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RESEARCH AND PhD CAPACITIES IN SUB-SAHARAN AFRICA: GHANA REPORT

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Foreword

This report forms part of a broader study commissioned by the British Council and the German Academic Exchange Service (DAAD) that surveyed research and doctoral training capacity in Sub-Saharan Africa.

The study includes six country reports, namely Ethiopia, Kenya, Ghana, Nigeria, Senegal and South Africa. This report addresses the outcomes of the study in relation to Ghana. The country reports include expanded contextualisation of the national research training landscape,[1] while a synthesis report is also available highlighting the key policy implications for PhD provision specifically.[2] The aims of the study were to investigate: (i) the availability, quality and thematic priorities of PhD programmes and how they have changed over the last ten years; (ii) the national-level research agenda; (iii) the extent to which research training at the institutional level is aligned with the national agenda; (iv) national-level systems (policies and legislation) that facilitate alignment between institutional-level research training and the national agenda; (v) how institutional priorities reflect the needs of universities and emerging research and development systems, including local industry and societal challenges; (vi) funding sources to develop and sustain PhD provision; and (vii) the role of international collaboration in building PhD capacity. The research, analysis, interpretations, conclusions and recommendations included in this report are those of the report authors.

1. Country reports can be found on the British Council website https://www.britishcouncil.org/education/ihe/knowledge-centre/developing-talent-employability/phd-capacities-sub-saharan-africa and the DAAD website https://www.daad.de/en
2. The synthesis report can be accessed on the British Council website at https://www.britishcouncil.org/education/ihe/knowledge-centre/developing-talent-employability/phd-capacities-sub-saharan-africa and the DAAD website https://www.daad.de/download/phd201806

1. The context of the higher education system in Ghana

1.1 Historical development

At independence in 1957, Ghana's first president, Dr Kwame Nkrumah, had recognised the importance of knowledge production for the needed rapid development and transformation of the newly independent Ghana (Ministry of Environment, Science and Technology, 2010). From independence, the new government envisaged that Ghana needed an educational system that could produce a scientifically and technically minded society. Apart from inputs made in basic education, it was recognised that universities were to be the driving engine of the envisaged development (Akyeampong, 2007). Ghana thus embarked on investments in higher education to achieve these aspirations.

By 2016, higher education in Ghana had dramatically expanded to include various institutional types delivering different programmes. By the beginning of 2017, there were ten public universities, four chartered private universities, 72 private tertiary institutions offering degree programmes under tutelage (i.e. private university colleges), ten polytechnics (some of which have been converted to technical universities), one distance-learning institution, 45 colleges of education and 29 nurses training colleges (National Accreditation Board, 2017). Between 2010 and 2015 student enrolment in the tertiary institutions grew from 217,543 to 320,746 (Ministry of Education, 2017). Despite this growth in the number of institutions and student enrolments, research production has not grown at the same rate. In the same vein, doctoral training has remained low despite efforts towards its expansion.

Though the higher education sector comprises several institutional types as discussed above, the bulk of research production and PhD training is dominated by the public universities. Only two of the over 70 private university colleges offer PhD programmes. Between 2010 and 2013, enrolment for doctoral students in Ghanaian universities grew from 715 to 1,135 (National Accreditation Board, 2015), a large growth, but in absolute terms is still low compared to international benchmarks. The majority of these doctoral students were registered at the University of Ghana (UG).

The higher education sector is regulated by two main agencies falling under the Ministry of Education: the National Council for Tertiary Education (NCTE) and the National Accreditation Board (NAB). The NCTE is mandated to advise the sector minister in charge of education on the development of tertiary institutions and to formulate policies to regulate tertiary education. Additionally, it has budget and financial responsibilities for the sector. The NAB on the other hand is responsible for accreditation of public and private tertiary institutions in Ghana. The NAB develops benchmarks for accreditation and quality assurance, ensures proper operations of accredited institutions and maintains acceptable levels of academic or professional standards. For accreditation to be granted for academic programmes including those for PhD training, NAB requirements have to be met. These include documentation reviews, site visits to the institution seeking accreditation, confirmation of availability of adequate and well-qualified staff, well-equipped library facilities and other infrastructure including classrooms, lecture theatres, laboratories, workshops and equipment. These steps are undertaken to ensure that programmes meet prescribed quality standards.

