*IOSR Journal Of Humanities And Social Science (IOSR-JHSS)*
*Volume 27, Issue 11, Series 6 (November, 2022) 56-60*
*e-ISSN: 2279-0837, p-ISSN: 2279-0845.*
*www.iosrjournals.org*

# The Quest for a Framework to Measure and Monitor Research-Industry (R-I) Synergy –Empirical evidence fromZimbabwe

Philemon Kwaramba*, Prof. J Kurasha**, Prof L.Dube**, Dr A Munzara****
**ZOU DPhil student and Business Operations Unit Director, SIRDC*
*** ZOU Professors ***ZOU Faculty of Commerce&the Department of Economics*

**Abstract:**
This paper introduces the research-industry synergy index developed through 212 expert responses from Zimbabwe. The researcher and/or expert perceptions were captured through Likert Scale responses (LSR) whose scale ranged from 1=lowest to 10=best/ideal. Twenty (20) techno-business parameters were covered. This culminated in an index for those in research, another index for those in industry and a third embracing both research and industry sides. R-I synergy level was estimated at 4 out of 10, confirming the widely held that R-I was very low. Aspects that needed policy attention are shared for informed intervention.

Date of Submission: 08-11-2022 Date of Acceptance: 22-11-2022

## I. Background Information

The World Association of Industrial and Technological Research Organisations (WAITRO) has just concluded its 2022 Global Summit in Cape Town, South Africa with a key message calling for enhanced collaboration among members and between research and industry. This was reportedly in line with UN Sustainable Development Goals (SDGs) 9 and 17. Respectively these SDGs emphasised Industry, Innovation and Infrastructure and the Partnerships for the Goals. Measuring progress in collaborative synergies lead to informed policy interventions. A tool for measuring and monitoring R-I synergy was equally key for policy. Doctoral studies carried out between 2017 and 2021 carried out by the author developed a perception based index in order to generate a quantitative measure for R-I synergy among developing economies.

## II. Guiding Design Philosophy:

The author based the index/model design on core philosophies of simplicity and functionality. The parameters that were used in building the dashboard were derived from:

- The Stage Gate Process (Cooper, 1994) - teamwork, novelty and customer attention
- Technology Diffusion Theory (Rogers, 1995)- from R&D to industry
- Systems Theory (Chen and Stroup,1993)- holistic view and feedback
- Triple Helix (Etzkowitz and Leydesdorff,2000)- balancing interests of academia, State and industry
- Business Ecosystem (Galateanau and Avasilcai,2013)- interconnectedness
- 3I Framework (Phulkerd *et al*, 2022) - balancing interests and"Trinity" Framework (Zhang, 2017) which balanced product research, business incubation and creation of industries.

Table 1 summarises the link between the theories, study objectives and variables used in data collection.

**Table 1:**Connecting Theories, Objectives and Variables used under the study

| **Theory** | **Selected Dimensions that have a bearing on R-I moral synergy** | **Study objective(s) covered** | **Variable(s) derived for questions under KII and expert survey** |
|---|---|---|---|
| Stage Gate | • Market first before R&D<br>• Novelty<br>• Prior art (literature, patents review)<br>• Teamwork<br>• Excellent communication<br>• Excellent compensation for employees | Factors and the Commercialisation Variables | **KII:**<br>• Extent of R-I synergy<br>• Issues causing resistance to R-I synergy<br>• Suitability of R&D facilities to support synergy<br>• Suitability of teaching and mentorship facilities for synergy |
| Triple Helix | • Functions<br>• Level of interactions | Extent of R-I synerg'y Factors | |

