Tanzania Higher Learning Institutional Repositories: Analysis of Research Collection on Industrial Development

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Abstract
This study aims to analyse the repositories of higher learning institutions in improving industrial development in Tanzania. The study was carried out to respond to three specific objectives which explain the importance, and contribution of repositories in industrial development, and examine the perception of library staff on the research policy and institutional factors toward influencing the sharing of research works for industrial development in Tanzania. An explanatory sequential mixed method design which involved a mixed research approach in data collection was used. The quantitative data from 153 library staff were analysed by the Statistical Product and Service Solution (SPSS) software version 26.0 while content analysis was used in qualitative data. The study findings indicate that the institutional repository is important and contributes to the proliferation of the industrial sector as well as universities. However, institutional and policy factors influence the sharing of research works. Recommendations for improvement, sustainability, and development goals achievement were provided.

Keywords: Institutional repository; higher learning institution; research outputs; industrial development; research and development; Tanzania

Introduction

The major and core function of higher learning institutions is to conduct training, consultancies, and research. Academic libraries of higher learning institutions preserve research outputs that are deemed important for development. Every state in the universe can achieve sustainable economic development through substantial investment in human capital through knowledge development and research outputs (Lemoine et al., 2017). Academic libraries' research output boosts citizens' economic activities and industrial development (Cobblah et al., 2022). It is through research outputs that compete in the world industrial markets characterised by rapidly changing technologies, production strategies, and business models, and thus advancement towards industrial growth and sustainability (United Nations Educational, Scientific and Cultural

Organization- (UNESCO), 2019). Higher learning institutions' research areas should be based on the industrial needs and efforts toward meeting the world market concerning its new products emanating from this combination. The sustainability to this endeavour depends on the ability to compete in the market economy and in globalized service markets coupled by excellence integration of technologies, Research and Development (R&D) (Penprase, 2018). The Tanzania Five Years' Development Plan 2021/22-2025/26 and the United Nations Sustainable Development Goal Nine (UN-SDG9) insist on the need for research institutions and government research agencies to be part of industrial development. In this light, Souleh (2020) defines industrial development as the advanced economic growth of a productive entity influenced by new technologies emanating from collaborative innovation initiatives between enterprises, research institutes, centres, agencies, and universities through cooperative research and development principles that lead to improved productivity, new products development and maximised profit.

University research outputs for industrial development overview

The university-industrial linkage is traced back to the 1970s when governments throughout the industrialised world focused on putting initiatives toward the university-industrial linkage for industrial and economic development (Souleh, 2020). In developed countries, this endeavour has had a crucial impact on industrial development, as it contributed to economic growth and the industrial revolution. Countries including the United Kingdom, United States of America, European Union, China, Japan, Korea, Taiwan, Indonesia, Mexico, and Brazil, among others, are benefiting from the university-industry linkage in sharing research works, experts and technology (Costantiello et al., 2022; Kniivilä, 2022). Universities in developed countries are increasing in providing original knowledge through research works which are commercially important in industrial development and have always been considered as the main stakeholders who are directly or indirectly involved in industrial development and ultimately the nations' prosperity at broad (Kniivilä, 2022; Teressa, 2022). The main emphasis of the developed countries in the establishment and maintenance of the sustainability of the linkage is through the industrial sector vision and the nations over the industrial development processes and strategies, sharing research agenda, provision of policies that foster the collaborative initiatives and contributes in the industrial development and performance. Universities of developed countries consider the linkage as a gateway for knowledge exchange and technology transfer for addressing technical issues, working on research and development, new industrial product development, and acquisition of scientific and technological knowledge for industrial proliferation (Singh & Kaundal, 2022). The university-industrial sector has for so long engaged in strengthening the region's research and development ecosystem while boosting economic, industrial, and regional progress.

The university-industry linkage in developing countries is increasingly becoming a priority in science and technology, engineering, processing, policy development, planning, and administration functions (UNESCO, 2020). A remarkable initiative has been realized in various regions of developing countries particularly East Asia while most of sub-Saharan Africa is far behind this endeavour (Tesfahunegn & Miruts, 2018; Singh & Kaundal, 2022). The ongoing

economic reforms and the United Nations Sustainable Development Goal Nine (UN-SDG9) on industrialisation have contributed to fostering most of the developing regions in visualizing the contribution of the universities in boosting industrial development (Okoronkwo, Agalaba, Onyekachi & Oladayo, 2022; Singh & Kaundal, 2022). Given the infrastructures and the developing countries' universities' working environments, the realisation towards collaboration with the industrial sector has gained momentum in recent years. For instance, African countries except South Africa, Benin, Nigeria, Ghana, Egypt, and Mauritius have been considered as the lagging nations in adopting the university-industry linkage for industrial development (Wangwe, 2018). Despite the research outputs being produced in these universities are mostly kept under custodians of the respective university libraries for the academic community access and less is being contributed to the industrial sector for development and networking. The institutional repositories of the respective academic libraries provide access to the research outputs to the academic community which more specifically the industrial sector is rarely addressed (Okoronkwo et al., 2022). In light of this, O'Dwyer et al. (2022) claim that the performance and development of the industry are subject to how the sector is well engaged with university networks and its management.

