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RESEARCH OUTPUT ON LEATHER TECHNOLOGY: A SCIENTOMETRIC STUDY ON WEB OF SCIENCE DATABASE DURING 2019 TO 2023

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ABSTRACT

The study analyses research publications in leather technology during 2019-2023. The data was obtained from Web of Science database. A total of 1906 records used for the present analysis were downloaded from the Web of science database. year wise publication, type of documents, Language wise publications, Top Ten most prolific authors, the top fifteen journals, Top Ten Cited Reference Records, List of Top Ten Institution wise publications, List of Top Fifteen Words and List of Top Twenty Country wise publications done as part of the present scientometric study.

Keywords: Scientometric study, Leather Technology, Web of Science Database, Cited Reference.

1. Introduction

Leather Technology is an engineering branch that focuses on synthesizing, producing, and refining leather for efficient use. It also involves the synthesis of artificial leather for commercial

goods. Leather is a durable and flexible material produced by tanning animal raw hides and skins. It is produced through various manufacturing processes and is an irreplaceable anon-woven material. The Indian leather industry plays a significant role in the Indian economy, contributing to exports, employment, and economic development. It has gained global recognition and is among the top seven foreign exchange earners of India. Today, 80% of value-added finished products in the leather sector are exported.

2. Scientometric

Scientometrics is a subfield of informetrics that studies quantitative aspects of scholarly literature, including the impact of research papers and academic journals, understanding scientific citations, and their use in policy and management contexts. It overlaps with other scientific fields like information systems, information science, and metascience. Critics argue that overreliance on scientometrics can lead to a publish or perish environment, resulting in low-quality research.

3. Review of Literature

Viviane de Castro Bizerra. & et al., (2024) this review analyzes 65 publications from 2010 to 2022 on the use of protease enzymes in leather processing. The research is primarily concentrated in India, Tunisia, Algeria, China, and Brazil, which produce the most leather. The keyword analysis identifies five clusters associated with new methodologies contributing to economic efficiency in the leather industry. Alkaline proteases of bacterial origin, particularly the alkaline serine protease, are prominent in biotechnological processes. Bacillus species, particularly Bacillus Subtilis and Bacillus Cereus, are the most explored. The industry has a significant interest in protease enzymes, and future studies should focus on new favorable processes for protease applications to improve the production of cleaner leather.

Shavkat Khurramov (2024). The study analyzes moisture content in a two-roll module of a machine for squeezing semi-finished leather products after chrome tanning. It identifies patterns of variation in moisture content during roller pressing and derives inequalities for estimating residual moisture content. Results show that as the thickness and initial moisture content decrease, the moisture content decreases, while as the initial moisture content increases, residual moisture content increases and approaches a certain value.

Shanthi & Thanuskodi (2019) the study analyzed leather technology research publications from 2009-2018 using data from the Web of Science database. It analyzed year-wise distribution, authorship patterns, collaboration degrees, prolific authors, prolific institutes, and productive journals, using 4027 records.

4. Objective of the study

- ✓ To find out the year wise publication in Leather Technology Research Output during 2019–2023

- ✓ To find out the type of documents in Leather Technology Research Output during 2019–2023
- ✓ To find out the Language wise publications in leather technology research output.
- ✓ To explore the Top Ten most prolific authors in leather technology research output during 2019-2023
- ✓ To evaluate the top fifteen journals which had published the most number of papers in leather technology research output.
- ✓ To explore the Top Ten Cited Reference Records in Leather Technology Research Output during 2019–2023
- ✓ To find out the List of Top Ten Institution wise publications in Leather Technology Research Output during 2019–2023
- ✓ To find out the List of Top Fifteen Words used in Leather Technology Research Output.
- ✓ To find out the List of Top Twenty Country wise publications in Leather Technology Research Output during 2019–2023

5. Data collection

The analysis utilized the Web of Science database from 2019-2023, using Keyword leather technology for title, abstract, and keywords searches. With precision, 1906 records were retrieved, and the data was exported to Microsoft Excel for analysis.