| | | | |
|---|---|---|---|
| | • Enabling role<br>• Existence of shared interest in R-I synergy | Policy changes | • Government role in synergy<br>• Attributes that support synergy (teamwork, passion, facility sharing)<br><br>**Researcher/ Expert survey:**<br>• Questions 1 to 5 on demographics, research output<br>LSR questions:<br>• Questions 6.1 to 6.10<br>• Questions 7.1 to 7.10<br>• Questions 8.1 to 8.10<br>• Questions 9 and 10 on policy recommendations and resource needs |
| Diffusion | • Infrastructure and manpower for innovations<br>• Technology transfer<br>• Income and benefits flow | R&D intentions and transfer<br>Commercialisation Inventory | |
| Systems | • Holistic view and management<br>• Extent and importance of feedback<br>• Inter-face options | Nature, level of R-I Engagement<br>Feedback levels leading to strengthened synergy | |
| Business Ecosystems | • Interconnectedness<br>• Extent of innovations and transfer from R to I or within R/I<br>• Level of productivity gains<br>• Sustainability signals | Connections<br>Flow of benefits (mutual)<br>Sustainability | |
| 3i-Framework | • Interests<br>• Ideas<br>• Institutional | Analytical themes for QUAL component<br>Contested interests and synergy | |
| "Trinity" Analytical Framework | • Institute<br>• Incubators<br>• Industrial base | Synergy among the three<br>Synergistic benefits | |
| Policy mix for commercialisi ng university technologies | • Direct funding support and synergy with technology transfer demos, science parks<br>• Importance of high innovation capacity<br>• How the three key stakeholders (scientists, TTOs, private investors) relate<br>• The quest for harmonising different barriers, varying motivations and dissimilar roles played by each | Policy analysis<br>Significance of high innovation capacity in synergy<br>The quest for balancing stakeholders interests (scientists, TTOs, private sector)<br>Harmonising barriers, motivations and dissimilar roles | |

**Source:** Author analysis

## III. The Twenty (20) Parameters in the R-I Synergy:

Twenty (20) parameters were used in developing Likert scale responses (LSR). These parameters were used under both research and industry circumstances.

The parameters used,within the working context of both R&D or I&C,were:

- R-I synergy level
- Extent of lobbying for R-I synergy
- Extent of R-I synergy support from statutes and policies
- Level of inclusivity in search of new ideas
- Extent to which the customer was given priority attention
- Level of skills and empowerment towards R-I synergy
- Joint R-I review
- Extent of rewarding novelty
- Level of exposure to international best practices in R-I synergy
- Bankable business plans that spoke to both R and I
- Extent of encouragement to read latest literature and related process/product patents
- Extent of teamwork within and across R and I
- Extent of quarterly engagements between R and I

The parameters used based on personal expert opinion (same question for R&D or I&C) were:

- Level of influence of time and distance
- Extent of breaking down projects into manageable stages
- Extent of R-I synergy inclusion in keynote speeches, strategic plans and policies
- Extent of culture, skill and competence in support of R-I synergy
- Role of mentors and senior management in supporting R-I synergy
- Extent to which personality differences hinder R- synergy

- Extent to which the absence of valuation of intellectual property (IP) and R&D outputs hinder R-I synergy

Each of the parametershad a 1-10 Likert scale rating, with 1=lowest whilst 10=highest/best. A colour code was also incorporated as follows: 1-4 Red [**Classical, Traditional**]; 5-7 Amber[**Changing towards Ideal**] and 8-10 Green [**Current Global Best Practice/Ideal**]. Over 212 respondents fed into the development of the R-I synergy dashboard.

## IV. Empirical Measurement:

Empirical findings are shared under table 2 below.

**Table 2:** Empirical Dashboard Findings

| **Defined Likert Scale Ratings (SLRs)** | **1-4** Red | **5-7** Orange | **8-10** Green |
|---|---|---|---|
| | **R&D** | **I&C** | **IDEAL** |
| Expert views within the context of Universities, R&D centres (R&D) relative to Organisations, Companies (I&C) | | | |
| • R&D LSR Ratings (N=114) | **4.2** | | **9** |
| • I&C LSR Ratings (N=98) | | **3.7** | **9** |
| • All LSR Ratings (N=212) | **4.0** | | **9** |

**Source:**2021 Expert Survey Findings

I&C rated synergy level to be much lower than what R&D felt. The overall R&D category rating of the extent of R-I synergy was 4.2 out of a possible 10 whilst the I&C rating was 3.7 out of a possible 10. The overall LSR rating for Research - Industry synergy was 4 out of a possible 10. All ratings were in the Red category. This shows the level of resistance to calls by policy makers for "silos" to be broken. It also shares that task ahead for those mandated to bring research and industry together through statutes or incentives or even a combination.

