Southeast Asia Journal of Business, Accounting, and Entrepreneurship
Volume 3, Issue 1-3
Page 20-36, March-September 2025
https://dailymakassar.id/ejournal/index.php/sains/

THE SKYWALKER SAGA: A BIBLIOMETRIC ANALYSIS ON PRODUCT INNOVATION IN THE ERA OF ARTIFICIAL INTELLIGENCE

The Skywalker Saga*: Analisis Berbasis Bibliometrik pada Inovasi Produk dalam Era Kecerdasan Buatan*

Muh. Yushar Mustafa[1]*, Riad Mustafa[2], M. Ikhwan Maulana Haeruddin[3], Muh. Al Fatah Arief Putra[4]
[1,3,4]Program Studi Manajemen, Fakultas Ekonomi dan Bisnis, Universitas Negeri Makassar
[2]Program Studi Teknik Mesin, Fakultas Teknik, Universitas Fajar Makassar
**Corresponding Email myusharm.@gmail.com*

Abstract

Product innovation is a key driver of economic growth and corporate competitiveness. Artificial intelligence (AI) is revolutionising product innovation, influencing how products are developed, marketed and used. This study aims to map the research landscape on product innovation and AI through bibliometric analysis. Data are collected from scientific publication databases such as Google Scholar, Scopus, and Web of Science, covering publications from 2000 to 2023. Bibliometric analysis is performed using VOSviewer and Publish or Perish software to identify publication trends, author collaborations, research themes, and keywords. As for theoretical contribution, the results of the study show a significant increase in related publications, strong interdisciplinary collaboration, and dominant research themes such as the use of AI in product design, AI-based market analysis, and smart product development. As for managerial contribution, this study provides insights into the challenges and opportunities associated with the use of AI for product innovation, which can help companies make more informed decisions and drive innovation in various industrial sectors.

Keywords: product innovation, artificial intelligence, bibliometrics, vosviewer, publish or perish, marketing

1. INTRODUCTION

Product innovation is a key driver of economic growth and corporate competitiveness (Mustafa et al., 2023a; Tafsir & Mustafa, 2025). In the era of artificial intelligence (AI), product innovation is undergoing a significant transformation, affecting how products are developed, marketed, and used (Akbar et al., 2024; Amran et al., 2024; Miller, 2019). AI technology offers a range of new tools and methods that enable companies to create smarter products that are more responsive to consumer needs. Companies are increasingly relying on AI to solve strategic problems, presenting product teams with new challenges (Tambe et al., 2019). These challenges include how to manage non-deterministic systems, provide a consistent user experience, and continue to iterate without losing human context. In this context, it is important to thoroughly analyse how AI-driven product innovation has evolved, as well as the challenges and opportunities faced by companies. Although there is a lot of research on product innovation and AI technology, there is still a gap in understanding the relationship between the two fields. Moreover, this study aims to answer the following questions, namely:

(a) How have publication trends related to product innovation and AI developed from 2000-2023?
(b) What are the main research themes emerging at the intersection of product innovation and AI from 2000-2023? and
(c) What are the main challenges and opportunities associated with the use of AI in product innovation from 2000-2023?

The main objectives of this study are:

(a) To map the research landscape on product innovation and AI using bibliometric analysis;

(b) To identify the main trends, influential authors, and research themes emerging in this field;
(c) To analyse the challenges and opportunities associated with the use of AI in product innovation;
(d) To provide insights for researchers and practitioners on the future direction of AI-driven product innovation.

Novelty of the Research

This research contributes by:

(a) Offering a bibliometric analysis of the existing literature on product innovation and AI;
(b) Identifying research gaps and potential areas for future research;
(c) Providing insights into emerging trends and research themes in this field;
(d) Highlighting key challenges and opportunities associated with the use of AI in product innovation, which can help companies make more informed decisions.

2. MATERIAL AND METHODS

Product Innovation

Product innovation is the creation and introduction of new goods or services, or improved versions of existing goods or services (Assoratgoon & Kantabutra, 2023; Mustafa et al., 2023b; Voss et al., 1997). Product innovation refers to changes that improve the design, materials, feel, appearance, capacity, functionality, and overall user experience (Grant, 2011). Innovation may use new knowledge or technology, or be based on new uses or combinations (Armstrong et al., 2014; Kotler et al., 2022). Product innovation can occur through changes in materials, components, and other features that improve the functional characteristics of the product (Armstrong et al., 2014). In today's volatile environment, product innovation is no longer an option; it has become one of the main ways to create relevant market opportunities and drive business growth (Ampauleng & Abdullah, 2023). Product innovation enables companies to penetrate new markets and maintain their existing product portfolios and market segments (Mustafa et al., 2023a; Mustafa et al., 2018). Furthermore, product innovation can be classified into two main categories: radical innovation and incremental innovation. Radical innovation aims to develop new products, while incremental innovation aims to improve existing products. The classification of innovation based on the level of novelty includes: new only to the company, new to the industry in the company's country or market of operation, or new to the world.

Artificial Intelligence

Artificial intelligence (AI) is the ability of computing systems to perform tasks that are typically associated with human intelligence, such as learning, reasoning, problem solving, perception, and decision making. AI is a field of computer science that develops and studies methods and software that enable machines to understand their environment and use learning and intelligence to take actions that maximise their chances of achieving their goals (Sun, 2018). AI encompasses a variety of technologies, including machine learning, natural language processing, and computer vision (Paesano, 2023). AI is revolutionising various industries, including digital product development (Amran et al., 2024; Raisch & Krakowski, 2021).

AI in Product Innovation

AI has the potential to revolutionise product innovation by enabling companies to generate new ideas, test concepts quickly, and personalise products for individual customers (Howard, 2019). AI can be used to identify market trends, analyse customer feedback, and automate repetitive tasks. By analysing customer behaviour and preferences, AI helps organisations design products that align with user needs, increasing customer satisfaction and loyalty. AI can accelerate time to market, improve customer centricity, and reduce costs (Sun, 2018).

Despite its potential benefits, there are also several challenges associated with using AI in product innovation. These challenges include:

(a) Data Quality and Availability: AI systems are highly dependent on high-quality, relevant, and comprehensive data;
(b) Integration with Existing Systems: Integrating AI with existing product management systems and workflows can be complex and require significant technical adjustments;
(c) Change Management: Integrating AI into product management often requires significant changes in workflows, processes, and organisational culture;
(d) Ethical and Legal Considerations: AI systems can raise ethical issues, such as bias in decision-making, privacy concerns, and transparency; and
(e) Talent and Expertise: Developing and implementing AI systems requires specialised talent and expertise

Opportunities in Integrating AI into Product Innovation
Despite these challenges, there are also several significant opportunities associated with the use of AI in product innovation (Mustafa et al., 2023a; Mustafa et al., 2024c):

(a) Accelerating Time to Market: AI-powered tools can automate repetitive tasks, such as data analysis and prototyping, which significantly reduces the time it takes to bring a product from concept to market;
(b) Enhancing Customer Centricity: By analysing customer behaviour and preferences, AI helps organisations design products that align with user needs, increasing customer satisfaction and loyalty; and
(c) Cost Efficiency: AI optimises resource allocation by identifying inefficiencies in the product development process, thereby reducing costs associated with R&D, manufacturing, and marketing;
(d) Improved Decision Making: AI provides actionable insights by processing and analysing large volumes of data, enabling more informed and strategic decision making; and
(e) Risk Mitigation: AI-powered predictive analytics can identify potential risks and challenges in the product lifecycle, enabling organisations to proactively address them; and
(f) Driving Innovation: AI can simulate various scenarios and generate creative solutions, pushing the boundaries of what is possible in product design and functionality [8].

