may provide a more comprehensive understanding of the challenges associated with WSD implementation in SMEs.

H.ROS – Structural Equation Modelling (SEM): Predominant Analysis Tool

Among the retrieved articles, 16 out of the 30 underwent quantitative analysis, with a particular focus on Structural Equation Modeling (SEM) methods, which bolster the validity of their findings by utilizing various models to elucidate the relationships between variables based on theoretical models [27]. Statistical models are employed to test the research hypotheses. Studies conducted by Fabi et al. [25], Makhamreh et al. [28], Bayo-Moriones et al. [29], Diamantidis & Chatzoglou [17], and Stoffers et al. [30] employed SEM-PLS (Partial Least Squares) to quantitatively analyze variables. Other SEM forms include regression, path models, and confirmatory factor analysis, as defined by Lomax [27]. Regression models, used by Arthur et al. [31], Tatila et al. [14], Glińska-Neweś et al. [22], and Muhammad & Yasir [24], focus on comparing different outcomes for projected hypotheses, helping researchers align their models with observational data. Confirmatory factor analysis, preferred in studies by Jyoti & Rani [32], Dhar [33], Diamantidis & Chatzoglou [17], and Utrilla et al. [26], is especially suitable for reducing large data sets into smaller, more manageable factors, enhancing data preservation.

IV. DISCUSSION

Work System Design (WSD) holds significant importance for small and medium enterprises (SMEs), although its implementation can be a daunting task. The data collected has shed light on the challenges related to WSD, including conflicts with Corporate Social Responsibility (CSR), resistance to change, resource constraints, the vital role of HR practices, and supportive systems like lean.

However, a robust revelation from the extensive results underscores the pivotal role of High-Performance Work Systems (HPWS) in enhancing SME productivity. Elements constituting HPWS, as identified in the study, encompass managerial incentives, opportunities, and leadership structures, all of which significantly impact employee performance and productivity [25]. The challenge now lies in adapting these elements to SMEs, which have limited resources and capabilities for work structure transformation.

Nonetheless, as Werner [13] states, large-scale change entails higher risks and costs. SMEs have the advantage of being more flexible and less exposed to such risks, making the implementation of HPWS more feasible and cost-effective [12]. The initial expenses of change can be outweighed by the subsequent performance and productivity gains. Moreover, it's apparent that corporate social responsibility is intricately linked to HPWS. According to Werner [13], one of the elements of HPWS is the incorporation of beliefs and values within the workplace. SMEs can integrate CSR into HPWS by making it a core part of the company's vision and mission, aligning business strategies with CSR goals. This comprehensive approach ensures that organizational structure, changes, and improvements revolve around the company's CSR-focused vision and values.

However, it is essential to acknowledge that alterations to a company's strategic priorities and objectives must be approached with careful consideration. Such changes may lead to adjustments in job positions and structures, potentially resulting in job mismatches [34]. Neglecting this aspect could prove detrimental to SMEs. Therefore, it becomes even more crucial for SME leaders and managers to possess the entrepreneurial skills necessary to address this issue, as emphasized by Fabi et al. [25]. They should strive to cultivate the strategic entrepreneurial capabilities required to deliver on their Corporate Social Responsibility (CSR) commitments. This, in turn, will enhance the connection with customers within the organization [35].

A significant limitation of many SEM-based studies, as revealed by Fabi et al. [25], Makhamreh et al. [28], Stoffers et al. [30], Diamantidis and Chatzoglou [17], Jyoti and Rani [32], and Utrilla et al. [26] is their reliance on cross-sectional data collection, which captures information at a specific point in time or location, leading to self-reported variables and a higher risk of bias. To address this limitation, the authors advocate for a shift toward longitudinal studies, which, as demonstrated by Stoffers et al. [30], Fabi et al. [25], and Mashavira [36], offer more robust evidence, additional insights, and improved generalizability of findings. The choice of study design and structure is shown to be as vital as the analysis method, directly

impacting result reliability. Furthermore, a promising recommendation from Dahooie et al. [37] suggests the adoption of a data evaluation analysis using fuzzy DEA tools, providing clearer insights into productivity in diverse organizations, which merits exploration in future research.

Topic modelling was carried out using Leximancer software, which employs natural text mining to uncover themes within a text collection. In Figure 2, the model reveals clusters formed around keywords like SME, leadership, and employee performance. This clustering implies that the articles collected are closely aligned with the focus of this study, validating the screening and data extraction process.

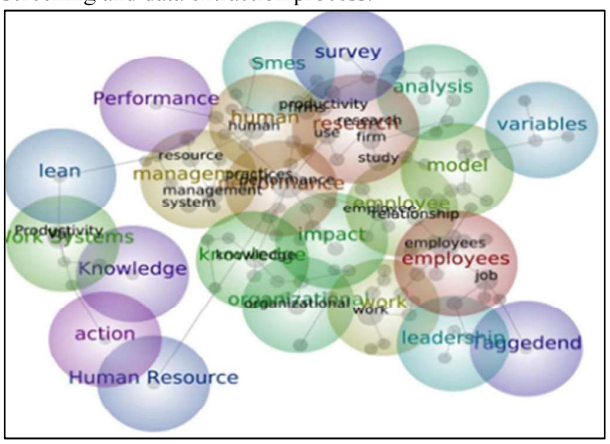

Fig. 2 Leximancer Topic Modelling

It's essential to interpret Figure 2 accurately. Prominent, bold-colored themes signify the most crucial relationships between themes. For example, the red-colored themes, such as performance, employees, and research, are the most prominent, which is expected since most of the 30 articles are research-based, focusing on employees and performance in businesses. A smaller cluster at the bottom-left of the model appears somewhat disconnected from the main cluster in the middle. Human Resources is directly connected to Performance, indicating a strong link between HR and performance, as discussed in the articles. While HR isn't directly connected to Lean, it indirectly relates through common nodes like Work systems, Productivity, Action, and Knowledge. This suggests that HR and Lean management share a common relation through these elements.

Therefore, by examining the topic model, one can deduce the connections between major topics and themes. HR, as an element of HPWS, is interrelated with Lean systems. This implies that implementing HPWS in SMEs must inherently incorporate Lean systems into the organizational structure, a notion supported by Werner [13], who identified total quality management as a popular practice linked to high-performance work systems.

V. Conclusion

The research conducted an in-depth exploration of the practical applications and implications of Work System Design (WSD) within Small and Medium Enterprises (SMEs) through a comprehensive systematic literature review. The following key insights emerged from the analysis:

- Effective implementation of High-Performance Work Systems (HPWS) and the consolidation of its elements significantly enhance SMEs' performance and productivity.
- While Corporate Social Responsibility (CSR), Industry 4.0 (I4) technology, and Lean systems might not have a direct impact on SME productivity, the visual analysis revealed their potential integration into HPWS to boost productivity in SMEs.
- The utilization of the PRISMA approach, as depicted in the PRISMA Flow Chart, ensured the systematic extraction of vital and relevant data from a large dataset, streamlining the data management process.
- The outcomes of topic modelling assured validation for the accuracy and applicability of the screening and data extraction methods.
- To mitigate bias in future studies employing Structural Equation Modeling (SEM) for data analysis, the adoption of longitudinal study designs instead of cross-sectional methods is recommended.

In summary, this analysis offers valuable insights to assist SMEs in navigating the complexities of WSD. It sheds light on the challenges posed by CSR, the adoption of new technologies, the pivotal role of Human Resource Management (HRM), and the benefits of optimizing work processes. The findings contribute to a clearer understanding of the relationship between WSD and SME productivity.

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