1.2 The current research and PhD training landscape

Given the role that some Ghanaian universities play in doctoral training, it is deserving to ask critical questions about their capacities and capabilities for PhD training. Answers to such questions will provide information to governments, the institutions themselves, international partners and other sectors seeking to support the higher education sector especially in knowledge generation through research and doctoral training. Several indicators have been used to measure research capacity at system and institutional levels. According to Bates et al. (2011) some of the indicators that have been used to measure changes in research capacity range from process measurements such as awarding of PhD scholarships or grants, to more precise measurements such as number of PhD programmes, numbers of PhDs completed, number of publications or programmes led by the university.

This study reveals that within the last decade, there have been several initiatives and reforms to increase research productivity and opportunities for PhD training in Ghanaian universities. Despite these developments, low research productivity and inadequate numbers of staff with PhDs still characterise the system. The persistent lack of capacity and inadequate funding to promote research and PhD training remain the main challenges of doctoral studies. The absence of a national policy framework with an overarching national research agenda could have led to creating fragmentation in national research efforts.

2. Methodology

In line with the aims of the study to capture a cross-section of diverse higher education institution types, ten were selected for the study. The sample was drawn from all chartered public and private universities in Ghana that have been in existence for at least ten years and which offer PhD programmes. To ensure diversity, the sampling criteria included the age, status, regional locations, numbers of PhD programmes and size of institution. These criteria yielded eight universities. However, two additional universities (one public and one private) not currently offering PhD programmes were added to the sample. This was to provide more insights into the challenges constraining such institutions from establishing PhD programmes. This mix provided a richly diverse and representative sample of the higher education sector in Ghana. Table 1 presents profiles of the sampled universities for the study. It also includes the year of establishment, type, student population and number of PhD programmes in the universities.

Table 1: Profiles of the sampled universities, 2015–16

	University	Region	Ownership	Year	Type	General student population (year)	No. of PhD programmes (year)
1.	University of Ghana (UG)	Greater Accra	Public	1948	Comprehensive	37,940	64
2.	Kwame Nkrumah University of Science and Technology (KNUST)	Ashanti	Public	1952	Comprehensive	45,866	71
3.	University of Cape Coast (UCC)	Central	Public	1962	Comprehensive	35,922	35
4.	University of Education, Winneba (UEW)	Central	Public	1992	Specialised professional	51,686	22
5.	University for Development Studies (UDS)	Northern	Public	1992	Specialised Professional	18,084	14
6.	University of Mines and Technology (UMaT)	Western	Public	2004	Specialised professional	2,105	9
7.	Ghana Institute of Management and Public Administration (GIMPA)	Greater Accra	Public	1961	Specialised professional	3,383	2
8.	Akrofi-Christaller Institute of Theology, Mission and Culture (ACITMC)	Eastern	Private	1987	Specialised professional	Not reported	1
9.	University of Professional Studies, Accra (UPSA)	Greater Accra	Public	1965	Specialised professional	12,000	0
10.	Central University College (CUC)	Greater Accra	Private	1988	Specialised professional	8,470	0

Source: universities' websites and handbooks

Data collection was undertaken through different approaches. One was by desk reviews of relevant documents and publications. The documents were mainly obtained from relevant government ministries (i.e. Ministry of Education, and Ministry of Environment, Science, Technology and Innovation), regulatory bodies for tertiary education (i.e. National Council for Tertiary Education and NAB) as well as annual reports, statistics reports, factsheets and research reports from the selected institutions. The second approach was through a questionnaire. The survey respondents were selected using convenience sampling and included alumni, heads of department, directors of research and supervisors of PhD students. The questionnaire data was supplemented by interviews with alumni and administrators responsible for doctoral provision (such as deputy vice-chancellors or registrars). In order to provide cross-sector context to the institutional data, interviews were also carried out with one representative of the ministry of education, two university leaders, and two leaders of regulatory authorities responsible for education. The interviewees were purposively sampled. One focus group discussion was held with seven representatives of industry drawn from six sectors: manufacturing (1); finance and insurance (2); telecommunication (1); government/public services (1); mining (1) and agriculture (1). Additional secondary data was obtained from the websites of the participating universities. Table 2 presents a summary of data collection.