Research Design
This study uses a quantitative approach with bibliometric analysis methods. Bibliometric analysis is a systematic study conducted on scientific literature to identify patterns, trends, and impacts in a particular field (Khan et al., 2022; Kirby, 2023) . This method helps identify research trends, collaboration between authors, and the influence of research.

Data Collection Technique and Research Sample
Data was collected from scientific publication databases such as Scopus, Google Scholars, and Web of Science. The data collected included relevant publications on product innovation and artificial intelligence in the period from 2000 to 2023. The search keywords used included ‘product innovation,’ ‘artificial intelligence,’ ‘machine learning,’ and ‘new product development’. The inclusion criteria included journal articles, conference proceedings, and reviews focusing on the relationship between the two topics.

Data Analysis
The data were analysed using bibliometric software such as VOSviewer and Publish or Perish. VOSviewer is a software tool designed for creating, visualizing, and analyzing bibliometric networks. It is commonly used in academic research to help researchers understand the structure of scientific literature. The key features and functionalities of VOSviewer is:

(a) Visualization: VOSviewer can generate visual maps that represent relationships among various entities, such as authors, papers, keywords, or journals. This helps in identifying clusters and trends in research;
(b) Bibliometric Analysis: It allows users to perform bibliometric analyses, which include assessing publication trends, citation patterns, and co-authorship networks. This can provide insights into the influence and impact of specific researchers or topics;

(c) Data Sources: VOSviewer can work with data from various bibliographic databases, including Scopus, Web of Science, and PubMed, making it versatile for different research fields; and
(d) User-Friendly Interface: The software is designed to be user-friendly, allowing researchers with varying levels of technical expertise to create detailed visualizations easily.

While, Publish or Perish is a software program that retrieves and analyses academic citations. It is particularly useful for evaluating the impact of scholarly work and performing citation analysis. Key aspects include:

(a) Citation Metrics: Publish or Perish provides various citation metrics, such as the h-index, g-index, and total citation counts, which help researchers assess their academic impact and productivity;
(b) Data Retrieval: The software can search for publications from various academic databases like Google Scholar. Users can retrieve citations for individual authors, journals, or specific papers;
(c) Analysis of Trends: Researchers can analyse citation data over time, which helps in understanding trends in specific fields or the impact of particular publications; and
(d) Comparison: It enables comparisons between researchers, institutions, or journals, making it easier to identify leading figures or trends in a specific area of study.

Moreover, the analysis included:

(a) Number of publications per year;
(b) Citation analysis;
(c) Lists of Author; and
(d) Keyword analysis.

3. RESULTS AND DISCUSSIONS

Publish or Perish Results

The analysis shows that the number of publications on product innovation and artificial intelligence has increased significantly since 2000. Publications peaked in 2023, with more than 10,000 articles published as shown in Table 1 and Table 2. This indicates a growing interest and attention to this topic among academics and practitioners.

Table 1. Results from Publish or Perish Analysis on Product Innovation

Rank	Cited	Author(s)	Year	Journal	DOI
1	298	RG Cooper	2005		
2	5902	JM Utterback, WJ Abernathy	2018	Organizational Innovation	
3	932	CA Un, A Cuervo-Cazurra…	2010	… of Product Innovation …	10.1111/j.1540-5885.2010.00744.x
4	760	RM Dangelico	2016	Business Strategy and the Environment	10.1002/bse.1886
5	412	RG Cooper	2000	Research-Technology Management	10.1080/08956308.2000.11671329
6	189	NB Kanagal	2015	Journal of Management and marketing research	
7	579	AR Jassawalla, HC Sashittal	2002	Academy of Management …	10.5465/AME.2002.8540307
8	415	M Fritsch, M Meschede	2001	Review of Industrial organization	10.1023/A:1011856020135
9	910	SF Slater, JJ Mohr, S Sengupta	2014	Journal of product innovation …	10.1111/jpim.12113
10	135	S Smith, G Smith, YT Shen	2012	Design Studies	
11	446	J Goldenberg, D Mazursky	2002		
12	250	B Cassiman, E Martinez-Ros	2007	Evidence from Spanish …	
13	519	RG Cooper, SJ Edgett	2008	Research-Technology Management	10.1080/08956308.2008.11657495
14	224	H Löfsten	2014	European Journal of innovation management	10.1108/EJIM-04-2013-0034
15	801	J Alegre, R Lapiedra, R Chiva	2006	European journal of innovation …	10.1108/14601060610707812

Rank	Cited	Author(s)	Year	Title	DOI
16	4191	E Danneels	2002	Strategic management journal	10.1002/smj.275
17	401	R Parthasarthy, J Hammond	2002	Journal of engineering and technology …	
18	1177	K Lyytinen, Y Yoo, RJ Boland Jr	2016	Information systems journal	10.1111/isj.12093
19	570	R Lentz, DT Mortensen	2008	Econometrica	10.3982/ECTA5997
20	805	JF De Medeiros, JLD Ribeiro, MN Cortimiglia	2014	Journal of cleaner …	
21	130	J Tung	2012	International Journal of Organizational Innovation …	
22	335	RG Cooper, SJ Edgett	2010	Research-Technology Management	10.1080/08956308.2010.11657629
23	44	G Wang, O Henfridsson, J Nandhakumar, Y Yoo	2022	MIS quarterly	
24	791	H Evanschitzky, M Eisend…	2012	… of product innovation …	10.1111/j.1540-5885.2012.00964.x
25	615	JC Naranjo Valencia, R Sanz Valle…	2010	… journal of innovation …	10.1108/14601061011086294
26	1781	BA Lukas, OC Ferrell	2000	Journal of the academy of marketing …	10.1177/0092070300282005
27	692	MS Freel	2000	International Small Business Journal	10.1177/0266242600182003
28	259	R Chapman, P Hyland	2004	Technovation	
29	687	K Cormican, D O'Sullivan	2004	Technovation	
30	790	E Bucherer, U Eisert…	2012	Creativity and innovation …	10.1111/j.1467-8691.2012.00637.x
31	108	R Winger, G Wall	2006		
32	655	J Vega-Jurado, A Gutiérrez-Gracia…	2008	Research policy	
33	715	A De Massis, F Frattini, E Pizzurno…	2015	Journal of Small …	10.1111/jsbm.12068
34	325	MP Cunha, A Rego, P Oliveira…	2014	… of Product Innovation …	10.1111/jpim.12090
35	831	HR Greve	2007	Industrial and corporate change	
36	357	DH Henard, PA Dacin	2010	Journal of Product Innovation …	10.1111/j.1540-5885.2010.00719.x
37	214	R Fontana, L Nesta	2009	Review of Industrial Organization	10.1007/s11151-009-9210-7
38	778	C Edquist, L Hommen, M McKelvey	2001	Innovation and Employment	
39	742	I Visnjic, F Wiengarten, A Neely	2016	Journal of product innovation …	10.1111/jpim.12254
40	341	C Reguia	2014	European Scientific Journal	
41	148	G Iyer, DA Soberman	2016	Marketing Science	10.1287/mksc.2015.0975
42	410	C Shepherd, PK Ahmed	2000	European journal of innovation …	10.1108/14601060010322293
43	193	D Hoonsopon, G Ruenrom	2012	Journal of Managerial Issues	
44	2532	H Li, K Atuahene-Gima	2001	Academy of management Journal	10.5465/3069392
45	206	Y Li, J Wang, X Li, W Zhao	2007	The international journal of advanced …	10.1007/s00170-006-0457-y
46	969	CM Lau, HY Ngo	2004	International business review	
47	172	JL Christensen, B Lundvall	2004		
48	172	B Durisin, G Calabretta…	2010	… of Product Innovation …	10.1111/j.1540-5885.2010.00726.x
49	18	S Biazzo, R Filippini	2021		10.1007/978-3-030-75011-4
50	272	RG Cooper, S Edgett	2008	PDMA visions magazine	
51	512	C Shu, KZ Zhou, Y Xiao, S Gao	2016	Journal of business ethics	10.1007/s10551-014-2401-7
52	146	D Lederman	2010	Journal of International Business Studies	10.1057/jibs.2009.30