6. Methodology

The study uses data from the web of science from 2019-2023, including authors, papers, contributions from various institutes, countries, and language-wise publications. The data is analyzed using Microsoft Excel, and then examined, analyzed, and tabulated for observations, ensuring the study's objectives are met.

For Analysis

S.No	***Publication Year***	***Recs***	***Percent***	***TLCS***	***TGCS***
1.	2019	314	16.47	9034	94494
2.	2020	365	19.15	8867	85003
3.	2021	403	21.14	7986	76188
4.	2022	436	22.88	6684	66015
5.	2023	388	20.36	4635	44601
Total		**1906**	**100.00**	**37206**	**366301**

Table – 1: Distribution of year wise publication in Leather Technology Research Output during 2019–2023

Let's interpret the data from the above table 1, which shows the distribution of year-wise publication in Leather Technology Research Output during 2019–2023. Publication Year and Number of Records (2019: 314 publications, accounting for 16.47% of the total, 2020: 365 publications, accounting for 19.15% of the total, 2021: 403 publications, accounting for 21.14%

of the total, 2022: 436 publications, accounting for 22.88% of the total and 2023: 388 publications, accounting for 20.36% of the total).

There is a steady increase in the number of publications from 2019 to 2022, with a slight decrease in 2023. The highest number of publications occurred in 2022, indicating a peak year in terms of research output. The percentage distribution shows how each year's publications contribute to the overall trend. The distribution is relatively balanced, with each year contributing between 16.47% and 22.88% to the total.

There is a decrease in local citation scores (TLCS) over the years, from 9034 in 2019 to 4635 in 2023. Similarly, global citation scores (TGCS) show a decrease from 94494 in 2019 to 44601 in 2023.

This trend suggests that while the number of publications has increased, the impact of these publications, as measured by citation scores, has declined over time. The year 2022 stands out with the highest number of publications, but citation scores are lower compared to earlier years.

S.No	***Document Type***	***Records***	***Percent***	***TLCS***	***TGCS***
1.	Article	906	47.53	1522	9355
2.	Review	360	18.89	1677	8418
3.	Meeting Abstract	182	9.55	17	78
4.	Article; Proceedings Paper	158	8.29	944	6625
5.	Editorial Material	80	4.20	76	553
6.	Article; Early Access	56	2.94	0	62
7.	Letter	56	2.94	78	157
8.	Book Review	39	2.05	0	0
9.	News Item	17	0.89	0	0
10.	Note	17	0.89	57	515
11.	Correction	12	0.63	9	80
12.	Review; Early Access	12	0.63	0	9
13.	Article; Book Chapter	3	0.17	2	9
14.	Editorial Material; Early Access	2	0.10	0	1
15.	Art Exhibit Review	1	0.05	0	0
16.	Article; Retracted Publication	1	0.05	0	2
17.	Excerpt	1	0.05	0	0
18.	Poetry	1	0.05	0	0
19.	Reprint	1	0.05	0	1
20.	Review; Retracted Publication	1	0.05	0	11
Total		**1906**	**100.00**	**4382**	**25876**

Table – 2: Distribution on type of documents in Leather Technology Research Output during 2019–2023

Each document type's percentage contribution to the total number of records is shown (Article: 906 records, accounting for 47.53% of the total, Review: 360 records, accounting for 18.89% of the total, Meeting Abstract: 182 records, accounting for 9.55% of the total, Article; Proceedings Paper: 158 records, accounting for 8.29% of the total, Editorial Material: 80 records, accounting for 4.20% of the total, Article; Early Access: 56 records, accounting for 2.94% of the total, Letter: 56 records, accounting for 2.94% of the total, Others (Book Review, News Item, Note, Correction, etc.): Each category represents a smaller percentage of the total, ranging from 0.05% to 2.05%.). Articles and Reviews are the most common types of documents, comprising nearly two-thirds of the total records (66.42%). Meeting Abstracts, Article; Proceedings Paper, and Editorial Materials also contribute significantly. Local and global citation scores are considerably lower for most document types compared to Table 1, indicating varied levels of impact and visibility across different types of research outputs.