## V. Tests for significance in difference

Eight (8) of the 20 parameters were significant in difference between R and I at 5% (N=212). The parameters were: Level of R-I synergy (Question 6.1); Statutes, policies, strategic plans supporting R-I synergy (Question 6.3); Inclusivity in search for new ideas (Question 7.1); Breaking down projects into stages for effective roll-out (Question 7.2); Management had sole right to make decisions (Question 7.3); Encouragement of teams to read latest literature and patents (Question 7.6); R&I joint review meetings (Question 7.7) and Professional bodies lobbying for R-I synergy (Question g7.8). Twelve (12) of the 20 parameters showed no significant difference at 5% (N=212).

## VI. Implications:

Moving away from R-I synergy levels of 4 out of 10 [Red] towards 8-10 out of 10 [Green] requires a paradigm in both research and industry. The study findings showed that both sides have work to do in order to shift away from the classical way of relating to one another. The unfortunate circumstance were both converge in the red zone need urgent action. Issues requiring attention under both research and industry include: researcher/expert incentives, policy and statutory reviews, exposure to international best practice cases and even capacity building in inter-facing skills for personnel involved in facilitating linkages. Culture change towards teamwork and passion for success (together) in linking research and industry were deemed key. Stakeholders were also urged to start very early to inculcate culture and practice of collaboration so that when they assume leadership positions they will have synergy within themselves or their DNA. Co-curricular (membership of clubs linking research and industry or advancing thematic fields of study) and extra-curricular engagements (sports)were deemed key. They foster teamwork and a winning mentality – ingredients needed for sound R-I synergy. Harnessing diaspora expertise and experience as well as membership to professional networks were essential. These quickly connect one to international best practice cases. The needed foreign currency for such engagements must be availed if interventions are bear fruits for developing economies like Zimbabwe. The WAITRO Global Summit 2022 urged capacity building and funding for the transformation of researched product into start-up companies and enhanced research commercialization. Over 40 Africa member countries agreed on the need and action for enhanced research commercialization.

## References:


[1]. **Butt Amir (2019):**Science of Entrepreneurship Keynote Address at the 12th bi-annual Zimbabwe International Research Symposium (ZIRS), Harare International Conference Centre (HICC) organised by the Research Council of Zimbabwe (RCZ), Harare, Zimbabwe.

[2]. **Chen Herbert (2014):**The Supporting Systems of Science Parks – Case Introduction of TusPark UNESCO World Technopolis Association (WTA) International Training Workshop, Conference Hall, INNOPOLIS Foundation, Republic of Korea.

[3]. **Chetsanga C.J. (2021):** Africa: Industrialising for Economic Prosperity: My Life and Work in Science and Technology Themba Books ISBN:9798433807693

[4]. **Cooper R.G. (2014):** The Next Stage for Stage Gate ® - Pragmatic Marketing in Research and Technology Management published by Industrial Research Institute, Washington, DC, USA.

[5]. **Confederation of Zimbabwe Industries (CZI)/CEO Africa Roundtable (2018):** Strategy for Economic Transformation and Development through Industrialisation for Zimbabwe: Research Report prepared by Crown Agents United States of America (USA) with funding under United States Agency for International Development (USAID)

[6]. **DAMVAD Analytics (2017):**Economic Impact of Research Collaborations with the Norwegian University of Science and Technology-NTNU Copy right 2017, DAMVAD Analytics A/S Hvnegade 39 DK-1058 Copenhagen https://www.damvad.com

[7]. **Government of Zimbabwe (2021**): National Development Strategy (NDS) 1 – Towards a Prosperous and Empowered Upper Middle Income Society by the Year 2030 Government Printers, Harare, Zimbabwe.