Table 2: Summary of data collection

University	Questionnaires						Interviews	
	Central university management		Deans and heads of department		Alumni		Alumni	Deputy vice-chancellors and registrars
	Sent	Valid received	Sent	Valid received	Sent	Valid received		
UG	3	0	20	13	25	16	5	1
KNUST	3	0	23	15	25	14	4	0
UCC	2	0	19	12	23	15	3	1
UEW	2	0	5	3	10	8	2	1
UDS	2	1	6	5	10	6	2	1
UMaT	2	0	6	3	6	4	1	0
GIMPA	2	1	2	1	0	0	0	0
ACITMC	2	1	1	1	3	2	1	1
UPSA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
CUC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
Total	**18**	**3**	**82**	**53**	**102**	**65**	**18**	**7**

Note: n/a = not applicable because the university does not run a PhD programme

3. Availability, thematic priorities and quality of doctoral training

3.1 Overview of the changes in the PhD training landscape over the last decade

Over the last ten years, there have been several transformations in the higher education sector in Ghana. These include the proliferation of private university colleges, the establishment of two new public universities, governance reforms, strengthening of regulatory frameworks, growth of regional, and continental higher education policies and other reforms targeting research and knowledge production. This study is however focused on research production and PhD training in the Ghanaian higher education system. It will thus mainly discuss transformations and developments related to these areas.

Over the past ten years, there have been developments in research production and PhD training in Ghanaian universities. Alabi (2013) identified four such initiatives, which included (i) establishment of research management offices in the universities, (ii) development of policies and capacities for managing and supporting research, (iii) identification of institutional research priorities and (iv) promotion of transparency and accountability in research. In addition to these, interviews with deputy vice-chancellors involved in this study revealed that the universities had been engaged in restructuring their PhD programmes. This included the establishment of new funding programmes for PhDs and research. Others had created centres of excellence for research which were also related to PhD programmes. There are also universities which had made investments into the acquisition of new infrastructure to support their PhD programmes and strengthen their research. In the ensuing sections, these developments are discussed in detail.

3.2 Growth in PhD provision and thematic priorities

As the tertiary education sector in Ghana continues to expand in response to the ever-growing demand for higher education, there has been a corresponding increase in demand for faculty with PhD qualifications. This is in addition to demand for highly qualified specialists in other sectors of the economy. At the same time, there has been growing pressure on the universities to enhance their research outputs for utilisation in responding to the several challenges facing Ghanaian society. Consequently, within the universities, there has been an implicit requirement on academic staff to obtain PhDs, prompting those who did not have PhDs to enrol. The push effect of this move has in the recent years led to the development of new PhD programmes due to additional demand. The universities have also been reviewing old doctoral programmes and introducing new and relevant ones. By 2016 over 200 PhD programmes could be identified in Ghanaian universities compared to the less than 100 programmes that existed in 2005. The PhD programmes covered a broad range of areas, as is summarised in Table 3.

Table 3: PhD programmes in the sampled universities, 2016

	University	Natural sciences, engineering and technology	Humanities and social sciences	Business, economics and management sciences	Education	Total
1.	UG	37	16	8	3	64
2.	KNUST	55	4	12	0	71
3.	UCC	12	12	1	10	35
4.	UEW	0	0	0	22	22
5.	UDS	12	0	2	0	14
6.	UMaT	9	0	0	0	9
7.	GIMPA	0	0	2	0	2
8.	ACITMC	0	1	0	0	1
Total						**218**

According to information from the universities, the initiative to introduce new PhD programmes was mainly undertaken by the departments and faculties following approval from the respective university senates and management. In a number of instances, the main rationale for introducing PhD programmes was 'to produce the human capital needed to develop and sustain high-quality teaching and research activities in the university'. The new PhD programmes had to be aligned to the respective missions of the universities, the overall institutional strategic plan and based on availability of qualified staff and facilities. Table 4 presents some of the key factors that were considered in establishing new PhD programmes. To a large degree, availability of adequate learning resources and research infrastructure, programme alignment to national priority development agendas and to labour market demand of the programmes were also considered.