Rank	Cited	Author(s)	Year	Title	DOI
53	204	P Vermeulen	2004	European Management Journal	
54	136	JD Bohlmann, J Spanjol, WJ Qualls…	2013	… of Product Innovation …	10.1111/j.1540-5885.2012.00962.x
55	194	P Harborne, A Johne	2003	European Journal of innovation management	10.1108/14601060310475273
56	602	JPJ De Jong, PAM Vermeulen	2006	International small business …	10.1177/0266242606069268
57	185	A Fishman, R Rob	2000	The RAND journal of Economics	
58	513	O Branzei, I Vertinsky	2006	Journal of Business Venturing	
59	146	Y Li, Y Liu, F Ren	2007	The Journal of Technology Transfer	10.1007/s10961-006-9009-8
60	280	CF Cheng, ML Chang, CS Li	2013	Journal of Business Research	
61	507	G Martín-de Castro, M Delgado-Verde…	2013	… Forecasting and Social …	
62	91	Y HARWANI, I APRIADI, J SIHITE, M SOELTON…	2023	ICCD	
63	110	S Jang, J Kim, M von Zedtwitz	2017	Journal of Business Research	
64	691	S Beugelsdijk	2008	Organization studies	10.1177/0170840608090530
65	144	K Gaubinger, M Rabl, S Swan, T Werani	2015	Innovation and product …	10.1007/978-3-642-54376-0
66	2440	K Atuahene-Gima	2005	Journal of marketing	10.1509/jmkg.2005.69.4.61
67	228	DL Rainey	2008		
68	159	M Corso, A Martini, E Paolucci…	2001	International journal of …	10.1111/1468-2370.00072
69	1886	J Bisbe, D Otley	2004	Accounting, organizations and society	
70	244	CH Chang	2016	Corporate Social Responsibility and …	10.1002/csr.1361
71	1338	R Balachandra, JH Friar	2002	IEEE Transactions on Engineering …	
72	174	G Miranda Silva, P J. Gomes, L Filipe Lages…	2014	International journal of …	10.1108/IJOPM-03-2012-0098
73	141	Y Zhan, KH Tan, G Ji, L Chung…	2017	Business Process …	10.1108/bpmj-11-2015-0157
74	191	KM Chen, RJ Liu	2005	Technovation	
75	109	B Ebersberger, SJ Herstad	2011	European Management Review	10.1111/j.1740-4762.2011.01014.x
76	152	D Argente, S Baslandze, D Hanley, S Moreira	2020		
77	145	S Tavassoli	2018	European Journal of Innovation Management	10.1108/ejim-12-2016-0124
78	31	D Maier, M Maftei, A Maier, GE Bițan	2019	Amfiteatru Economic	
79	65	C Bart, A Pujari	2007	Journal of Product Innovation Management	10.1111/j.1540-5885.2006.00229.x
80	459	M Freel	2000	Entrepreneurship &Regional Development	10.1080/089856200413482
81	222	S Rosenkranz	2003	Journal of Economic Behavior &Organization	
82	395	S Im, MM Montoya…	2013	… of Product Innovatio	10.1111/j.1540-5885.2012.00887.x
83	891	MV Tatikonda, MM Montoya-Weiss	2001	Management science	10.1287/mnsc.47.1.151.10669
84	180	E Prandelli, G Verona…	2006	California Management …	10.2307/41166363
85	128	M Fossas-Olalla, B Minguela-Rata…	2015	Journal of Business …	
86	132	M Zhang, B Fan, N Zhang, W Wang, W Fan	2021	Information Processing & …	
87	136	MPE Cunha, JFS Gomes	2003	Creativity and innovation …	10.1111/1467-8691.00280
88	525	M Wang, Y Li, J Li, Z Wang	2021	Journal of environmental management	

Rank	Cited	Author(s)	Year	Title	DOI
89	128	Y Chen, M Schwartz	2013	Journal of Economics &Management …	10.1111/jems.12026
90	1555	FJHM Verhees, MTG Meulenberg	2004	Journal of small business …	10.1111/j.1540-627X.2004.00102.x
91	2294	M Sawhney, G Verona…	2005	Journal of interactive …	10.1002/dir.20046
92	346	B Manders, HJ de Vries, K Blind	2016	Technovation	
93	1310	KW Artz, PM Norman, DE Hatfield…	2010	… of product innovation …	10.1111/j.1540-5885.2010.00747.x
94	63	G Seliger	2001	CIRP Annals	
95	142	KA Paulson Gjerde, SA Slotnick…	2002	Management …	10.1287/mnsc.48.10.1268.270
96	380	SI Hallstedt, AW Thompson, P Lindahl	2013	Journal of cleaner production	
97	14	EA Chang-Muñoz, AF Guarín-García, Y Charris-Sevilla…	2023	Sustainability	
98	167	FH Al-Salem	2009	International Journal of Islamic and Middle Eastern …	10.1108/17538390910986326
99	174	SJ Khan, A Dhir, V Parida…	2021	Business Strategy and the …	10.1002/bse.2858
100	256	L Melander	2017	Business strategy and the environment	10.1002/bse.1970

Source: Data Processed (2025)