The university research collection is a critical and basic factor for industrial development (Lemoine et al., 2017). The United Nations Strategic Development Goal 9 for industry, innovation, and infrastructure considers research and development as the panacea for the industrial revolution. Research institutions and universities are the main sources of opportunities for improving innovation capacity in the industrial sector (UNESCO, 2020). Universities in developed countries are linked with the industrial sector for sharing research works, an endeavour which in developing countries, including Tanzania is rarely seized. Universities in Tanzania for so long have been used in developing human capital for service provision in various public and private sectors but have not noted the contribution of its research collections toward industrial development. The government of the United Republic of Tanzania has adopted the UN-SDG9 and on its capacity established a five-year development plan with a focus on seizing opportunities for improving the industrial sector and poverty reduction among the community. It has gone further and established a research data-sharing procedure in 2010 (Mushi et al., 2020). The initiatives on university-industry linkage in Tanzania have been earmarked and its prominence remained superficially researched. Teressa (2022) is of the view that the university-industry linkage has to be highlighted and its interactive performance measured through research and their findings documented for innovation, decision-making, and knowledge development.

The government of the United Republic of Tanzania has invested in research and development to achieve long-term economic development through industrialisation and realise its vision of being transformed into a middle-income and semi-industrialised nation by 2025 (COSTECH, 2016). In this, the government initiated the Third Five Year Development Plan (FYDP III) 2021/22 – 2025/26 integrated with the National Strategy for Growth and Reduction of Poverty (NSGRP). The latter was planned to nurture industrialisation for the transformation of the economy and human development through research and development, linkages, and poverty reduction

(Wangwe, 2018). Universities and research institutions or agencies had to improve research data transfer to foreign and other stakeholders through the established research data transfer procedures of 2010 (Mushi et al., 2020). However, the contribution and impact of the academic libraries' research collection for industrial development is rarely earmarked to date. It is similarly surprising to discover that there is very little in the way of rigorous research or even reliable basic information on the proposed study topic in Tanzania except for a study by Mushi et al. (2020) on identifying and implementing relevant research data management services for the library at the University of Dodoma. They insist and recommend researchers and university management to collaborate and make their data accessible to the community for improving industrialisation through research and development. In response to the above issues, the study takes up the challenge of studying academic libraries' research collection in improving industrial development in Tanzania.

Objectives

The main objective of this study is to analyse the academic libraries' research collections in fostering industrial development in Tanzania. Specifically, the study aims to:

i. explain the importance of academic library research collection in the industrial development in Tanzania;
ii. determine the levels of contribution of academic libraries' research collection in the industrial development in Tanzania; and
iii. examine the perception of library staff on the research policy and institutional factors that influence the sharing of academic library research collection for industrial development in Tanzania.

Literature review

The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2019) in the "*Global Investments in Research and Development Report"*, acknowledges the fact that academic libraries' research collection boosts citizen's productivity, and innovation and promotes entrepreneurship and technological development. It is through research collection that brings competence in the world industrial markets and thus advanced committed regions to the Fourth Industrial Revolution (4IR). The academic library collection on research work forms a crucial component for industrial development. A close relationship between academic libraries and industries is significant to the aspect of research and development. In Ghana, Cobblah et al. (2022) in the study "*Connecting industries to research outputs and the role of academic libraries"* indicate that academic libraries could effectively contribute through the dissemination of research outputs with the industrial sector for development. In this, Cobblah et al. (2022) insist on stronger collaboration among researchers, academic libraries, and industries to foster innovation, high production, and thus national development and poverty reduction. It follows from this fact that in Tanzania academic libraries such collaboration is unevenly practised among the universities to the extent that if it evenly exists could have added value in the industrial development, economic development, achieving the national five-year development plan 2021/22-2025/26 and realisation of the United Nation Sustainable Development Goal Nine (UN-SDG9).

Polese et al. (2021) describe the co-creation value in university-industry collaboration. The authors put forward that sharing and dissemination of research works between academic libraries and industries provide global competition, economic stability, and rapid technological proliferation. This is a joint effort based on socio-capital development which enhances a competitive advantage in innovation and socio-economic development of the national economy. The shared knowledge contributes to new and mutual value advantages between the academic libraries and the industrial sector. The industrialisation in the current market economy has become volatile and operational in a competitive global environment. This calls for a research and development collaborative approach to meet the demands of customers. Research organisations, government research agencies, and universities are inevitable in this endeavour. Through this lens, Awasthy et al. (2020) proposed "*A framework to improve university–industry collaboration".* The framework for university-industry collaboration should consider; an effective collaboration platform, strengthening the research outputs sharing strategy, and focus on social capital resources (this includes trust, common obligation and understanding, access to information and opportunities). Moreover, a collaborative policy to support interventions and management of the collaboration is imperative for achieving the set goals. Regarding this endeavour, the academic libraries of higher learning institutions particularly in Tanzania can further establish and/or improve linkage with the industrial sector in supporting research and development. The ideology of understanding a complex set of interrelated factors comprising industrial development and the context of research outputs, industrial research agendas, professional trajectories as well as curriculum issues at higher learning institutions are considered imperative.

The linkage between academic libraries and the industrial sector mainly describes the collaboration and partnership between these two entities aiming at supporting research and development, innovation, and education (Polese, Ciasullo & Montera, 2021). In addition, such collaboration focuses on mobilising the resources, expertise, and knowledge of both entities to enhance the competitiveness of industries and provide better access to information for researchers, the public, the academic community, and other stakeholders (Kong, 2022). Among others, the main activities with the academic library-industry collaboration are not limited to joint research projects, internships and job opportunities for graduates, technology transfer, and the provision of access to industry-specific databases and resources (Cobblah et al., 2022; Kong, 2022). The goal is to develop a mutually beneficial association that fosters the advancement of knowledge and technology, as well as economic development, employment, and poverty reduction.