However, the two factors that did not seem to attain much consideration in establishing the programmes was the availability of sustainable funding to support them or the role of professional associations in the establishment of the programmes. The lack of prioritisation of funding is an interesting one, as funding was one of the key challenges and barriers to research production and PhD training in Ghana.[3]

Table 4: Factors considered by deans and heads of department when introducing new PhD programmes

Factors considered	Frequency (n=53)	%
Programme alignment to the university's mission and strategic plan	44	83.02
Availability of qualified and experienced faculty	44	83.02
The needs of stakeholders (industry/business)	43	81.13
Availability of adequate learning resources and research infrastructure	36	67.92
Programme alignment to national priority development agendas	33	62.26
Labour market demand for the programme	27	50.94
Sustainability over medium to long term	24	45.28
Availability of funding	10	18.87
Professional associations	5	9.43

Source: field survey data (2016)

3. The majority of the responses (i.e. 52 out of 53) came from public universities and therefore the findings could not be analysed to show the differences, if any, between the public and private universities.

Admission into PhD programmes generally took a similar mode in all Ghanaian universities. Admission was mainly done through the respective graduate admission boards based on recommendations from departments and faculties in which the students intended to study. Across the studied institutions, there were difficulties in obtaining data regarding enrolments and graduation rates of the PhD students over the past ten years. This notwithstanding, some useful data was obtained from the NAB which generally indicated that PhD enrolments in Ghanaian universities was growing. According to the NAB (2015) between 2010 and 2013, enrolments in doctoral programmes in Ghana's public HE institutions grew at an average of 26.5 per cent. In 2010–11, the board reported that total enrolment for doctorate degrees was 715. This figure rose to 824 in 2011–12 (representing a 15.24 per cent growth rate) and 1,135 in 2012–13 (a growth rate of 37.74 per cent).

Despite this growth, enrolments into PhD programmes constituted only 0.5 per cent of the total student enrolments in the public tertiary educational institutions. While there were 824 students enrolled in PhD programmes, the undergraduate and master's students' enrolments combined stood at 226,750. In 2014–15, out of a total enrolment of 147,180 students in the public universities, only 0.9 per cent were enrolled in PhD programmes. The UMaT had the highest percentage of 1.4 per cent followed by the UG with 1.1 per cent of total enrolled students. For the private universities that presented statistics to the NCTE[4] in 2014, none of them had a PhD programme and thus did not have registered PhD students.

A more detailed picture of enrolments in relation to graduations is available for the nation's six oldest universities. The NCTE further reported that for 2012–13, only 65 students graduated with doctoral degrees out of a total of 42,246 graduating students from KNUST, UCC, UDS, UEW, UG and UMaT. This figure represents 0.15 per cent of the graduating students and an average of 11 PhDs per university. Meanwhile, the total enrolment of PhD students for that year was 963 with the UG having the highest enrolment figure and UMaT the least (see Table 5). Of the 65 PhDs that were graduated in 2012–13, the UG and KNUST graduated more than 70 per cent of them, with 32 and 15 PhDs respectively (see Table 5). The UG, which has the highest rate of PhD production in Ghana, has produced 81 PhDs between 2005 and 2010 – an average of about 16 PhDs per annum. With only 65 PhDs produced by the system annually, amid the expanding higher education sector, dwindling research productivity and the challenges facing PhD training, it is clear that deliberate and concerted efforts are needed to address the situation.

Table 5: PhD enrolments and graduation rates from the sampled public universities, 2012–13

Institution	PhD enrolment	PhD graduation
KNUST	228	15
UCC	164	9
UDS	88	4
UEW	155	4
UG	302	32
UMaT	26	1
Total	**963**	**65**

Source: NCTE (2014)

4. The NCTE is the supervisory body for tertiary education in Ghana.

3.3 Capacity of existing PhD programmes

It was also important to undertake an analysis of the capacities of the existing PhD programmes. The approach taken was to look into the quality of the academic staff in these programmes and departments and the available facilities to support the training. It was notable from the sampled universities that though efforts had been made to improve the quality of staff and training facilities, the capacities within the departments were still inadequate. For instance, looking at the ranks of academic staff in the sampled Ghanaian universities (see Table 6) and also corroborated by the outcomes of the interviews with the university leaders and heads of the academic departments, there were still very few staff with PhD qualifications across the institutions. As per the NAB's requirements, the minimum qualification required for teaching at the degree and tertiary level in Ghana is a researched master's degree.[5] Thus, most of the staff in the universities had a master's as their highest academic qualification. This is demonstrated in Table 6, in which the majority of staff are lecturers (master's qualifications) while very few are at the level of senior lecturer or professor where PhD qualification is a requirement. As Table 6 depicts, only about 30 per cent of the staff had PhDs with some of them located in departments which did not offer PhD programmes. This suggests that the staff with PhDs were very thinly spread in the departments offering PhD training. The proportion of faculty trained to PhD level is critical for quality training of PhDs and strengthening research capacity and productivity. As is depicted in Table 7, for the 2012–13 academic year, the proportion of academic staff in Ghanaian public universities with PhDs ranged between 18.1 per cent to 49.1 per cent. This excludes data from KNUST and UCC, which was unavailable (NCTE, 2014). With the increasing PhD enrolments this already-stretched capacity will struggle to cope with the growing demand.