Articles and Reviews are predominant, reflecting the primary forms of scholarly communication in leather technology research. The distribution of citation scores varies widely across different document types, with Articles and Reviews generally having higher citation scores compared to other types such as Meeting Abstracts or Editorials.

S.No	***Language***	***Records***	***Percent***	***TLCS***	***TGCS***
1.	English	1740	91.29	7999	23282
2.	German	47	2.47	24	218
3.	Spanish	28	1.47	0	53
4.	French	26	1.36	10	127
5.	Portuguese	19	1.02	13	88
6.	Russian	7	0.37	30	60
7.	Polish	6	0.31	1	6
8.	Croatian	5	0.26	1	7
9.	Italian	5	0.26	0	1
10.	Japanese	4	0.21	2	7
11.	Chinese	3	0.16	1	4
12.	Estonian	3	0.16	0	2
13.	Unspecified	3	0.16	0	0
14.	Czech	2	0.10	0	13
15.	Dutch	2	0.10	0	0
16.	Turkish	2	0.10	0	1
17.	Afrikaans	1	0.05	0	4
18.	Korean	1	0.05	0	3
19.	Slovak	1	0.05	0	0
20.	Slovene	1	0.05	0	0
Total		**1906**	**100.00**	**18081**	**123876**

Table – 3: Distribution on Language wise publications in leather technology research output during 2019–2023

The distribution of language-wise publications in leather technology research output, English: 1740 records, accounting for 91.29% of the total, German: 47 records, accounting for 2.47% of the total, Spanish: 28 records, accounting for 1.47% of the total, French: 26 records, accounting for 1.36% of the total, Portuguese: 19 records, accounting for 1.02% of the total, Russian, Polish, Croatian, Italian: Each language accounts for less than 1% of the total, with varying numbers of records, Japanese, Chinese, Estonian, Unspecified, Czech, Dutch, Turkish, Afrikaans, Korean, Slovak, Slovene: Each language has a very small percentage of representation, ranging from 0.05% to 0.26%. English publications generally receive higher citation scores, underscoring their broader influence and dissemination across global research networks.

S.No	***Author***	***Records***	***Percent***	***TLCS***
1.	Menz HB	77	1.3	639
2.	Bus SA	66	1.2	1048
3.	Gu YD	44	0.8	54
4.	Cavanagh PR	43	0.7	772
5.	Rome K	41	0.7	130
6.	Van Netten JJ	40	0.7	105
7.	Nigg BM	38	0.7	450
8.	López-López D	35	0.6	1
9.	Armstrong DG	34	0.6	547
10.	Becerro-de-Bengoa-Vallejo R	34	0.6	0

Table – 4: Top Ten most prolific authors in leather technology research output during 2019-2023

The number of publications ranges from 77 records (Menz HB) to 34 records (Armstrong DG and Becerro-de-Bengoa-Vallejo R). This indicates a varying degree of prolificacy among these authors. The total local citation scores vary widely among the authors, ranging from 0 (Becerro-de-Bengoa-Vallejo R) to 1048 (Bus SA). This suggests differing levels of impact or visibility of their research within the field.