The university-industry linkage can be shaped in various forms of associations and commonly they can be; linkage for cooperative research, collaborative technology transfer, research support relationship, linkage for knowledge transfer, personal collaboration, linkage for the interest of institutional programs, industrial education programs and agreements between organisations relationship (Singh & Kaundal, 2022). Given the kind of collaboration, each requires the working tools that guide communication between the entities. In light of this view, a cooperative research linkage underpins the study, and thus issues related to research sharing policy, research

action policy, collaborative research agenda, and intellectual property rights are essential for a smooth operation of the linkage (Mushi et al., 2020; Kong, 2022). Nevertheless, the universities have to establish potential units and the mechanism for the industrial collaboration organisation, monitoring, and sharing of resources. The three selected universities for this study have these components for effective sharing of research work and communication.

Table 1: University-industry linkage units and mechanism

University	Linked university units	Linkage mechanism
University of Dar es Salaam	• Bureau for Industrial Cooperation (based in the College of Engineering and Technology) • Technology development and transfer centre	• Research work (Library) • Consultancy • Technology transfer • Professional services • Professional development courses for industries
Sokoine University of Agriculture	• Directorate of postgraduate studies and research • Technology transfer and consultancy • Departmental outreach committees • Local outreach stations • Bureau of agricultural consultancy and advisory services	• Research work (Library) • Consultancy • Patented innovations and technology transfer • ICT training and working laboratories • Exhibitions • Internship & exchange programme
Mbeya University of Science & Technology	• Directorate of postgraduate studies, research and publications • Directorate of public services and external links (department of industrial linkage and labour market) • Centre for innovation and technology transfer • Consultancy bureau	• Collaborative research (Library) • Consultancy • Internship • Technology transfer • Innovation & Incubation • Industrial Practical Training • Fieldwork and Student Research Programs • Industrial linkages for students

Source: *Kong (2022)*

The universities have a role to ensure that their units and the mechanism of sharing research work with the industrial sector are given attention for linkage sustainability (Kong, 2022). Researchers and the industrial sector have to appreciate the role of universities through their academic libraries as intermediaries that cannot be overlooked, hence the need for stronger relationships among researchers, academic libraries, and industries, which ultimately brings about high productivity leading to national development (Bangi, 2020; Morisson & Pattinson,

2020). Furthermore, the linkage, on the other hand, can be a source of funds for the university as there are cases where researchers and students can be granted to conduct research in a specific industrial area of interest. However, to some extent, government funds are offered for research work on a university-industry basis (Abebe, 2016; Priya et al., 2021). The mechanism and the overall process of selecting, organising, and preserving research work should be conducted by skilled information professionals or librarians who are well-trained in research data selection and sharing through a particular platform for the specific industrial need.

Research design and methods

The study was implemented in three universities that are conversant with engineering, processing, and technology programmes and thus have sufficient library research collection in the fields. These academic libraries are from the University of Dar es Salaam (UDSM), Sokoine University of Agriculture (SUA), and Mbeya University of Science and Technology (MUST). Choosing one of the most established public universities in Tanzania enhances the research data by reflecting the perspectives of the industrial sector development from the academic library research collection. At the same time, the suitable location and comfortable setting of the universities greatly allowed the research to progress smoothly as the study areas were easily reached.

The study adopted an explanatory sequential mixed research design. This design was selected for the study as it provided quantitative data collection from the respondents and later used qualitative data to explain the findings collected through the quantitative method. The unit of analysis of the study comprised 174 library staff and three library directors of the selected academic libraries. The total population of the library staff was 177 (UDSM Library 121, SUA 38, and MUST 18), and this was obtained from the respective library directors of the selected academic libraries. Table 2 presents the demographic information of the respondents. Given the population size, all the library staff were considered as potential respondents to this study. In light of this, a census method provided a quantitative and statistical inquiry in which data were collected from all the enumerated populations under the study. The method was deemed to be reliable and provided accurate information on the underpinning phenomenon of the study (Dubey & Kothari, 2022). Data was gathered through a structured questionnaire drawing from the literature that classified and evaluated the contribution of academic library research collection in fostering industrial development in Tanzania. Questionnaires were administered to 174 library staff who are involved in the management of the research collection. There was a face-to-face interview with three library directors who were purposely selected from the survey to capture administrative functions concerning knowledge or research collection-sharing with the industrial sector for its development. Interviews were conducted using pre-formulated guide questions. In this, the in-depth review of relevant documents including; policies, laws, reports, and literature that established prominence and assisted to achieve a better understanding of the issues underpinning the study were reviewed. In a nutshell, the study involved gathering both numeric information (for example, on instruments) and text information (for example, in an in-depth documentary review of relevant documents), so that the final database contains both quantitative and qualitative information.