Table 6: Distribution of academic staff in the public universities sampled, 2013–14

Institution	Professor/ associate professor	Senior lecturer	Lecturer	Assistant lecturer	Tutor	Total
KNUST	89	178	447	86	0	800
UCC	78	143	283	120	0	624
UDS	19	65	345	68	0	497
UEW	44	80	310	15	0	449
UG	174	241	405	193	32	1,045
UMaT	10	17	44	17	0	88
UPSA	4	2	84	51	0	141
Total	**418**	**726**	**1,918**	**550**	**32**	**3,644**

Source: Ministry of Education (2017)

5. The NAB's decision on this minimum requirement can be found at: www.nab.gov.gh/board/board-decisions

Table 7: Academic staff qualification, 2012–13

Institution	Qualification	Male	Female	Total	%
KNUST	Not available	Not available	Not available	Not available	Not available
UCC	Not available	Not available	Not available	Not available	Not available
UDS	PhD	113	-	113	25
	MPhil	120	5	125	27
	Master's	217	5	222	48
	Degree/others	-	-	-	0
	Total	**450**	**10**	**460**	**100**
UEW	PhD	81	8	89	25.6
	MPhil[6]	93	36	129	37.1
	Master's	93	35	12	36.8
	Degree/others	2	-	2	0.5
	Total	269	79	348	100
UG	PhD	369	84	453	49.1
	MPhil	197	92	289	31.3
	Master's	98	40	138	15.0
	Degree/others	30	13	43	4.6
	Total	**694**	**229**	**923**	**100**
UMaT	PhD	15	-	15	18.1
	MPhil	22	3	25	30.1
	Master's	38	5	43	51.8
	Degree/others	-	-	-	0
	Total	**75**	**8**	**83**	**100**

Source: NCTE (2014)

6. The MPhil in Ghana is a two-year researched master's degree aimed at preparing students to be able to conduct good research. Students spend the second year writing a thesis under supervision which is normally examined externally.

It is in recognition of this capacity challenge that NAB encourages academic staff in the universities to have a PhD qualification, but only actually requires a researched master's degree or MPhil. NCTE's norm for academic staff in public tertiary institutions states that 25 per cent of the academic staff should be professors/associate professors, 30 per cent senior lecturers and 45 per cent lecturers. For most of the public universities now, holding a PhD is a requirement for promotion to a senior lecturer position.

From the interviews with the universities that are yet to introduce PhD programmes, it also emerged that the main constraint they face in the attempt to introduce PhD programmes was the lack of qualified staff for teaching and supervision of the doctoral students. Due to these constraints, they cannot be granted approvals to offer doctoral programmes. This situation is similar in most of the private universities.

3.4 Quality of PhD programmes: perspectives of academic departments and alumni

While quality is crucial in PhD training, assessing the quality of PhD programmes can be a complex task since there is no single precise way of doing so. To evaluate the quality of PhD programmes in this study, the questionnaires to the deans and heads of departments examined the availability of policies put in place to ensure several aspects of quality, and the extent to which the policies were rated as effective or not. The statements on institutional policies to ensure quality PhD programmes were presented to the heads of departments and alumni on a Likert scale ranging from 1 'Not effective' to 4 'Very effective', with 0 indicating 'Not available'. The outcomes are presented in Table 8.