S.No	***Journal***	***Records***	***Percent***	***TLCS***	***TGCS***
1.	Gait & Posture	173	3	1112	4793
2.	Journal of Foot and Ankle Research	151	2.6	0	2479
3.	Journal of The American Podiatric Medical Association	106	1.8	583	1890
4.	Journal of Biomechanics	103	1.8	804	3775
5.	Medicine and Science in Sports and Exercise	85	1.5	846	2559
6.	Foot & Ankle International	83	1.4	351	2646
7.	Applied Ergonomics	71	1.2	590	1847
8.	Plos One	70	1.2	0	968
9.	Clinical Biomechanics	67	1.2	672	2599
10.	Journal of Sports Sciences	66	1.2	338	1112

11.	Forensic Science International	61	1.1	179	616
12.	Ergonomics	60	1	505	1768
13.	Journal of Forensic Sciences	59	1	126	371
14.	Sensors	52	0.9	30	857
15.	Science & Justice	46	0.8	101	510

Table – 5: The Top Fifteen Journals which had published the most number of papers in Leather Technology Research Output during 2019–2023

The number of publications per journal ranges from 173 records (Gait & Posture) to 46 records (Science & Justice). This shows varying levels of involvement and focus on leather technology research across different journals. The total local and global citation scores also vary among the journals, reflecting the impact and visibility of the research published in each journal. For instance, Gait & Posture has 1112 local citation scores and 4793 global citation scores, indicating a strong impact and wide readership. Journals like Gait & Posture, Journal of Foot and Ankle Research, and Journal of Biomechanics have published the highest number of papers and have also accumulated substantial citation scores, highlighting their influence in the field of leather technology research. The presence of journals like Applied Ergonomics and Medicine and Science in Sports and Exercise suggests a multidisciplinary approach to leather technology research, incorporating ergonomics and sports sciences.

S.No	***Author / Year / Journal***	***Recs***	***Percent***
1.	Lieberman DE, 2010, NATURE, V463, P531, DOI 10.1038/nature08723	245	4.3
2.	Squadrone R, 2009, J SPORT MED PHYS FIT, V49, P6	142	2.5
3.	De Wit B, 2000, J BIOMECH, V33, P269, DOI 10.1016/S0021-9290(99)00192-X	134	2.3
4.	van Gent RN, 2007, BRIT J SPORT MED, V41, P469, DOI 10.1136/bjsm.2006.033548	115	2
5.	Cohen J., 1988, Statistical Power Analysis for the Behavioral Sciences	111	1.9
6.	Armstrong DG, 2017, NEW ENGL J MED, V376, P2367, DOI 10.1056/NEJMra1615439	106	1.8
7.	CAVANAGH PR, 1980, J BIOMECH, V13, P397, DOI 10.1016/0021-9290(80)90033-0	105	1.8
8.	Bonacci J, 2013, BRIT J SPORT MED, V47, P387, DOI 10.1136/bjsports-2012-091837	103	1.8
9.	Bus SA, 2013, DIABETES CARE, V36, P4109, DOI 10.2337/dc13-0996	102	1.8
10.	UCCIOLI L, 1995, DIABETES CARE, V18, P1376, DOI 10.2337/diacare.18.10.1376	95	1.7

Table – 6: Top Ten Cited Reference Records in Leather Technology Research Output during 2019–2023

The above table 6, which lists the top ten cited reference records in leather technology research output during 2019–2023. The top cited reference by Lieberman DE in the journal Nature has 245 citations, making it the most influential reference in leather technology research during this period. References come from various journals such as Nature, Journal of Biomechanics, British Journal of Sports Medicine, and others, covering a wide range of topics related to biomechanics, sports medicine, and diabetes care. References like Cohen's book on statistical power analysis and Cavanagh's work on biomechanics indicate the methodological underpinnings and analytical approaches influential in leather technology research.