Moreover, of the 174 self-administered copies of a questionnaire that were distributed to the library staff, only 153 filled questionnaires were returned, representing a response rate of 87.9% which was sufficient for further procedures. According to Livingston and Wislar (2012), a response rate that is less than 60% is termed as poor and thus the higher the response rate the lower the potential chances of bias in research data. The collected data and the collection process had no potential effects on the respondents, particularly the most vulnerable group – the library staff. Additionally, library staff members participated in the study voluntarily, and indicated consent by signing a consent form. Participants were informed of their right to withdraw from the project at any time without any penalty or discrimination.

The collected data was finally analysed quantitatively by using the Statistical Product and Service Solutions (SPSS) software version 26.0 while the qualitative data was subjected to content analysis. The SPSS software was selected because of its high descriptive and multivariate statistical power for quantitative data analysis whereas the content analysis technique is a more systematic and objective one that organizes qualitative data based on phrases, occurrences, and concepts and ultimately derives inferences from the communication.

Table 2. Socio-demographic characteristics (n=153)

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Variable	Category	Frequency	Percent
Institution	UDSM	107	69.9
	SUA	29	19.0
	MUST	17	11.1
Gender	Male	76	49.7
	Female	76	49.7
Age (years)	≤30	20.9	21.1
	30-35	28.8	28.9
	36-40	16.3	16.4
	41-45	13.1	13.2
	46-50	7.2	7.2
	51-55	9.2	9.2
	≥55	3.9	3.9
Highest Qualification	Lib certificate	9	5.9
	Dip certificate	35	23.0
	Bachelor degree	58	38.2
	Masters' degree	29	19.1
	PGDip	8	5.3
	PhD	12	7.9
	Post-Doctoral	1	.7
Work Experience (years)	≤2	9	5.9
	2-5	35	23.0
	6-10	58	38.2
	11-15	29	19.1
	≥15	8	5.3

Findings in Table 2 indicate that the surveyed libraries have sufficient and knowledgeable information professionals with enough working experience. These traits were crucial in providing detailed information on the importance, contributions, and factors influencing academic libraries in sharing research-based works with the industrial sector for economic growth, collaboration, research and development, and new product development.

Findings and discussion

Importance of university-industry linkage

The importance of most academic libraries is to support effective research works, teaching, and learning. Academic libraries collect both electronic and print-based research works and share the same with the academic community, public and potential stakeholders, including the industrial sector for references and decision-making. The industrial sector utilizes these resources for industrial and national economic development. Academic libraries use various methods in sharing research works with the industrial sector. The approaches include academic libraries social networking, academic library or institutional websites, researcher identifiers, and profile or institutional repository system to support in disseminating research works (Morisson & Pattinson, 2020; Olubiyo, 2022). The shared research work has varying importance to the

industry, universities, and the nation. Findings on the importance of academic library research works are presented in Table 3.

Table 3: Importance of university-industry linkage (n=153)

Importance of sharing research collection	Library	Important		Not important		I do not know	
		f	*%*	*f*	*%*	*f*	*%*
Boosts industrial production	UDSM	87	81.3	7	6.5	13	12.1
	SUA	26	89.7	1	3.4	2	6.9
	MUST	17	100	0	0	0	0
	Total	**130**	**85**	**8**	**5.2**	**15**	**9.8**
New product development	UDSM	85	79.4	8	7.5	14	13.1
	SUA	28	96.5	1	3.4	0	0
	MUST	17	100	0	0	0	0
	Total	**130**	**85**	**9**	**5.9**	**14**	**9.2**
Industrial innovation	UDSM	84	78.5	9	8.4	14	13.1
	SUA	27	93.1	2	6.9	0	0
	MUST	17	100	0	0	0	0
	Total	**128**	**83.7**	**11**	**7.2**	**14**	**9.2**
Promotes entrepreneurship	UDSM	85	79.4	7	6.5	15	14
	SUA	27	93.1	1	3.4	1	3.4
	MUST	12	70.6	5	29.4	0	0
	Total	**124**	**81**	**13**	**8.5**	**16**	**10.5**
Technological development	UDSM	82	76.6	11	10.3	14	13.1
	SUA	25	86.2	3	10.3	1	3.4
	MUST	14	82.4	0	0	3	17.6
	Total	**121**	**79**	**14**	**9.2**	**18**	**11.8**
Industrial revolution	UDSM	80	74.8	11	10	16	15
	SUA	23	79.3	4	13.8	2	6.9
	MUST	14	82.4	0	0	3	17.6
	Total	**117**	**76.5**	**15**	**9.8**	**21**	**13.7**

Source: *Field Data (2022)*

Table 3 shows that the linkage of academic libraries and the industrial sector has more benefits to the latter. Among the respondents, 130(85%) indicated that sharing research collections with the industrial sector boosts industrial production and new product development. Nevertheless, 128(83.7%) respondents showed that the academic library-industry linkage is important in promoting industrial innovation while 124(81%) respondents pointed out the importance of promoting entrepreneurship. Moreover, 121(79%) respondents indicated its importance in technological development, and the importance of it in the industrial revolution was mentioned

by 117(76.5%) respondents. These findings imply that academic libraries play a key role in the effective sharing of research outputs to the industrial sector. On a different note, it was reported through interviews as follows:

> *The importance of the academic library in sharing research data has not been visualised as much of the information needed by the industrial sector is not related to the programs being offered in this university. If well organised, the information needs from various industries have to be centrally identified and the government through the Ministry of Education, science, and Technology in collaboration with the Ministry of Investment, Industry, and Trade links the information needs to particular higher learning institutions in respect to the programs offered or research agenda* [Participant 2].