Table 2. Results from Publish or Perish Analysis on Artificial Intelligence

Rank	Cited	Author(s)	Year	Journal	DOI
1	663	Y Jiang, X Li, H Luo, S Yin, O Kaynak	2022	Quo vadis artificial intelligence?	10.1007/s44163-022-00022-8
2	471	EB Hunt	2014	Artificial intelligence	
3	3001	P Hamet, J Tremblay	2017	Artificial intelligence in medicine	
4	1479	J Holmes, L Sacchi, R Bellazzi	2004	Artificial intelligence in medicine	10.1007/978-3-319-19551-3
5	5038	WP Henry, PH Winston	2004	Artificial intelligence	10.5555/993568
6	304	SJ Russell, P Norvig, E Davis	2010	Artificial intelligence	
7	193	E Kumar	2013	Artificial intelligence	
8	390	M Flasiński	2016	Introduction to artificial intelligence	
9	536	PC Jackson	2019	Introduction to artificial intelligence	
10	118	IE Suleimenov, YS Vitulyova, AS Bakirov…	2020	Artificial Intelligence: what is it?	10.1145/3397125.3397141
11	3415	J McCarthy	2007	What is artificial intelligence	
12	397	K Warwick	2013	Artificial intelligence: the basics	10.4324/9780203802878
13	9638	NJ Nilsson	2014	Principles of artificial intelligence	
14	110	H Abbass	2021	What is artificial intelligence?	
15	2476	NJ Nilsson	2009	The quest for artificial intelligence	
16	1533	J Copeland	2015	Artificial intelligence: A philosophical introduction	
17	199	SA Oke	2008	A literature review on artificial intelligence	
18	3465	M Minsky	2007	Steps toward artificial intelligence	
19	551	KR Chowdhary	2020	Fundamentals of artificial intelligence	10.1007/978-81-322-3972-7
20	199	R Mitchell, J Michalski, T Carbonell	2013	An artificial intelligence approach	10.1007/978-3-662-12405-5
21	4786	M Negnevitsky	2005	Artificial intelligence: a guide to intelligent systems	

22	32	OFA INTELLIGENCE	2016	Of Artificial Intelligence	
Rank	**Cited**	**Author(s)**	**Year**	**Title**	**DOI**
23	1373	N Berente, B Gu, J Recker, R Santhanam	2021	Managing artificial intelligence	
24	1352	P Malik, M Pathania, VK Rathaur	2019	Overview of artificial intelligence in medicine	
25	1025	Y Mintz, R Brodie	2019	Introduction to artificial intelligence in medicine	10.1080/13645706.2019.1575882
26	1962	A Holzinger, G Langs, H Denk…	2019	Causability and explainability of artificial intelligence in medicine	10.1002/widm.1312
27	419	T Huynh-The, QV Pham, XQ Pham, TT Nguyen…	2023	Artificial intelligence for the metaverse: A survey	
28	552	A Pannu	2015	Artificial intelligence and its application in different areas	
29	676	JE Korteling, GC van de Boer-Visschedijk…	2021	Human-versus artificial intelligence	10.3389/frai.2021.622364
30	148	A Sheth, K Roy, M Gaur	2023	Neurosymbolic artificial intelligence (why, what, and how)	
31	601	M Ginsberg	2012	Essentials of artificial intelligence	
32	167	A Benko, CS Lányi	2009	History of artificial intelligence	
33	476	P Szolovits	2019	Artificial intelligence and medicine	10.4324/9780429052071-1
34	143	B Whitby	2009	Artificial intelligence	
35	172	B Mondal	2019	Artificial intelligence: state of the art	10.1007/978-3-030-32644-9_32
36	142	J Finlay	2020	An introduction to artificial intelligence	10.1201/9781003072485
37	854	E Brynjolfsson, A Mcafee	2017	Artificial intelligence, for real	
38	1241	E Brynjolfsson, A Mcafee	2017	The business of artificial intelligence	
39	247	T Taulli	2019	Artificial intelligence basics	10.1007/978-1-4842-5028-0
40	501	A Agrawal, J Gans, A Goldfarb	2017	What to expect from artificial intelligence	
41	126	M Khaleel, AA Ahmed…	2023	Artificial intelligence in engineering	
42	343	J Liu, X Kong, F Xia, X Bai, L Wang, Q Qing, I Lee	2018	Artificial intelligence in the 21st century	
43	813	H Surden	2018	Artificial intelligence and law: An overview	
44	137	A Garnham	2017	Artificial intelligence: An introduction	10.4324/9780203704394
45	88	MR Endsley	2023	Ironies of artificial intelligence	10.1080/00140139.2023.2243404
46	1269	V Kaul, S Enslin, SA Gross	2020	History of artificial intelligence in medicine	
47	100	WF Clocksin	2003	Artificial intelligence and the future	10.1098/rsta.2003.1232
48	142	RT Kreutzer, M Sirrenberg	2020	Understanding artificial intelligence	10.1007/978-3-658-46131-7
49	98	R Akerkar	2014	Introduction to artificial intelligence	
50	252	R Adams	2021	Can artificial intelligence be decolonized?	10.1080/03080188.2020.1840225
51	869	G Briganti, O Le Moine	2020	Artificial intelligence in medicine: today and tomorrow	10.3389/fmed.2020.00027
52	151	L Spector	2006	Evolution of artificial intelligence	
53	303	N Muthukrishnan, F Maleki, K Ovens…	2020	Brief history of artificial intelligence	
54	3947	TH Davenport, R Ronanki	2018	Artificial intelligence for the real world	
55	464	T Munakata	2008	Fundamentals of the new artificial intelligence	10.1007/978-1-84628-839-5