S.No	***Institution***	***Records***	***Percent***	***TLCS***	***TGCS***
1.	La Trobe University	132	2.3	41	193
2.	University Calgary	122	2.1	528	3336
3.	University Amsterdam	85	1.5	630	2872
4.	Hong Kong Polytechnic University	81	1.4	1046	6359
5.	University Melbourne	77	1.3	401	2105
6.	University Washington	76	1.3	226	1232
7.	University Complutense Madrid	66	1.2	684	5113
8.	University Salford	63	1.1	42	681
9.	University Sydney	63	1.1	252	1993
10.	Monash University	62	1.1	218	1884

Table – 7: List of Top Ten Institution wise publications in Leather Technology Research Output during 2019–2023

The table lists institutions along with the number of records (publications), percentage of total publications, Total Local Citation Scores (TLCS), and Total Global Citation Scores (TGCS). The institutions range from La Trobe University with 132 records to Monash University with 62 records. These numbers reflect the volume of research output from each institution in leather technology. Institutions like Hong Kong Polytechnic University, University Amsterdam, and University Complutense Madrid have notably higher TLCS and TGCS, indicating their research has been widely cited both locally and globally. Institutions from various regions including Australia (La Trobe University, University Melbourne, University Sydney, Monash University), Canada (University Calgary), Netherlands (University Amsterdam), Hong Kong (Hong Kong Polytechnic University), USA (University Washington), Spain (University Complutense Madrid), and UK (University Salford) are represented in the top ten, showcasing global participation in leather technology research.

S.No	***Word***	***Records***	***Percent***	***TLCS***	***TGCS***
1.	Leather	1738	30.3	7288	26668
2.	Footwear	1076	18.8	5127	33917
3.	Running	476	8.3	3551	12216
4.	Shoe	423	7.4	2572	8711
5.	Shoes	380	6.6	2225	6884
6.	Diabetic	310	5.4	1771	13135

7.	Patients	281	4.9	1452	8859
8.	Plantar	262	4.6	1721	7362
9.	Gait	251	4.4	760	4624
10.	Pressure	249	4.3	1442	6465
11.	Walking	244	4.3	999	5191
12.	Lower	216	3.8	614	3357
13.	Industry	194	3.4	274	3805
14.	Diabetes	187	3.3	1197	8396
15.	Ankle	173	3	480	3514
16.	Knee	163	2.8	669	5575
17.	Children	155	2.7	398	2469
18.	Joint	151	2.6	590	2512
19.	Design	143	2.5	701	2976
20.	Different	142	2.5	435	1999

Table – 8: List of Top Fifteen Words used in Leather Technology Research Output during 2019–2023

The above table reveals that, which lists the top fifteen words used in leather technology research output during five years on 2019–2023. The table includes words such as "Leather," "Footwear," "Running," "Shoe," "Diabetic," and others, along with the number of records they appear in, percentage of total records, Total Local Citation Scores (TLCS), and Total Global Citation Scores (TGCS). The most frequently used word is "Leather," appearing in 1738 records, which is about 30.3% of the total. This indicates that leather itself is a central focus in much of the research. Words like "Footwear," "Running," "Shoe," "Diabetic," "Patients," "Plantar," "Gait," "Pressure," and "Walking" reflect specific topics within leather technology research, such as footwear design, biomechanics of running and walking, diabetic foot care, and pressure distribution in shoes. Words associated with specific conditions like "Diabetic," "Diabetes," "Ankle," and "Knee" has substantial TLCS and TGCS, indicating significant research interest and impact in these areas.

S.No	***Country***	***Records***	***Percent***	***TLCS***	***TGCS***
1.	USA	1330	23.2	6230	41756
2.	UK	899	15.7	3188	26457
3.	Australia	549	9.6	2176	14385
4.	Peoples R China	426	7.4	1052	7600
5.	Spain	384	6.7	326	6610
6.	Canada	304	5.3	1489	8475
7.	Germany	271	4.7	1137	5877
8.	Netherlands	222	3.9	1506	11088
9.	Brazil	203	3.5	244	3116
10.	India	202	3.5	322	3221
11.	Italy	190	3.3	491	5059