In this regard, the need for a stronger collaboration among researchers, academic libraries, and industries is imperative to ensure high productivity, leading to national and economic development through the Tanzania Five Years' Development Plan 2021/22-2025/26 which focuses on realizing that the industry sector is well established with increased efficiency and productivity in manufacturing (United Republic of Tanzania (URT), 2021) and realisation of the United Nation Sustainable Development Goal Nine (UN-SDG9). The UN-SDG9 is hinged on building resilient infrastructures, promoting inclusive and sustainable industrialisation fostering innovation through enhancing scientific research, and upgrading the technological capabilities of industries in developing regions through collaboration with research institutions and centres (UNESCO, 2020). With this endeavour, academic libraries have to dynamically shift from their traditional roles and functions to modernized kinds of services where sharing of research works becomes more comprehensive and coupled with technology.

Contribution of university-industry linkage

The university-industry linkage has the potential for professionalism, industrial technology, and product capabilities. Industries depend on their internal R&D or outsource research works from various linkages which include inter-firm cooperation, research institution or centre-industry, and university-industry linkage. Different organisations and scholars (Lemoine, et al., 2017; Penprase, 2018; UNESCO, 2019; UNESCO, 2020) have considered the university-industry linkage as the crucial collaboration for industrial development, innovation, technology, new product development, and national economic development and in meeting the UN-SDG9. Developed countries have benefited from this endeavour and have dynamically transformed to the Fourth Industrial Revolution (4IR) and rarely this endeavour has been addressed in developing regions including the United Republic of Tanzania. This study has found that, in Tanzania, the university-industry linkage for sharing collected research works has contributed to the development of various industries. Figure 1 indicates the contribution of the university through the sharing of its academic library research collections with the industrial sector.

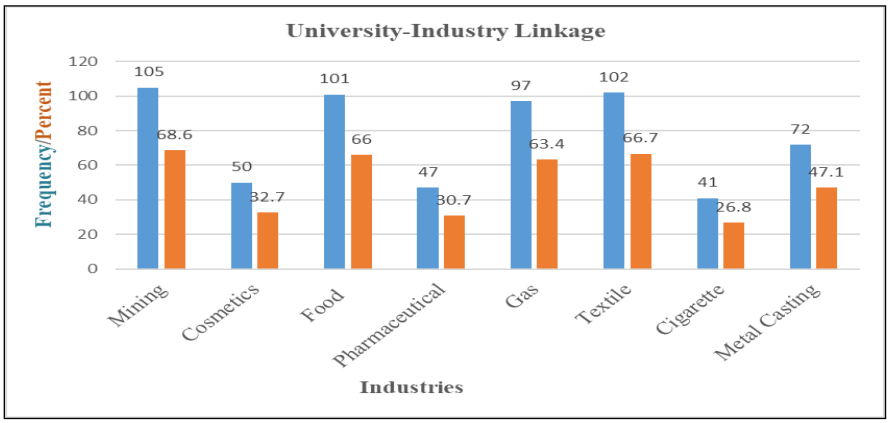

Figure 1: *Contribution of university-industry linkage (Field Data, 2022)*

Findings in Figure 1 indicate that universities contribute their research work collections with several fields at different levels. Among the respondents, 105(68.6%) showed that academic libraries contribute by sharing research collections with the mining industry while 102(66.7%) reported sharing with the textile industry. Moreover, 101(66%) respondents indicated that academic libraries contribute their research collections to the food and drinks industries. In addition, 97(63.4%) respondents indicated that academic libraries contribute to sharing research collections with the natural gas industry. This trend of sharing research work collections with the industrial sector is contributed by the fact that programs related to these fields are provided by the selected universities. For instance, a geology program consists of natural gas and mining and it is particularly offered by the University of Dar es Salaam (UDSM). Similarly, processing technology forms part of the disciplines offered at the selected universities where the textile, food, and drinks industries benefit from these institutions in R&D. During the interview, the SUA Library Director said that;

> *Despite the library's contribution to the processing industries including the sugar and textile industries, researchers, and the academic community, its contribution is similarly marked by small-scale producers such as small farmers involved in food and drinks processing, livestock, and veterinary sciences. The institutional repository and the 'Mkulima' research library collection have been crucial to the small-scale producers* [Participant 1].

Both UDSM and SUA have units for reserving research works (academic libraries), have a bureau for industrial linkage, technology transfer and consultancy, public services and external linkage, and teaching programs related to engineering and processing technology that have led to collaborative research projects. The academic libraries of the surveyed universities have enough research-based collections on mining, natural gas, textile, food, and drinks processing from which the linked industries benefit from this endeavour. In the study on leveraging university-

industry collaboration, Kong (2022) opines that the most honoured universities in Tanzania that indicate significant linkage and dedicate their research works for industrial development are the University of Dar es Salaam, Sokoine University of Agriculture and Mbeya University of Science and Technology. On the other hand, the university-industry linkage with the cigarette, pharmaceutical, cosmetics, and metal casting industries was at a lower level (<50%) because of the reasons that the fields may not be streamlined with the selected universities' programmes and/or research and consultancy service collaborations are still very low.

Factors influencing university-industry linkage in Tanzania

In this study, factors related to institutional and policy issues influencing the sharing of research collection with the industrial sector were surveyed. Various factors were provided and the respondents were supposed to rate the extent of perception of the influence. The results are presented in Tables 4 and 5 respectively.

