



A SYSTEMATIC REVIEW ABOUT ACADEMIC INDUSTRY COLLABORATION, TECHNOLOGY TRANSFER & SKILL DEVELOPMENT: A BIBLIOMETRIC ANALYSIS USING THE SCOPUS DATABASE

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Abstract

The gap between new-age jobs & availability of a skilled workforce is widening have shifted focus to academic-industrial collaboration nurturing applied research innovation, technology transfer & creation of a skilled workforce. This paper attempts to analyze a birds-eye view of the research that happened from 2011 onward that had been done in this arena & explores the critical aspects of academic-industrial collaboration, technology transfer, and skill development.

A systematic review of studies published between 2010 onwards is studied using the following trusted Scopus database. After the initial screening of the paper resulted in 1,534 documents, after the keywords refinement final, 121 papers were taken for the analysis, and eight exclusive papers studied the skill development parameter along with the above keywords. The result shows that most of the United States has the maximum number of documents published in AIC. In the second number, the publication is from the United Kingdom, followed by India. It signifies that a growing economy needs innovation, technology transfer & skilled workforce & AIC is the model to go ahead.

Keywords: Collaboration; Academia Industry; Technology transfer; Skill development

Introduction

In Academia stands first in driving newer innovation & skilled workforce but needs significant improvement. Galan-Muros and Davey (2019) proposed a conceptual framework to understand university-industry collaboration. With many academic research centres, central universities are the best places to nurture & up-bring research ideas practically for development in segments like Agricultural,

Healthcare, infrastructure & education, which can enhance the quality of healthcare facilities with tremendous opportunities.

Modern manufacturing technologies are evolving fast, and further demand for a skilled workforce will be arising. Most companies offshoring innovation work, bridging the skills gap, is used for this procedure (Aken et al., 2009). These new ideas & concepts can be considered by the industry for these concepts commercialize for

market needs. Academia should prepare students to be skill-ready for new-generation jobs (Oraison, H., Konjarski, L., & Howe, S., 2019). In one way, academia should market themselves more to industry or government & industry should also work with academia to work on new concepts which can address the market needs. The industry-academia gap needs to be bridged. Across the world, a motivated and skilled brain is the most precious asset available. Promoting Entrepreneurship and Startups will ensure an unprecedented wave of long-deserved growth, prosperity and well-being that can serve the interests of the rest of the world. (Kaminski, Switzer, and Gloeckner, 2009; Kivunja, 2014) Bridging the AIC gap is vital in this scheme, where students and universities can work together to work on a cause. Accessible to world-class innovation and entrepreneurial ecosystem, leveraging accessible, affordable technologies transforming our world and enabling incredible innovation and new job creation opportunities. Many published research paper has time to time, focused on this. Recently, many published scientific studies have highlighted this significant and timely challenge of curriculum alignment to bridge the gap between the skills attained in the university and the complementary skills that are mandatory in the job market (Manaf, 2021; Zimmer & Keiper, 2021). With technology transfer & skilled workforce requirements in the forthcoming years, developing and seeking an employable workforce has been challenging for most recruiters. As low employability hits the sector, bridging this qualitative talent supply gap is imperative. In recent years a massive amount of importance has been given to skill development through AIC collaboration, like AIC technology transfer in the USA. Its increasingly significant impact in a big way indicates a recognition of the economic role of academic institutions, which has been called the 'Second Academic Revolution' (Berneman, L. P., & Denis, K. A. 1998). In recent updates, various statutory Organizations of the Government, like in a recent circular UGC, India, issued specific guidelines for providing Skill Based Education under National Skills Qualifications Framework.

Higher education institutions must interact with the industry sector in the current scenario to create and promote industry-oriented courses. These courses may qualify for credits and will help the employability of graduate students. Academia should emphasize providing an established ecosystem for skill development to meet industrial needs (Mazuray, L., & Balembois, F. (2016, September). (Image No. 01) shows the models and frameworks of employability and the salient factors that influence technology transfer & skill development through.