56	1518	H Lu, Y Li, M Chen, H Kim, S Serikawa	2018	Brain intelligence: go beyond artificial intelligence	10.1007/s11036-017-0932-8
Rank	**Cited**	**Author(s)**	**Year**	**Title**	**DOI**
57	966	PR Cohen, EA Feigenbaum	2014	The handbook of artificial intelligence: Volume 3	
58	437	MI Jordan	2019	Artificial intelligence—the revolution hasn't happened yet	
59	235	M Chowdhury, AW Sadek	2012	Advantages and limitations of artificial intelligence	
60	418	Z Swiecki, H Khosravi, G Chen…	2022	Assessment in the age of artificial intelligence	
61	2565	D Gunning, D Aha	2019	DARPA's explainable artificial intelligence (XAI) program	
62	468	J Shaw, F Rudzicz, T Jamieson, A Goldfarb	2019	Artificial intelligence and the implementation challenge	
63	228	EA Wilson	2011	Affect and artificial intelligence	
64	516	C Huang, Z Zhang, B Mao, X Yao	2022	An overview of artificial intelligence ethics	
65	214	S Reddy	2022	Explainability and artificial intelligence in medicine	
66	501	K Jarek, G Mazurek	2019	Marketing and artificial intelligence.	
67	1734	Y Xu, X Liu, X Cao, C Huang, E Liu, S Qian, X Liu…	2021	Artificial intelligence: A powerful paradigm for scientific research	
68	75	D Bojar, F Lisacek	2022	Glycoinformatics in the artificial intelligence era	10.1021/acs.chemrev.2c00110
69	1255	D Li, Y Du	2017	Artificial intelligence with uncertainty	10.1201/9781315366951
70	185	ES Brunette, RC Flemmer…	2009	A review of artificial intelligence	
71	3594	MR Genesereth, NJ Nilsson	2012	Logical foundations of artificial intelligence	
72	381	R Akerkar	2019	Artificial intelligence for business	10.1007/978-3-319-97436-1
73	331	P Lu, S Chen, Y Zheng	2012	Artificial intelligence in civil engineering	10.1155/2012/145974
74	298	T Madiega	2021	Artificial intelligence act	
75	1475	X Zhai, X Chu, CS Chai, MSY Jong, A Istenic…	2021	A Review of Artificial Intelligence (AI) in Education from 2010 to 2020	10.1155/2021/8812542
76	508	JN Kok, EJ Boers, WA Kosters, P Van der Putten…	2009	Artificial intelligence: definition, trends, techniques, and cases	
77	76	AA Abonamah, MU Tariq, S Shilbayeh	2021	On the commoditization of artificial intelligence	10.3389/fpsyg.2021.696346
78	2073	AH Bond, L Gasser	2014	Readings in distributed artificial intelligence	
79	1295	P Wang	2019	On defining artificial intelligence	10.2478/jagi-2019-0002
80	976	MA Goralski, TK Tan	2020	Artificial intelligence and sustainable development	
81	105	V Prabhakaran, R Qadri, B Hutchinson	2022	Cultural incongruencies in artificial intelligence	
82	7126	T Miller	2019	Explanation in artificial intelligence: Insights from the social sciences	
83	1550	C Zhang, Y Lu	2021	Study on artificial intelligence: The state of the art and future prospects	
84	200	D Dobrev	2012	A definition of artificial intelligence	
85	202	S Spielberg	2001	AI: artificial intelligence	

86	831	VL Patel, EH Shortliffe, M Stefanelli, P Szolovits…	2009	The coming of age of artificial intelligence in medicine	
87	245	NP Padhy	2005	Artificial intelligence and intelligent systems	
Rank	**Cited**	**Author(s)**	**Year**	**Title**	**DOI**
88	258	AL Beam, JM Drazen, IS Kohane…	2023	Artificial intelligence in medicine	10.1056/NEJMe2206291
89	74	LM Possati	2023	Psychoanalyzing artificial intelligence: The case of Replika	10.1007/s00146-021-01379-7
90	25	PS Sajja	2020	Introduction to artificial intelligence	10.1007/978-981-15-9589-9_1
91	49	P Dai, D Weld	2011	Artificial intelligence for artificial artificial intelligence	
92	127	J Fleck	2018	Development and establishment in artificial intelligence	10.4324/9780429505331-3
93	4152	M Haenlein, A Kaplan	2019	A brief history of artificial intelligence: On the past, present, and future of artificial intelligence	10.1177/0008125619864925
94	168	A Bhardwaj, S Kishore, DK Pandey	2022	Artificial intelligence in biological sciences	
95	68	E Wolfgang	2017	Introduction to artificial intelligence	
96	357	SF Ahmad, MK Rahmat, MS Mubarik, MM Alam…	2021	Artificial intelligence and its role in education	
97	2494	J He, SL Baxter, J Xu, J Xu, X Zhou, K Zhang	2019	The practical implementation of artificial intelligence technologies in medicine	
98	3451	RS Michalski, JG Carbonell, TM Mitchell	2013	Machine learning: An artificial intelligence approach	
99	973	R Calo	2017	Artificial intelligence policy: a primer and roadmap	
100	496	H Sheikh, C Prins, E Schrijvers	2023	Artificial intelligence: definition and background	10.1007/978-3-031-21448-6_2

Source: Data Processed (2025)

Based on Table 1, this study finds that:

(a) Most Cited Works: The most cited work is by JM Utterback and WJ Abernathy (2018) with 5,902 citations, indicating it is a seminal piece in the field of organizational innovation. Its high citation count suggests that it has significantly influenced subsequent research. Other highly cited works include those by RG Cooper and colleagues, which appear multiple times, reflecting Cooper's prominence in innovation studies;
(b) Trends Over Time: The publication years range from 2000 to 2023, allowing for the examination of how research focus has shifted. For example, more recent publications may reflect current trends and technologies, like AI's role in innovation. The presence of earlier works with high citation counts suggests foundational studies that continue to inform current research;
(c) Author Influence: Multiple publications by certain authors, such as RG Cooper, indicate their significant contributions to the understanding of product innovation. This can help identify leading researchers in the field for potential collaborations or further study;
(d) Journal Impact: The diversity of journals indicates a multidisciplinary interest in the topics of innovation and AI. Publications in high-impact journals (e.g., "Journal of Product Innovation Management" and "Academy of Management Journal") suggest a rigorous peer-review process and greater visibility in the academic community; and
(e) Research Themes: The variety of topics represented—ranging from theoretical frameworks to empirical studies—suggests a rich tapestry of research interests within the field of innovation. Key themes such as sustainable innovation and the integration of AI into product development are likely emerging areas of focus.

Based on the results of Table 1, this study also suggests that:

(a) Impact of Research: The table highlights influential works that have shaped the discourse on product innovation and AI. Researchers can use this data to identify critical contributions and gaps in the literature;
(b) Future Research Directions: Emerging trends and high-citation works can guide future research inquiries, suggesting areas that require further exploration or contemporary adaptation; and
(c) Collaboration Opportunities: The identification of prolific authors and their networks may present opportunities for collaboration, enhancing research output and impact.

Moreover, Table 2 demonstrates the results of bibliometric analysis on artificial intelligence, which are:

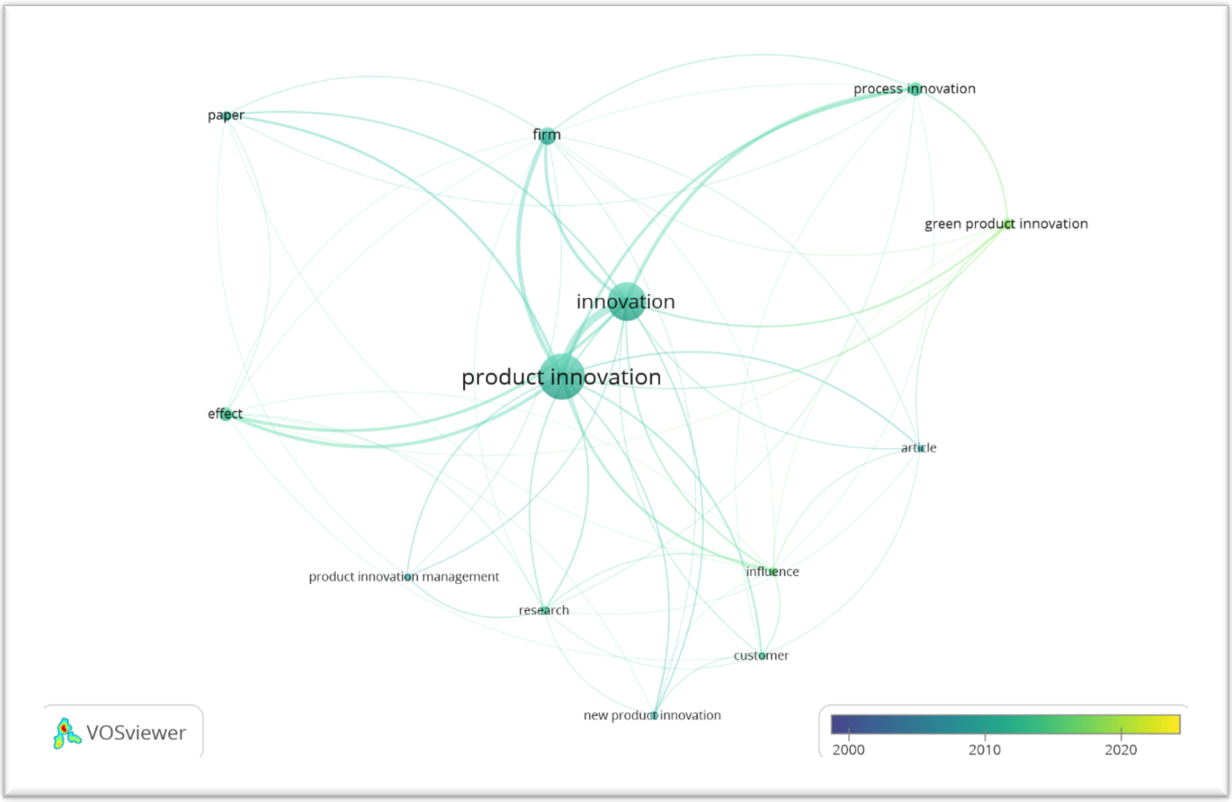
(a) Most Cited Works: The most cited publication, "Principles of Artificial Intelligence" by NJ Nilsson (2014), has an impressive 9,638 citations, indicating it is a foundational text in the AI field. Other high-impact works include "Artificial Intelligence in Medicine" by P Hamet and J Tremblay (2017) with 3,001 citations, reflecting its significance in the medical application of AI;
(b) Trends Over Time: The publication years range from 2001 to 2023, showcasing the evolution of AI research. For instance, earlier works from the 2000s are still highly cited, indicating their lasting impact; and
(c) Recent works, such as those from 2021 and 2022, suggest growing interest in specific applications of AI, including medicine and ethics, as the technology continues to advance.
(d) Author Influence: Authors like NJ Nilsson and M Minsky have multiple entries, showing their significant contributions and influence in the AI domain. Notably, Minsky's work from 2007 has 3,465 citations, highlighting his foundational role in the field.
(e) Journal Impact: Publications appear in various journals, indicating a multidisciplinary interest in AI. Journals like "Artificial Intelligence" and "Artificial Intelligence in Medicine" suggest a rigorous peer-review process and higher visibility within the community. The presence of journals specific to medicine indicates a sector-specific application of AI research, underlining its relevance in healthcare; and
(f) Research Themes: The diversity of topics in the table reflects a broad range of research interests within AI, including foundational theories, applications in medicine, ethical considerations, and historical perspectives on AI development. Emerging themes, such as "explainability" and "causability" in AI, reflect current concerns and trends in the field.

In line with the results in Table 2, this study also offers several insights, namely:

(a) Impact of Research: The table highlights significant contributions that have shaped the understanding and application of AI. Researchers can identify seminal works that have influenced a wide range of subsequent studies;
(b) Future Research Directions: The identification of high-citation works can guide future inquiries into areas that require further exploration or contemporary adaptation, particularly in the rapidly evolving context of AI; and
(c) Collaboration Opportunities: The presence of notable authors and their networks may foster collaboration opportunities, enhancing research output and impact.

VOSviewer Results

Figure 1. VOSviewer Results on Product Innovation



Souce: Data Processed (2025)

Based on Figure 1, VOSviewer selects and processes the minimum number of occurrences of a term, which is 7 and resulting that over the 1064 terms of product innovation, there are 26 terms meet the threshold. Each of the 26 terms, a relevance score is calculated and based on such 26 terms, and the most relevant terms are selected for the default choice is 60%, and this study selects 15 terms (slightly less than 60%). Accordingly, the results in Figure 1 show that there are 58 links and the strength of the total link is 895. Moreover, the results also disclose that there are 13 items and 5 clusters for “product innovation term” discussed and published inside Scopus, Web of Science, and Google Scholar, which are:

(a) Cluster 1 (7 items): article, customer, influence, new product innovation, product innovation, product innovation management, and research;
(b) Cluster 2 (3 items): green product innovation, innovation, and process innovation;
(c) Cluster 3, 4, and 5 (1 item each): paper, firm, and effect.

Furthermore, Figure 1 also explicitly discloses that:

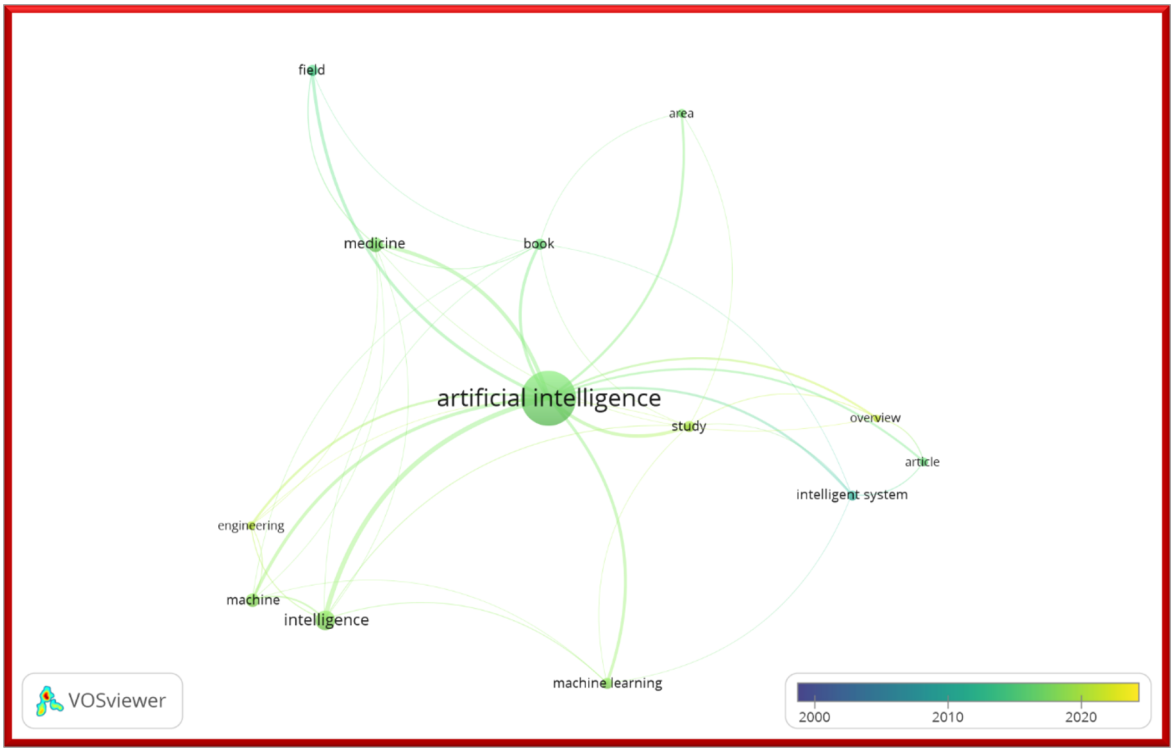
(a) Term Threshold: Out of 1,064 terms related to product innovation, 26 met the minimum occurrence threshold of 7. This indicates a focused selection of terms that are frequently discussed in the literature;
(b) Term Selection: The study selected 15 relevant terms, slightly below the 60% threshold. This selection indicates a concentrated effort to highlight the most pertinent concepts in the field of product innovation;
(c) Links and Strengths: The Figure 1 displays 58 links among the selected terms, with a total link strength of 895. This signifies a robust network of relationships among the terms, suggesting that they are frequently co-occurring in the literature;