Institutional factors

The institution management's commitment, support, and accountability to research work sharing is imperative in maintaining relationships with various stakeholders for both professionalism and knowledge sharing. Other issues that influence the sharing of research work are not limited to decision-making on the relationship with stakeholders and the capability of extracting research work for sharing and dissemination. Table 4 presents findings on institutional factors.

Table 4: Institutional factors (n=153)

Institutional issues	Library	To a great extent		To some extent		To a small extent		Not at all	
		F	*%*	*f*	*%*	*f*	*%*	*f*	*%*
Quality of research collection	UDSM	64	59.8	24	22.4	11	10.3	8	7.5
	SUA	15	51.7	7	24.1	3	10.3	4	13.8
	MUST	11	64.7	6	35.3	-	-	-	-
	Total	**90**	**58.8**	**37**	**24.2**	**14**	**9.2**	**12**	**7.8**
Decision makers' commitment	UDSM	71	66.4	22	20.6	12	11.2	2	1.9
	SUA	17	58.6	10	34.5	2	6.9	-	-
	MUST	10	58.8	6	35.3	1	5.9	-	-
	Total	**98**	**64**	**38**	**24.8**	**15**	**9.8**	**2**	**1.3**
Linkage with the industrial sector	UDSM	62	58	28	26.2	15	14	2	1.9
	SUA	18	62.1	9	31	2	6.9	-	-
	MUST	11	64.7	6	35.3	-	-	-	-
	Total	**91**	**59.5**	**43**	**28.1**	**17**	**11.1**	**2**	**1.3**
Industrial research agenda	UDSM	68	63.5	24	22.4	13	12.1	2	1.9
	SUA	15	51.7	10	34.5	4	13.8	-	-
	MUST	11	64.7	4	23.5	1	5.9	1	5.9
	Total	**94**	**61.5**	**38**	**24.8**	**18**	**11.8**	**3**	**2**
Reflective	UDSM	63	58.8	31	29	11	10.3	2	1.9

curriculum	SUA	11	37.9	12	41.4	3	10.3	3	10.3
	MUST	9	52.9	2	11.8	6	35.3	-	-
	Total	**83**	**54.3**	**45**	**29.4**	**20**	**13.1**	**5**	**3.3**
Accountability	UDSM	61	57	34	31.8	10	9.3	2	1.9
	SUA	15	51.7	9	31	5	17.2	-	-
	MUST	12	70.6	1	5.9	3	17.6	-	-
	Total	**88**	**57.5**	**44**	**28.8**	**18**	**11.8**	**2**	**1.3**
Institution - industry research agenda	UDSM	65	60.7	27	25.2	12	11.2	3	2.8
	SUA	17	58.6	7	24.1	4	13.8	1	3.4
	MUST	10	58.9	2	11.8	3	17.6	2	11.8
	Total	**92**	**60.2**	**36**	**23.5**	**19**	**12.4**	**6**	**3.9**
Institution/academic library vision on research sharing	UDSM	60	56.1	28	26.2	13	12.1	6	5.6
	SUA	14	48.3	8	27.6	7	24.1	-	-
	MUST	10	58.8	3	17.6	4	23.5	-	-
	Total	**84**	**54.9**	**39**	**25.5**	**24**	**15.7**	**6**	**3.9**
Model of research work sharing	UDSM	61	57	27	25.2	17	15.9	2	1.9
	SUA	22	75.9	3	10.3	4	13.8	-	-
	MUST	9	52.9	7	41.2	1	5.9	-	-
	Total	**92**	**60.2**	**37**	**24.2**	**22**	**14.4**	**2**	**1.3**
The capability of librarians to extract data or research works for sharing	UDSM	59	55.2	27	25.2	13	12.1	8	7.5
	SUA	17	58.6	7	24.1	5	17.2	-	-
	MUST	9	52.9	4	23.5	4	23.5	-	-
	Total	**85**	**55.6**	**38**	**24.8**	**22**	**14.4**	**8**	**5.2**
Funds for establishing research data and management	UDSM	61	57	26	24.3	18	16.8	2	1.9
	SUA	20	68.9	3	10.3	5	17.2	1	3.4
	MUST	11	64.7	-	-	6	35.3	-	-
	Total	**92**	**60.2**	**29**	**19**	**29**	**19**	**3**	**2**

Source: *Field Data (2022)*

Findings in Table 4 show that institutional factors influence the sharing of research works with the industrial sector. The most factors reported to influence to a great extent are the commitment of decision-makers which was reported by 98(64%) respondents, industrial research agenda indicated by 94(61.5%) respondents whereas 92(60.2%) respondents pointed to institutional-industrial research agenda to influence the efforts in sharing research work. However, both the model for research work sharing and funds for establishing research data management for collaboration with the industrial sector were reported by 92(60.2%) respondents.

These factors are similarly varying between the institutions. For instance, 75.9% of the SUA respondents show that the model for research work sharing affected the dissemination of resources to a great extent while 70.6% of the respondents at MUST indicated that accountability of the institutional management affected research work sharing with the industrial sector. On the other hand, 55.6% of the respondents indicated that the librarian's ability to extract research works for sharing with the industrial sector to a great extent affected

the collaborative efforts. Nevertheless, during an interview one of the participants narrated as follows:

> *It is important to make the institutional linkage strong with the industrial sector, training information professionals on research reports management is crucial as it provides the ability to handle issues related to selective dissemination of research data to a particular industry or any user interested in* [Participant 3].