Table 8: Policies for quality of PhD programmes according to deans and heads of department

Policy	Mean	Standard deviation	Likert-scale responses (%) n=53				
			Not available	Not effective	Somewhat effective	Effective	Very effective
Admission regulations and procedures for PhD students	3.66	0.55	0.00	0.00	3.77	26.42	69.81
Institutional accreditation related to PhD	3.54	0.61	0.00	0.00	5.66	33.96	60.38
Programme accreditation related to PhD	3.53	0.64	0.00	0.00	7.55	32.08	60.38
Policies and procedures for supervision of PhD students	3.40	0.66	0.00	0.00	9.43	41.51	49.06
Regulations and procedures for thesis examination	3.36	1.02	0.00	5.66	5.66	30.19	58.49
Institutional system for evaluating the organisation and quality of PhD supervision	3.21	0.77	0.00	0.00	20.75	37.74	41.51
Systems and procedures for evaluating quality of teaching and learning related to PhD programmes	3.13	0.90	0.00	5.66	16.98	35.85	41.51
Systems and procedures for monitoring the progress of PhD students	3.04	0.76	0.00	1.89	20.75	49.06	28.30
Systems and procedures for assessing quantity and quality of research related to PhD	3.00	1.09	3.77	7.55	13.21	35.85	39.62

Table 8 continued

Policy	Mean	Standard deviation	Likert-scale responses (%) n=53				
			Not available	Not effective	Somewhat effective	Effective	Very effective
Structures to co-ordinate and manage PhD programmes	2.91	0.84	0.00	5.66	22.64	47.17	24.53
Institutional system for periodic review of PhD programmes	2.79	0.97	3.77	3.77	24.53	45.28	22.64
Systems to promote a stimulating research and working environment for PhD students	2.43	0.91	3.77	5.66	45.28	33.96	11.00
Structures to facilitate partnership with industry and business sector related to PhD training	2.19	1.06	0.00	32.08	32.08	20.75	15.09
Institutional system and mechanisms for funding PhD research	2.09	1.16	7.55	26.42	28.30	24.53	13.21

Source: field survey data (2016)

As is depicted in Table 8, most of the responses were rated 2 and above with average scores higher than 3. This indicates that in the departments or universities where PhD quality policies exist, they were thought to be generally effective. From the results, there are five areas (the last five items in the table) that were rated less than 3, suggesting that they require improvement. Such areas include *'systems and procedures for assessing quantity and quality of research related to PhD'* and *'systems to promote a stimulating research and working environment for PhD students'*. Furthermore, there were cases where certain policies were not available suggesting a need for interventions with relevant policies. These policies include having *'systems and procedures for assessing quantity and quality of research related to PhD'*, *'institutional system and mechanisms for funding PhD research'*, *'institutional system for periodic review of PhD programmes'* and *'systems to promote a stimulating research and working environment for PhD students'*. Standard deviation is a measure of variability in responses given. The responses *'admission regulations and procedures for PhD students'* had the least variation with a standard deviation of 0.55, while responses to *'institutional system and mechanisms for funding PhD research'* had the most variation with a standard deviation of 1.16, indicating that there is variation in systematic funding mechanisms at Ghanaian universities.

The quality of the PhD programmes was also evaluated based on the responses from the alumni who had just graduated from these programmes. The responses as presented in Table 9 indicate that the alumni felt that the PhD training was generally of reasonable quality as it enabled them to develop research skills in their fields of training. They however reported to have missed some important skills such as developing research proposals, working collaboratively with interdisciplinary and multidisciplinary teams, teaching skills and skills for advising postgraduate students. The alumni also gave their perception of the quality and adequacy of resources including library facilities and services; electronic learning resources; research infrastructure; specialized equipment, computers; web-based campus computer services; working space or office for PhD students, career development support; and intellectual environment of the departments where they studied. Table 9 provides the responses of the alumni on the availability and quality of resources that were available during their doctoral training.

Table 9: Evaluation of PhD resources by doctoral alumni

Resources	Adequacy (%) n=65			Quality (%) n=65		
	2	1	0	a	b	c
Library facilities and services (study space, books, electronic journals, other references, etc.)	56.92	43.08	0.00	52.31	38.46	9.23
Electronic learning resources (computers, internet access, etc.)	36.92	56.92	6.15	24.62	50.77	24.62
Research infrastructure (labs, workshops, etc.)	32.31	50.77	16.92	29.23	47.69	23.08
Specialised equipment, computers, etc.	24.62	41.54	33.85	21.54	38.46	40.00
Web-based campus computer services	24.62	52.31	23.08	27.69	41.54	30.77
Working space (office) for PhD students	9.23	32.31	58.46	6.15	21.54	72.31
Career development support	12.31	50.77	36.92	9.23	23.08	67.69
Intellectual environment of your department	35.38	64.62	0.00	43.08	50.77	6.15