12.	France	148	2.6	452	2497
13.	New Zealand	116	2	276	1972
14.	Poland	104	1.8	212	725
15.	Portugal	103	1.8	170	3142
16.	Taiwan	103	1.8	436	2307
17.	Japan	101	1.8	239	1276
18.	Sweden	87	1.5	370	4237
19.	Switzerland	87	1.5	204	2273
20.	South Korea	85	1.3	104	1203

Table – 9: List of Top Twenty Country wise publications in Leather Technology Research Output during 2019–2023

Among the total 117 countries published in leather technology research outputs for the past five years. The USA leads with 1330 records, followed by the UK with 899 records and Australia with 549 records. These countries demonstrate substantial contributions to leather technology research globally. Countries like the USA, UK, Netherlands, and Australia have high TLCS and TGCS, indicating strong citation impact and research influence in the field.

7. Implications of the study

- Researchers and institutions in leather technology may need to focus on strategies to enhance the visibility and impact of their research findings.
- Understanding the reasons behind the declining citation scores could lead to improvements in research dissemination and engagement with the broader academic community.
- Researchers and institutions may prioritize publishing Articles and Reviews to maximize visibility and impact within the field.
- Understanding the citation patterns for different document types can inform strategies for improving research dissemination and engagement.
- Less common document types may require specific strategies to enhance their visibility and impact.
- English is overwhelmingly dominant, representing the vast majority (91.29%) of leather technology research publications. Other languages such as German, Spanish, French, and Portuguese also contribute, but to a much smaller extent.
- Authors like Bus SA and Cavanagh PR have not only published a substantial number of papers but have also garnered high local citation scores, indicating their research's influence and recognition within the field.
- While some authors focus more on quantity (e.g., Menz HB with 77 records), others may have fewer publications but higher citation impact (e.g., Bus SA with 1048 local citation scores).
- These top fifteen journals play a pivotal role in publishing and disseminating leather technology research, contributing significantly to the academic literature in the field.

- Higher citation scores suggest that research from institutions like Hong Kong Polytechnic University and University Complutense Madrid has had substantial influence and visibility within the academic community.
- The prominence of words likes "Footwear," "Running," and "Shoe" suggests a strong focus on practical applications of leather technology in footwear design and performance.
- The dominance of countries like the USA, UK, and Australia reflects their leadership in leather technology research, driven by robust academic and industrial sectors.

8. Conclusion

Conclusion, while the quantity of research output in leather technology has increased, there is a need for further investigation into maintaining or improving the quality and impact of these publications. The distribution of document types in leather technology research output shows a dominance of Articles and Reviews, with varying levels of citation scores across different types. This highlights the importance of considering both the type of document and its citation impact when assessing research output in this field. English remains the predominant language in leather technology research; there are opportunities and challenges associated with publishing in other languages that warrant further exploration to maximize the impact and reach of research findings in this field. The top 10 most prolific authors in leather technology research from 2019 to 2023 demonstrate significant contributions in terms of publication output and impact, underscoring their influence in the field and their potential role in shaping its future direction.

The top fifteen journals in leather technology research from 2019 to 2023 demonstrate significant contributions in terms of publication output and impact, underscoring their influence in shaping the discourse and advancing knowledge in this specialized field. These highly cited references provide foundational knowledge and methodological frameworks that guide researchers in leather technology, ensuring robustness and relevance in their investigations. The top ten institutions in leather technology research output from 2019 to 2023 highlight global participation and leadership in advancing knowledge and innovation in this specialized field. Their research output and citation impact underscore their significant contributions to the academic community and their potential to shape the future of leather technology research.

Analyzing these words provides valuable insights into research focus areas and their impact on advancing knowledge and innovation in leather technology. The top twenty countries in leather technology research output from 2019 to 2023 illustrate a diverse and dynamic global research community contributing to advancing knowledge and innovation in this field. Analyzing these country-wise publications provides valuable insights into regional research strengths, collaboration opportunities, and the evolving impact of research efforts on a global scale.

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