The aspect of librarians' capability was similarly observed by Ashiq et al. (2020) in the systematic literature review on research data management practices and services that academic librarians and researchers in developing countries lack the capacity and skills to identify the potential research works for collaboration. On the other hand, Cobblah et al. (2022) conducted a study on connecting industries to research outputs and the role of academic libraries in Ghana. This study by Cobblah et al. (2022) indicates that academic librarians in Ghana are not doing much in Selective Dissemination of Information (SDI) to identify potential research works that can be shared with a particular industry for sustainable collaboration and development. This phenomenon is contributed by the ability of librarians to extract data or research works for sharing. In addition, other institutional factors were not limited to; insufficient collaboration between academic libraries and industries, lack of funds for research work management and sharing but also lack of common research agenda between universities and the industrial sector and ultimately research works collected in the libraries never related to industrial needs and for so long remained in shelves for circulation.

The institutional factor of sufficient academic library-industry linkage is similarly supported by Kashyap and Agrawal (2019) on the study of academia as a new knowledge supplier to the industry, the uncovering barriers in the process in India. Again, the findings on academia-industry linkage, Singh and Kaundal (2022) supported poor academic library linkage and added other institutional-related factors of insufficient funds for linkage and resource identification and sharing, commitment, accountability, and support from the institutional management, librarians' skills and ability to select resources for sharing. Given the institutional factors that influence academia-industry linkage, the institutional top management of mostly developing countries must consider collaboration as a panacea for mutual relationship, economic development, sustainability, and professionalism.

Policy factors

The Universities, research centres, and institutions have a research-sharing policy that guides the procedures for sharing research works and data. The policy establishes the type of data for sharing and with whom, conditions for sharing, research data management, intellectual property rights, privacy rights, and licensing of shared data. In this study, policy factors that influence the sharing of research work with the industrial sector are presented in Table 5.

Table 5: Policy factors (n=153)

Policy issues	Library	To a great extent		To some extent		To a small extent		Not at all	
		f	*%*	*f*	*%*	*f*	*%*	*f*	*%*
Implementation of research-sharing policy	UDSM	77	72	19	17.8	8	7.5	3	2.8
	SUA	17	58.6	7	24.1	3	10.3	2	6.9
	MUST	13	76.5	3	17.6	1	5.9	-	-
	Total	**107**	**69.9**	**29**	**19**	**12**	**7.8**	**5**	**3.3**
Oversight of policy makers	UDSM	69	64.5	29	27.1	5	4.7	4	3.7
	SUA	11	37.9	11	37.9	5	17.2	2	6.9
	MUST	12	70.5	5	29.4	-	-	-	-
	Total	**92**	**60.1**	**45**	**29.4**	**10**	**6.5**	**6**	**3.9**
Integrated HLIs-Industrial policy	UDSM	69	64.4	27	25.2	7	6.5	4	3.7
	SUA	11	37.9	11	37.9	5	17.2	2	6.9
	MUST	13	76.5	3	17.6	-	-	1	5.9
	Total	**93**	**60.8**	**41**	**26.8**	**12**	**7.8**	**7**	**4.6**
Updated research policy	UDSM	65	60.8	28	26.2	10	9.3	4	3.7
	SUA	12	41.4	9	31	5	17.2	3	10.3
	MUST	8	47.1	3	17.6	5	29.4	1	5.9
	Total	**85**	**55.6**	**40**	**26.1**	**20**	**13.1**	**8**	**5.2**
Government intervention	UDSM	65	60.7	30	28	9	8.4	3	2.8
	SUA	15	51.7	9	31	4	13.8	1	3.4
	MUST	7	41.2	2	11.8	5	29.4	3	17.6
	Total	**87**	**56.9**	**41**	**26.8**	**18**	**11.8**	**7**	**4.6**
Involvement of stakeholders in policy development.	UDSM	62	57.9	32	29.9	9	8.4	4	3.7
	SUA	18	62.1	8	27.6	3	10.3	-	-
	MUST	9	52.9	2	11.8	4	23.5	2	11.8
	Total	**89**	**58.2**	**42**	**27.5**	**16**	**10.5**	**6**	**3.9**
Policy implementation	UDSM	60	56.1	30	28	12	11.2	5	4.7
	SUA	17	58.6	9	31	3	10.3	-	-
	MUST	10	58.8	6	35.3	1	5.9	-	-
	Total	**87**	**56.8**	**45**	**29.4**	**16**	**10.5**	**5**	**3.3**

Source: *Field Data (2022)*

Findings in Table 5 on the factors influencing sharing of research works show that 107(69.9%) respondents reported on efficient implementation of research sharing policy while 93(60.8%) respondents pointed out the integrated university-industry policy and 92(60.1%) respondents opined on the policy makers' oversight. In addition, 89(58.2%) respondents affirmed the level of stakeholders' involvement in policy development as has to a large extent influenced the sharing of research works with the industrial sector. In this regard, and based on documentary review, the surveyed universities have research sharing policy but the policy action and the implementation of it in sharing research works has remained questionable. For instance, the University of Dar es

Salaam has a 3rd ed. research policy and operational procedures of 2015 while the Sokoine University of Agriculture possess a research policy of 2018. However, Mbeya University of Science and Technology is missing a research policy for guiding research data management and sharing with the public and potential stakeholders (Kong, 2022).