(d) Cluster Analysis: The results reveal 5 distinct clusters of terms, indicating themes or categories within the broader topic of product innovation:
   1) Cluster 1 (7 Items):
      - Terms: Article, Customer, Influence, New Product Innovation, Product. Innovation, Product Innovation Management, Research.
      - Interpretation: This cluster focuses on the foundational concepts of product innovation. Terms like "customer" and "influence" suggest a strong emphasis on user-centric approaches and the impact of customer feedback on innovation processes. "New Product Innovation" and "Product Innovation Management" highlight the practical aspects of managing and developing new products.
   2) Cluster 2 (3 Items):
      - Terms: Green Product Innovation, Innovation, Process Innovation.
      - Interpretation: This cluster reflects a growing interest in sustainable practices within product innovation, with "green product innovation" as a key focus. The presence of "process innovation" indicates a recognition of the importance of improving processes alongside product development, aligning with trends in operational efficiency and sustainability.
   3) Clusters 3, 4, and 5 (1 Item Each):
      - Terms: Paper, Firm, Effect.
      - Interpretation: Each of these terms represents more niche or specific discussions within the broader product innovation discourse. "Paper" may refer to academic contributions or research outputs. "Firm" indicates the organizational context of product innovation, suggesting a focus on how companies approach innovation. "Effect" could pertain to the outcomes or impacts of product innovation efforts, though it is less central to the discussion than terms in the previous clusters.

(e) Visual Representation:
   1) Central Node: The central node "Product Innovation" connects to other terms, indicating its role as a focal point in the literature.
   2) Linkage: The connections (links) between terms represent the relationships and co-occurrence in academic writings. Stronger and more numerous links suggest more integrated discussions in the literature.
   3) Temporal Aspect: The color gradient (from purple to yellow) likely represents the timeline of publications, with darker colors indicating older publications and lighter colors showing more recent works. This can help identify evolving trends in the field.

(f) Overall Insights:
   1) Research Focus: The clustering of terms suggests that the discourse on product innovation is multifaceted, encompassing not only product development and management but also sustainability and organizational impacts;
   2) Emerging Themes: The emphasis on green product innovation signals a shift toward more environmentally conscious approaches in the field, reflecting broader societal trends; and
   3) Interconnectedness: The strong links among terms indicate a well-connected body of literature where concepts are interrelated, which is crucial for understanding how innovation practices evolve.

Figure 2. VOSviewer Results on Artificial Intelligence



Source: Data Processed (2025)

Figure 2 shows that VOSviewer picks and runs the minimum number of occurrences of a term, which is 5 and consequentially provides information that over the 480 terms of artificial intelligence, there are 22 terms meet the threshold. Each of the 22 terms, a relevance score is calculated and based on such 22 terms, and the most relevant terms are selected for the default choice is 60%, and this study selects 13 terms (slightly less than 60%). Accordingly, the results in Figure 2 show that there are 38 links and the strength of the total link is 349. Moreover, the results also disclose that there are 13 items and 5 clusters for “product innovation term” discussed and published inside Scopus, Web of Science, and Google Scholar, which are:

(a) Cluster 1 (5 items): article, artificial intelligence, intelligent system, overview, and study;
(b) Cluster 2 (3 items): engineering, intelligence, and machine;
(c) Cluster 3 and 4 (2 items each): area-book, and field-machine;
(d) Cluster 5 (1 item): machine learning.

Subsequently, the results in Figure 2 also in detail discovers that:

(a) Term Threshold: With a minimum occurrence threshold set at 5, 22 terms out of 480 related to artificial intelligence were identified. This indicates a careful selection of terms that are frequently discussed in relevant literature.
(b) Term Selection: The study selected 13 relevant terms, which is slightly less than the default threshold of 60%. This selection emphasizes key concepts within the domain of artificial intelligence.
(c) Links and Strengths: The analysis reveals 38 links among the selected terms, with a total link strength of 349. This suggests a moderate network of relationships among these terms, indicating that they often co-occur in academic publications.
(d) Cluster Analysis

The results categorize the selected terms into 5 distinct clusters, each representing different themes or aspects of artificial intelligence:

1) Cluster 1 (5 Items):
   - Terms: Article, Artificial Intelligence, Intelligent System, Overview, Study.
   - Interpretation: This cluster focuses on foundational aspects of artificial intelligence. The presence of "Artificial Intelligence" and "Intelligent System" highlights core topics essential to understanding AI technologies. Terms like "Overview" and "Study" suggest that there is a substantial body of literature summarizing and analyzing these concepts, indicating a strong interest in reviewing existing research.
2) Cluster 2 (3 Items):
   - Terms: Engineering, Intelligence, Machine.
   - Interpretation: This cluster emphasizes the technical aspects of artificial intelligence, particularly in engineering contexts. The term "Intelligence" here may encompass both artificial and human intelligence, reflecting the intersection of engineering practices and cognitive processes.
3) Clusters 3 and 4 (2 Items Each):
   - Terms: Area, Book (Cluster 3); Field, Machine (Cluster 4).
   - Interpretation: These clusters indicate specific domains (Area) and reference materials (Book) that are relevant to the study of artificial intelligence. The recurring mention of "Machine" in both clusters underscores its significance in discussions around AI applications and technologies.
4) Cluster 5 (1 Item)
   - Term: Machine Learning.
   - Interpretation: This cluster focuses specifically on machine learning, a pivotal area within artificial intelligence. The singular focus on "Machine Learning" indicates its critical role in driving advancements and innovations in AI.

(e) Visual Representation:
1. Central Node: The central node "Artificial Intelligence" connects to other terms, establishing it as a focal point in the literature.
2. Linkage: The connections among terms illustrate their relationships and co-occurrences. The moderate strength of links indicates that while these terms are interconnected, they may not be as densely clustered as in other studies.
3. Temporal Aspect: The color gradient (from purple to green) represents the timeline of publications, with darker colors indicating older works and lighter colors showing more recent contributions. This helps identify trends in research focus over time.