Image No. 01

Source: Mazuray, L., & Balembois, F. (2016, September)

The review

A systematic review was done using the Scopus database and Scopus Analyse search results, followed by VOSviewer for conducting systematic network analysis studies. First, we start by defining the research question. Then determine the required characteristic for the study. Continue by retrieving potentially relevant literature and selecting pertinent literature. We then synthesize relevant information from the literature, and the final step is reporting the result of the review.

The following research question addressed:

RQ1: What is the critical aspect of AIC, and how do they influence AIC outcome?

RQ2: What is the major subject area that was studied in AIC?

RQ3: What are the different outcome trends of successful AIC?

Retrieving and selecting pertinent literature

The literature review with the Scopus database initially resulted from 2,534 documents in results, and the number of publications has increased in recent years.

The scope, further refined with the above keywords, given 121 documents from 2011 (Table 1) years onwards & this literature was used to conduct analysis using Scopus Analyze search. The results output documents published by year, document analysis by source, Citation overview, documents by country, affiliation, type, subject area, funding sponsor, and author.

Keyword	No of literature
Technology Transfer	67
Knowledge Management	19
Industry-academia Collaboration	13
Knowledge Transfer	13
Industry Collaboration	12
Software Engineering	12
Industry	11
Innovation	11
Engineering Education	11
Human	11

Table 1(a). Summary of reviewed literature Keyword search Retrieved data from www.scopus.com

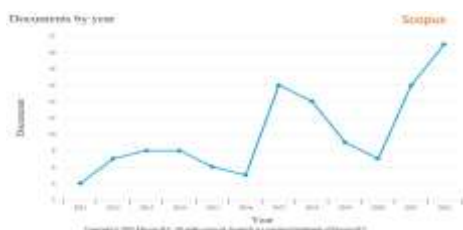
Table2. Summary of most cited first ten literature searches with the above keyword search. Source: www.scopus.com

Publication Year	Document Title	Authors	Cited by (highest)
2017	How intermediary organizations facilitate university–industry technology transfer: A proximity approach	Villani E., Rasmussen E., Grimaldi R.	149
2011	Heat exchanger fouling: Mitigation and cleaning strategies	Muller-Steinhagen H., Malayeri M.R., Watkinson A.P.	122
2012	The success factors powering industry-academia collaboration	Wohlin C., Aurum A., Angelis L., Phillips L., Dittrich Y., Gorschek T., Grahn H., Henningsson K., Kagstrom S., Low G., Rovegard P., Tomaszewski P., Van Toorn C., Winter J.	98
2011	Willingness to engage in technology transfer in industry-university collaborations	Lai W.-H.	62
2013	Issues and initiatives for practical deployment of wireless power transfer technologies in Japan	Shoki H.	40
2016	Global software engineering: Evolution and trends	Ebert C., Kuhrmann M., Prikladnicki R.	36
2015	Targeting Academic Engagement in Open Innovation: Tools, Effects and Challenges for University Management	Jonsson L., Baraldi E., Larsson L.-E., Forsberg P., Severinsson K.	36
2018	An experience report on applying software testing academic results in the industry: we need usable automated test generation	Arcuri A.	34
2015	Scientific yield from collaboration with industry: The relevance of researchers' strategic approaches	Callaert J., Landoni P., Van Looy B., Verganti R.	31
2014	Transferring an automated test generation tool to practice: From Pex to Fakes and Code Digger	Tillmann N., De Halleux J., Xie T.	25

From the above list of top-cited papers from the considered keywords in this paper, technology transfer & collaboration emerges as a crucial parameter in AIC. The success of the collaborative model outcome focus on two main important factors: innovation, which is technological transferable mostly for manufacturing scale-up and skill development.

Statistical analysis of the Scopus database delivered the following outcomes.