[8]. **Government of Zimbabwe (2021):** Centre for Education, Innovation, Research and Development Act Chapter 25:34 No.3/2021

[9]. Government of Zimbabwe (August 2020): Agriculture and Food Systems Transformation Strategy- 5-Year Agriculture Gross Value Projections Ministry of Lands, Agriculture, Fisheries, Water and Rural Resettlement

[10]. **Government of Zimbabwe-GoZ (2019):** Zimbabwe National Industrial Development Policy (ZNIDP) 2019:2023 Ministry of Industry and Commerce, Mukwati Building, Harare, Zimbabwe.

[11]. **Government of Zimbabwe –GoZ (September 2019):** Performance Review of the SIRDC: Analysis, Assessment and Recommendations for a Turnaround Strategy conducted by Tetralink Taylor and Associates East Africa with funding from the African Development Bank (ADB) validated at an all-stakeholder workshop held on the 20th of September 2019, Crowne Plaza Monomutapa Hotel, Harare, Zimbabwe.

[12]. **Gweme F (2011):** Enhancing the Commercialisation of R&D Results using the Stage Gate Process Model: Implications for R&D Institutions in Zimbabwe A Dissertation submitted in partial fulfilment of the requirements of the Eastern and Southern Africa Management Institute-ESAMI-Executive Masters in Business Administration –EMBA-Degree.

[13]. **International Association of Science and Technology Parks (IASP 2008):** Annual World

[14]. Conference on Science and Technology Parks and the 2008 Members' Annual General

[15]. Meeting, Johannesburg, South Africa.

[16]. **IASP Africa Division (May 2011):**Science and Technology Parks (STPs) and Business Incubators (BICs) in Africa Survey Report Project and Knowledge Management Department, IASP http://www.iasp.ws

[17]. **IASP (2018):** "IASP Strategigramme"www.iasp.ws **/AOIs**

[18]. **Klimuk V, Tarasova A, Yulia K et al (2020):**Synergistic interaction of education, science and industry Leadership Education Personal Interdisciplinary J2, 53-58 (2020) https://doi.org/10.1365/s42681-020-00009-y

[19]. **Kijkasiwat P, Cave J, Hewa Wellalage N, Locke S (2022):**Synergistic model to boost business performance: a New Zealand Case Study Journal of Small Business Enterprise Development, Vol 29 No 2 pp 241-260 © 2021 Emerald Publishing Limited https://doi.org/10.1108/JSBED-O3-2020-0063

[20]. **Martin Jacques (2009):**When China Rules the World: The End of the Western World and the Rise of the New Global Order Penguin Publishers

[21]. **Michael J Remington (2005):**The Bayh-Dole Act at Twenty-Five Years: Looking Back, Taking Stock, Acting for the Future Journal of the Association of University Technology Managers Summer Issue, Volume XVII, No 1 pp 15-31

[22]. **Government of Zimbabwe (2001):**The Research Act Chapter 10:22 22/2001 Government Printers, Harare

[23]. **Ministry of Finance and Economic Development (January 2020):**Turnaround Reform Strategy and Action Plan for the Scientific and Industrial Research and Development Centre-SIRDC- Final Report

Tetralink Taylor and Associates East Africa in JV with Pazel Conroy Consulting Ltd with financial support from the African Development Bank, Nairobi, Kenya

[24]. **Ministry of Higher and Tertiary Education, Science and Technology Development (2019a):**Strategic Plan 2019-2023-Education 5.0 Heritage-Innovation-Industrialisation The Modernisation and Industrialisation of Zimbabwe through Education, Science and Technology, Harare, Zimbabwe.

[25]. **Ministry of Higher and Tertiary Education, Science and Technology Development (2019b):**Government of Zimbabwe's Priority Programmes 2019-2030 on Innovation, Science and Technology Development The Modernisation and Industrialisation of Zimbabwe through Education, Science and Technology, Harare, Zimbabwe.