(f) Overall Insights
1. Research Focus: The clustering of terms highlights a significant emphasis on artificial intelligence, particularly its application in engineering and machine learning.
2. Emerging Themes: The presence of terms related to "Intelligent Systems" and "Machine Learning" reflects current trends in AI research, signaling a growing integration of these concepts within product innovation.
3. Interconnectedness: The moderate number of links indicates an evolving body of literature where AI-related concepts are becoming increasingly integrated into discussions of innovation and engineering.

4. CONCLUSIONS AND RECOMMENDATIONS

This study provides significant insights into the relationship between product innovation and artificial intelligence through bibliometric analysis.As for theoretical contribution context, the results show that there has been a significant increase in related publications, as well as strong interdisciplinary collaboration. For example, by examining citation

patterns, influential authors, and publication trends, researchers can gain insights into the current state of the field and identify potential avenues for future study especially on product innovation and artificial intelligence based on quantitative approach. The data not only reflects the historical significance of foundational works but also points to emerging areas of interest that are crucial for ongoing research and application in product innovation as well as artificial intelligence. Likewise, the VOSviewer results provide valuable insights into the landscape of artificial intelligence research, particularly in relation to product innovation. The identified clusters highlight key themes and interrelations, emphasizing the importance of AI technologies in driving innovation. This analysis serves as a guide for researchers and practitioners to navigate the complexities of artificial intelligence, pointing to areas for future exploration, collaboration, and application in various fields. As for managerial contribution context, this study also recommends that companies be more active in exploring the use of AI in their product innovation, as well as supporting collaboration between academics and practitioners to overcome existing challenges. Further research is also needed to explore more deeply the specific impact of AI in various industrial sectors.

REFRENCES

Akbar, A., Mustafa, M. Y., Haeruddin, M. I. M., Mariñas-Acosta, C., Hasbiyadi, H., Alam, S., & Darmawinata, W. N. S. (2024). Days of future past: Scrutinising the artificial intelligence impact on the leadership of internationalising SMEs. *Asian Journal of Economics, Business and Accounting*, *24*(5), 53–59. https://doi.org/https://doi.org/10.9734/ajeba/2024/v24i51292

Ampauleng, A., & Abdullah, S. (2023). The Resource-Based View of Tourism Management in Investigating the Critical Moderation Role of Leadership Inside SMEs and VUCA Markets. *African Journal of Hospitality, Tourism, and Leisure*, *12*(4), 1359–1369. https://doi.org/https://www.ajhtl.com/uploads/7/1/6/3/7163688/article_12_12_4_1359-1369.pdf

Amran, A. D., Syahid, R., & Mustafa, M. Y. (2024). Digital Leadership Impacts on a Village-owned Enterprise Performance: A Moderation Effect of Artificial Intelligence. *South Asian Journal of Social Studies and Economics*, *21*(11), 74–80. https://doi.org/https://dx.doi.org/10.9734/sajsse/2024/v21i11902

Armstrong, G., Adam, S., Denize, S., & Kotler, P. (2014). *Principles of marketing*. Pearson.

Assoratgoon, W., & Kantabutra, S. (2023). Toward a sustainability organizational culture model. *Journal of Cleaner Production*, *400*, 136666.

Grant, J. (2011). *The brand innovation manifesto: How to build brands, redefine markets & defy conventions*. Wiley+ ORM.

Howard, J. (2019). Artificial intelligence: Implications for the future of work. *American journal of industrial medicine*, *62*(11), 917–926. https://doi.org/https://doi.org/10.1002/ajim.23037

Khan, A., Goodell, J. W., Hassan, M. K., & Paltrinieri, A. (2022). A bibliometric review of finance bibliometric papers. *Finance Research Letters*, *47*(102520).

Kirby, A. (2023). Exploratory bibliometrics: using VOSviewer as a preliminary research tool. *Publications*, *11*(1), 10.

Kotler, P., Keller, K. L., Ang, S. H., Tan, C. T., & Leong, S. M. (2022). *Marketing management: an Asian perspective*. Pearson Education.

Miller, T. (2019). Explanation in artificial intelligence: Insights from the social sciences. *Artificial intelligence*, *267*, 1–38.

Mustafa, M. Y., Akbar, A., Razak, N., Angreyani, A. D., Abadi, R. R., & Nurjannah, N. (2023a). The rise of skywalker: The critical vehemence of customer loyalty inside the e-commerce platform. *Asian Journal of Education and Social Studies*, *41*(2), 57–67.

Mustafa, M. Y., Mustafa, F., Mustafa, R., & Mustafa, R. (2018). Japanese enterprises role on SMEs development in Indonesia: inside tobiko export and import. *Hasanuddin Economics and Business Review*, *2*(2), 83–95. https://doi.org/http://dx.doi.org/10.26487/hebr.v2i2.1352

Mustafa, M. Y., Rauf, D. I., & Killa, B. A. (2023b). Consumer behavior: Lifestyle, socialmedia and peer friends on consumptive behavior online shopping for fashion products on the tiktok platform: Study on management students of Makassar State University. *Jurnal Penelitian dan Karya Mahasiswa*, *1*(1), 33–42.

Mustafa, M. Y., Umiyati, H., Ghozali, Z., Zulfikar, R., & Koni, A. (2024c). *Prinsip Pemasaran Untuk Era Digital*. Widina Media Utama.

Paesano, A. (2023). Artificial intelligence and creative activities inside organizational behavior. *International Journal of Organizational Analysis*, *31*(5), 1694–1723. https://doi.org/https://doi.org/10.1108/IJOA-09-2020-2421

Raisch, S., & Krakowski, S. (2021). Artificial intelligence and management: The automation–augmentation paradox. *Academy of management review*, *46*(1), 192–210. https://doi.org/https://doi.org/10.5465/amr.2018.0072

Sun, Z. (2018). Artificial Leadership: An Artificial Intelligence Approach. *PNG UoT BAIS*, *3*(12), 1–7. https://doi.org/https://www.researchgate.net/profile/Zhaohao-Sun/publication/327105932_Artificial_Leadership_An_Artificial_Intelligence_Approach/links/5b78c65a299bf1d5a714a391/Artificial-Leadership-An-Artificial-Intelligence-Approach.pdf

Tafsir, M., & Mustafa, M. Y. (2025). The Force Awakens: The Role of Social Media Marketing on SMEs Context in Makassar (A Case Study Approach). *Entrepreneurship, Management, and Business Research Journal*, *2*(1), 1–5. https://dailymakassar.id/ejournal/index.php/embun/article/view/101/178

Tambe, P., Cappelli, P., & Yakubovich, V. (2019). Artificial intelligence in human resources management: Challenges and a path forward. *California Management Review*, *61*(4), 15–42.

Voss, C. A., Åhlström, P., & Blackmon, K. (1997). Benchmarking and operational performance: some empirical results. *International Journal of Operations & Production Management*, *17*(10), 1046–1058.