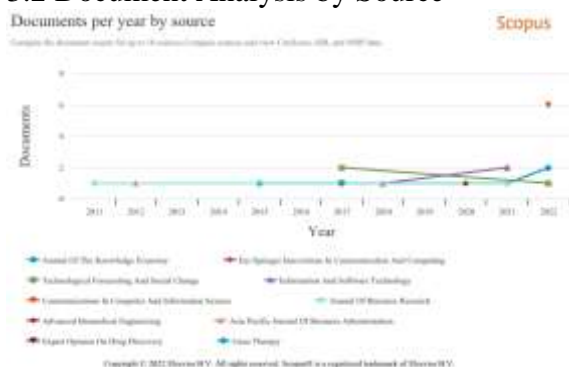
3.1 Document Analysis by Year



Graph No. 01

The need for AIC gained importance in the last decade, understanding the needs of the industry, academic & industry collaboration on various fronts to deliver the applied solution to modern complex problems. The above (Graph No.1) shows that the number of publications generated has significantly increased and evolved various new models to create a better academic curriculum keeping in mind the industrial needs & better job-ready carrier for the students.

3.2 Document Analysis by Source

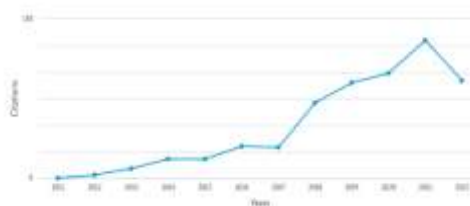


Graph No.2

Various sources generate on the AIC. The trend (Graph No.2) for the source shows an increase in technology transfer by devising a sustainable model through AIC as it evolves, which will directly revolutionize the skilled-based education system.

3.3 Citation overview

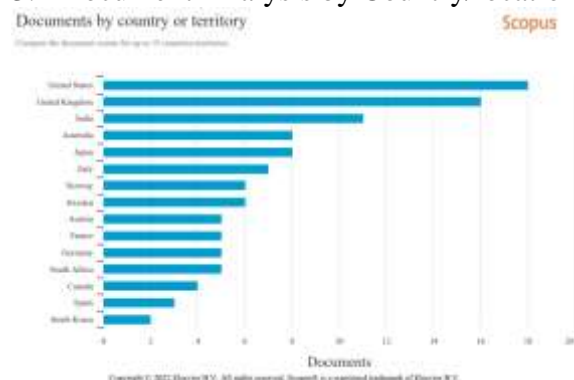
Retrieved data from www.scopus.com



Graph No.3

The trend observed in the number of citations (Graph No.3) over the year is growing; there is a slight dip in the citation in the year 2022

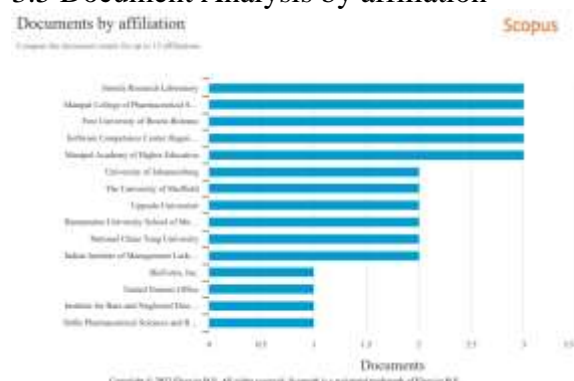
3.4 Document Analysis by Country/location



Graph No.4

While studying the publication trends (Graph No.4), the maximum number of AIC happening in the United States, the importance & needs for the current era. India has significantly transformed the AIC landscape through a lot of innovation & skilled workforce development through industrial collaboration, which needs to look to the next level by implementing newer policies to cater to and nurture the growth of speedy development.

3.5 Document Analysis by affiliation

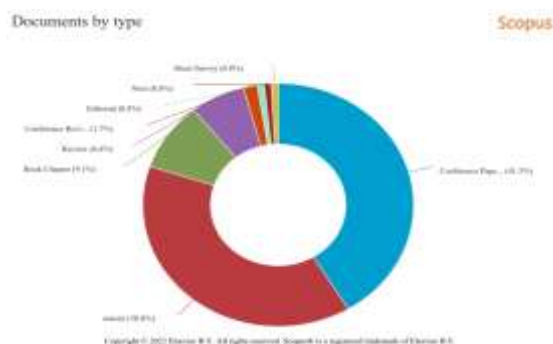


(Graph No.5)

While studying the outcome of the document by affiliation (Graph No.5), we find it offers a higher number of research outcomes through collaboration.