Source: field survey data (2016)

Note: 0 = Unavailable; 1 = Inadequate; 2 = Adequate; a = Good; b = Satisfactory; c = Poor

Based on the outcomes presented in Table 9, apart from library facilities which were found to be adequate by a small majority of respondents (56.92 per cent), the other resources necessary for PhD training were either inadequate or unavailable. In addition to availability, a similar conclusion can be reached for the quality of the resources. Except for library facilities and services which was rated good by more than half of the respondents (52.31 per cent), the rest of resources and facilities were rated as either satisfactory or poor. In particular, the poor rating of 'working space (office) for PhD students' was striking, suggesting that measures need to be taken to address this problem. Equally, there were a number of areas where a sizeable proportion of the respondents (between 6.15 per cent and 58.46 per cent) indicated that the resources were not available. Worthy of note among these is 'working space (office) for PhD students', which requires urgent redress in order to facilitate students' research.

3.5 Alumni satisfaction with PhD programmes

In addition to the above aspects, the study also addressed the satisfaction of the alumni with the quality of their PhD training. On a scale of 1 (dissatisfied) to 4 (very satisfied), the average responses to most of the questions ranged between 3 and 4 indicating satisfied or very satisfied. *'The overall content learning during your PhD study'* and *'your overall experience as a PhD student'* were rated at 3.43 and 3.49 respectively (see Table 10). Based on the mean scores, the top three aspects of PhD study in which the alumni were most satisfied were *'competence and experience of your research supervisor(s)'* (mean of 3.91), *'relevance of your dissertation topic to your field of study'* (mean 3.89) and *'professional relationship with your supervisor'* (mean 3.83). These outcomes suggest that the alumni were very satisfied with the capacities of their supervisors and their professional relationships. In addition, they expressed satisfaction with the quality of their work by rating *'quality of your research work'* at a mean of 3.71. It is also important to note from Table 10 that the respondents evaluated *'relevance of your research work to national research priority agendas/industry'* as 3.55, suggesting that they were very satisfied with the extent to which their research fitted into the national-level research priority agendas and industry needs.

Table 10: Alumni satisfaction with PhD study

Item	Mean	Standard deviation	Likert-scale responses (%) n=65				
			Not applicable	Dissatisfied	Somewhat dissatisfied	Satisfied	Very satisfied
The overall content learning during your PhD study	3.43	0.77	0.00	0.00	16.92	23.08	60.00
The guidance and advisement by your department	3.17	0.99	3.08	3.08	13.85	33.85	46.15
Relevance of the PhD courses offered	3.06	1.42	15.38	0.00	4.62	23.08	56.92
Overall quality of the PhD course offered	2.97	1.47	16.92	0.00	7.69	20.00	55.38
Competence and experience of your research supervisor(s)	3.91	0.29	0.00	0.00	0.00	9.23	90.77
Professional relationship with your supervisor(s)	3.83	0.75	0.00	0.00	0.00	16.92	83.08
Quality and effectiveness of research supervision	3.55	1.01	0.00	3.08	6.15	23.08	67.69
Adequacy of research facilities provided	2.93	1.31	0.00	12.31	16.92	35.38	35.38
Adequacy of financial support for your research project	2.49	1.04	6.15	23.08	16.92	23.08	30.77
Support provided in designing your research project	2.91	0.31	3.08	9.23	12.31	44.62	30.77
Relevance of your dissertation topic to your field of study	3.89	0.45	0.00	0.00	0.00	10.77	89.23
Relevance of your PhD training for your professional development	3.72	0.79	0.00	0.00	0.00	27.69	72.31
Relevance of your research work to national research priority agendas/ industry	3.55	0.46	3.08	0.00	0.00	32.31	64.62
Quality of your research work	3.71	1.20	0.00	0.00	0.00	29.23	70.77

Table 10 continued

Item	Mean	Standard deviation	Likert-scale responses (%) n=65				
			Not applicable	Dissatisfied	Somewhat dissatisfied	Satisfied	Very satisfied
Your participation in national conferences	2.51	1.25	9.23	6.15	33.85	26.15	24.62
Your participation in international conferences	2.73	1.25	6.15	12.31	20.00	24.62	36.92
Intellectual environment of your department	3.28	0.80	0.00	3.08	12.31	38.46	46.15
The overall working environment	3.20	0.86	0.00	3.08	20.00	30.77	46.15
Your overall experience as a PhD student	3.49	0.73	0.00	0.00	13.85	23.08	63.08