[26]. **Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development – MinHTE,ISTD (2018a)**: Zimbabwe's Innovation Hubs Phase 1 Government of Zimbabwe, Harare

[27]. **Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (2018b):** Funding Models for Research and Development to operationalize Zimbabwe's Innovation Hubs Government of Zimbabwe, Harare

[28]. **Ministry of Higher and Tertiary Education, Science and Technology Development (April-May, 2017):**University Industries Incubation Tour A report by the high-power delegation comprising the Minister, 10 Vice Chancellors, Zimbabwe Manpower Development Fund (ZIMDEF) Chief Executive Officer (CEO), Advocates in Government and Senior Government Officers, Government of Zimbabwe, Harare, Zimbabwe

[29]. **Ministry of Higher and Tertiary Education, Science and Technology Development - MinHTE,STD (May 2017):** Transformation of Higher Education for Industrialisation and Modernisation a Report on the Proceedings of the workshop held on Friday, 19th of May 2017, Council Room, University of Zimbabwe, Harare

[30]. **Muranda Z (2021):** Academia-Industry Interface: the Weak Link in Human Capital and New Industry Development Marketing Matters in the ZimMarketer December 2021 Edition published by the Marketers Association of Zimbabwe © MAZ

[31]. **Rao Bharat and Mulloth Bala (2017):**The Role of Universities in Encouraging Growth of Technology-Based New Ventures International Journal of Innovation and Technology Management August 2017, Vol. 14, No. 04 https://doi.org/10.1142/S0219877017500146

[32]. **Ravindra Nath (2017):**Creating Enabling Environment for MSMEs-Indian Ecosystem in Research Council of Zimbabwe (RCZ) 2017: The 11th Zimbabwe International Research Symposium Book of Papers Presented ISBN 978-0-7974-7845-6 ISSN: 2412-2386 edited by Nhachi CFB (2017) Harare, Zimbabwe

[33]. **Paul Krutko (2021):**Collaborating to solve the big challenges in ISAP2020 Virtual, The Human factor: people, communities and the innovation ecosystem, www.iasp.ws Malaga, Spain

[34]. **Sabola Byson (2019):** Intellectual Property and Wealth Creation Presentation at the Inaugural Zimbabwe National Career Guidance Conference held on the 4th of July 2019, SIRDC Campus, Harare, Zimbabwe.

[35]. **Saruchera F (2014):** Determinants of Commercialisation of Technological Innovations in

[36]. Developing Economies: A study of Zimbabwe's Research Institutes. A thesis submitted in

[37]. fulfilment of the requirements for the degree of Doctor of Philosophy, University of

[38]. KwaZulu-Natal; School of Management, Information Technology-IT and Governance;

[39]. College of Law and Management Studies; South Africa.

[40]. **Scientific and Industrial Research and Development Centre-SIRDC (March 2021):** Strategic Plan 2021-2025 – Moving towards an empowered and prosperous upper middle income economy anchored on National Development Strategy 1 SIRDC, Harare, Zimbabwe.

[41]. SIRDC Supplement to the Nation published by the Sunday Mail, 10 November 2019 www.sirdc.ac.zw

[42]. **SIRDC (June** 2019): Strategic Plan 2019-2021 © SIRDC Harare, Zimbabwe www.sirdc.ac.zw

[43]. **Constitution of the Scientific and Industrial Research and Development Centre (SIRDC)** registered in terms of Part V, Section 24 of Research Act Chapter 10:22/2001 on 1st of February 1997

[44]. The USA Technology Transfer and Commercialisation Act (2000) https://www.govinfo.gov

[45]. **University of Zimbabwe (2019):**University of Zimbabwe 2019-2025 Strategic Plan: Educating to Change Lives University of Zimbabwe Office of the Vice Chancellor, Harare, Zimbabwe, 43 pages

[46]. WAITRO Strategic Plan 2030: Work Programme 2021-2022www.waitro.org

[47]. **WAITRO (2022):** Annual Summit 2022 Cape town South Africa

[48]. **Zimbabwe Statistical Agency (ZIMSTAT) (August 2021):**Monthly Summary of Zimbabwe External Trade Statistics for the period January 2019 to Mid-June 2021 Harare, Zimbabwe. www.zimstat.co.zw

[49]. www.iasp.ws **International Association of Science, Technology Parks**

[50]. www.undp.org/SDG9 **(Sustainable Development Goal number 9)**