3.6 Document Analysis by Type

articles. In (Image No. 02) shows the distribution of the document's outcome.



(Image No.2),

Significant documented outcomes are conference papers followed by research

3.7 Document Analysis by Subject area

Table 3.Summary of reviewed literature Keyword search

Source: www.scopus.com

Subject Area	Number of literature
Computer Science	36
Engineering	31
Business, Management, and Accounting	22
Social Sciences	11
Energy	9
Decision Sciences	8
Materials Science	8
Mathematics	8
Medicine	7
Earth and Planetary Sciences	6
Environmental Science	6
Economics, Econometrics, and Finance	4
Physics and Astronomy	4
Biochemistry, Genetics, and Molecular Biology	3
Psychology	3
Pharmacology, Toxicology, and Pharmaceutics	2
Agricultural and Biological Sciences	1
Arts and Humanities	1
Chemical Engineering	1
Chemistry	1

(Image No. 03)

Computer sciences, and engineering, followed by business management, are the primary subject areas of the current collaborative research focus. In the above

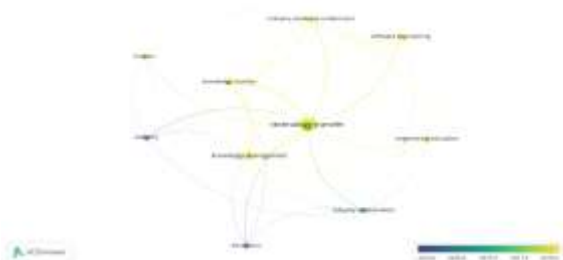


Image No.4a

Industry-academia collaboration, technology transfer, innovation, knowledge transfer, knowledge management, engineering education, and human industry network is studied (Image No.4a.)

4.2 Network map of thirty critical parameters network analysis studied together.

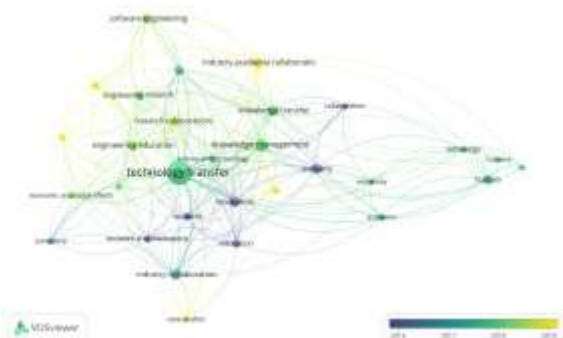


Image No.4 (b)

A network map of thirty items studied together, like academia, collaboration, industry-academia collaboration, collaborative research, higher education, and innovation, is done. (Image No.4a.) Technology transfer, innovation, and knowledge management are essential factors in AIC.

Conclusion of Research work

The current world needs innovation to overcome the current challenging needs of the era in the field of agriculture, healthcare, environment few to look. The conducted systematic literature review provides information on studies AIC. First, the most critical aspect of the AIC is knowledge & technology generation in collaboration with industry to address current global needs in applied sectors. In this way, both academia & industry benefit; academia utilizes & nature young minds and imparts a high skill set for industrial needs. Secondly, the study indicates that

most work is done in computer science, followed by engineering, business management & accounting. All this area is critical & support to revolutionize industrial & economic growth through AIC. Finally, the vital insight brings attention to the point that the current trends show that maximum AIC is studied in the United States, followed by United Kingdom & India, and there is much importance given to Academic industry collaboration with the outcome of technology transfer. The world needs innovation to overcome the current challenging needs of the era in the field of agriculture, healthcare, environment few aspects to focus.

The partnerships must foster a culture of collaboration and embrace a shared vision of trust, teamwork, and transparency in the structure and scope of these collaborations to develop & deliver successful outcomes. Funding is also an important parameter that keeps this collaboration going on needs to be studied further. Thus, AIC provides a paradigm shift to bridge the gap in technology transfer; a skilled workforce can serve the interests of the rest of the world & ensure an unprecedented wave of long-deserved growth, prosperity, and well-being.

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