Again, the issue of revising research research-sharing policy is crucial in adopting the technological changes in research and development. In this study, 85(55.6%) respondents indicated that the research-sharing policies are not frequently updated, which is the factor that influences greatly the sharing of research data and management. The evidence of this fact is observed in the two research-sharing policies from the University of Dar es Salaam and Sokoine University of Agriculture that have been in place for over 5-8 years without being reviewed.

Despite the availability of these policies, none is documented on action research policy for university-industry sharing of research data. On the same lens, Cobblah et al. (2022) identified that most of the university-industry collaborations in developing countries lack a research action policy which engages both the collaborating parts toward the implementation of the research data sharing. Unfortunately, in this study, 93(60.8%) respondents reported the fact that university-industry research sharing policies are crucial in the collaboration and mostly, and 89(58.2%) respondents reported on the levels of involvement of the collaborating part in designing the action research policy. The engaged action policy incorporates laws, regulations, incentives, guidelines, and funding programs for the well-being of university-industry research-based linkage. One of the participants reported as follows during the interview:

> *The collaborative initiatives have to be bound with a corporative policy which among others, has to be streamlined with the research action for implementation and sharing strategies. A collaborative research agenda has to be in place as other terms of reference regarding sharing of the resources and the issue of intellectual property. However, most of the universities here in Tanzania do not have a corporative research sharing policy with industries, and thus inefficiency in sharing of the resources* [Participant 2].

It is in the same vein that, Mushi et al. (2020) in the study to identify and implement relevant research data management services at the University of Dodoma library, observed that the implementation of the research data sharing policy and its management is not comprehensive to most of the African higher learning institutions including the University of Dodoma. In this regard, the European Union (EU) (2020) insists on the strength of the university-industrial collaboration which has to be determined by the university-industry knowledge transfer and inclusive action research policy. With the action research policy, the research agenda can be established for collaboration and implementation.

Conclusion

Generally, the empirical data supplemented by a survey of the selected universities indicate that the academic library research collections are important in boosting industrial production. These

lead to new product development, industrial innovation, promotion of entrepreneurship, technological development, and industrial revolution. The academic libraries contribute their research collections to the natural gas industry, mining, textile, food, and drinks. For instance, the University of Dar es Salaam has set a research agenda to collaborate with the mining and natural gas industries and established an effective university-industry linkage. The study has established that institutional and policy issues have influenced the academic library research collections sharing with the industrial sector. The institutional factors include a commitment of decision makers, industrial research agenda, institutional-industrial research agenda, defined model of research work sharing, and funds for establishing research data management for collaboration with the industrial sector. Nevertheless, the policy factors are related to the implementation of research sharing policy, oversight of policymakers, integrated university-industry policy, stakeholders' involvement in policy development, updating research sharing policy, and involvement of the collaborating part in designing the action research policy for sharing research collection. Needless to say the crucial and comprehensive university-industry linkage in economic development and achievement of the UN-SDG9 of any developing country Tanzania inclusive, this study offers practical recommendations which would encourage strong engagement of the universities through their research collection for effective collaboration with the industrial sector.

Recommendations

The government of the United Republic of Tanzania through the Ministry of Education, Science and Technology should take advantage of the Universities and industrial strategies in formulating a collaborative research agenda for the proliferation of the linkage and achieving the United Nations Sustainable Development Goal Nine (UN-SDG9). The following recommendations are considered important for the government and universities in particular, towards enhancing the effective sharing of research collections with the industrial sector that may contribute to resolving economic problems, unemployment cases, and poverty reduction among the public:

i. The University research approach has to be improved by integrating or performing more action research rather than continuing with experienced research gap coverage. The developed regions have been successful in collaborative research works where the action research approach has contributed to the proliferation of the university-industry linkage.

ii. An effective university-industry policy is to be established for research works by involving all the stakeholders and the policy action for implementation should be centrally established with the modality of operation in line with the agreed university-industry research agenda. The policy has to be frequently reviewed to keep abreast with the fast development in technology and the industrial revolution.

iii. Linkages and partnerships between universities, research, and development institutions/centres have to be promoted on the one hand and industries at local and international levels on the other hand. It is also important to invest in R&D to foster technological diffusion, decrease knowledge gaps, reduce poverty among the citizens, improve visibility, sustainable economic development, and realisation of the UN-SDG9.

iv. Integration of various innovative policies for university-industrial linkage, including ICT policy, industrial policy, national broadband policy, higher learning education policy, and cyber-security policy. Additionally, an intellectual diaspora policy can be established to ensure that such a network connects the country to the global knowledge community and provides opportunities for partnership and development, particularly in innovation, technology, and research.

v. Universities should revise their core functions and may establish industrial innovative research and development centre for industrial practitioners and investors' access. The centres should develop operational policies, procedures, and incentives for academics and researchers in various disciplines to address problems related to university-industrial research collaboration. The centres may however help to develop competencies in solving problems through technological action research.

vi. The university libraries have to get more improve by integrating emerging technology trends and Web technologies for easy communication, sharing, and dissemination of the research collection to the public and other stakeholders, particularly the industrial sector.

Conflict of Interest

The authors declare that they have no conflict of interest.

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