Source: field survey data (2016)

Note: 1 = Dissatisfied; 2 = somewhat dissatisfied; 3 = Satisfied; 4 = Very satisfied; 0 = Not applicable

Conversely, the results in Table 10 also reveal aspects of the PhD training that the respondents were least satisfied with. One of these include *'adequacy of financial support for your research project'* (mean of 2.49), *'your participation in national conferences'* (mean of 2.51), and *'your participation in international conferences'* (mean of 2.73). With these findings, the areas for policy interventions are manifest.

Financial support for research and other requirements by PhD students such as support for participation in conferences and capacity-building workshops could enhance their satisfaction with their PhD studies. These kinds of support could provide them with exposure to other academic resources and relevant academic communities. This could enhance their capacities and contribute immensely to their academic growth, especially for those who want to be become academics, as they are given a platform to publicly present their work, and engage with peers and other scholars. Such training can result in well-rounded and developed graduates ready to enter the world of academia.

4. The national-level research agenda and doctoral training

4.1 Defining a national research agenda

There are several advantages to be derived from having a research policy or framework that can guide the conduct of research at the national level. One advantage is that it helps set the national-level agenda for research and the priority areas to be pursued by national research-oriented institutions. It also provides a mechanism for ensuring that the research agenda and priorities address the national vision. Such policies would also have modalities for aligning research efforts at all levels (institutional, regional and national) to this agenda. According to Benneh (2002) and Cisse (2001) the lack of national research agenda has resulted into the fragmentation of national research efforts in many African countries, including Ghana. This study noted that Ghana is yet to establish a national research policy that could addresses these challenges to research and PhD training among others. However, in November 2017, the Cabinet voted $50 million as seed money for the establishment of the National Research Fund. It is not yet clear if the fund will identify some priority areas for research and improve on resource allocation to research-based institutions and researchers including doctoral students.

The outcome of the interviews with the university leaders indicated that it was still contentious if a national-level research agenda or policy was necessary in Ghana. One of the vice-chancellors expressed the view that *'we sincerely need to have a national research agenda that outlines what we need to focus our research on, how much we want to invest in research and the funding sources',* while another vice-chancellor expressed a contrary view. Another was of the view that *'It is not possible to have a national research agenda, because research is supposed to answer questions and there are many questions. So, you can't have a national research agenda but rather you should have a national interest or enthusiasm for research. You should have an environment that is supportive of research'.*

In the absence of a national-level research agenda or policy, Ghana, like many other African countries, has had a series of national plans and programmes that are expected to give direction to research institutions about governments' priority areas. These national plans, albeit not explicitly, provide some pointers to what could be regarded as national-level research agenda. Since independence, eight such plans have been developed in Ghana (NDPC, 2016). They include the Second Five-Year Plan (1959–64), Seven-Year Development Plan for National Reconstruction and Development (1963–64 to 1969–70), Operation Feed Yourself and Operation Feed Your Industries, Economic Recovery Programme (ERP I: 1983–86 and ERP II: 1987–92), Vision 2020: First Step (1996–2000), Ghana Poverty Reduction Strategy (GPRS I: 2003–05), Growth and Poverty Reduction Strategy (GPRS II: 2006–09), Ghana Shared Growth and Development Agenda I (GSDA I: 2010–13) and Ghana Shared Growth and Development Agenda II (GSDA II: 2014–17).

A closer examination of the planning documents relating to the millennium years point to some national priorities that should have been important in driving the national research agenda. The areas of priority in the 2003–09 documents (i.e. GPRS I and II) were: enhanced infrastructure development, rural development based on modernised agriculture, enhanced social services, good governance and private sector development. However, in the 2010–17 planning documents (i.e. GSDA I and II) the priorities were: ensuring and sustaining macroeconomic stability; enhanced competitiveness of Ghana's private sector; accelerated agricultural modernisation and natural resource management; oil and gas development; infrastructure, energy and human settlements development; human development, employment and productivity; transparent and accountable governance, social development; economic development; infrastructure development; natural resource management and environmental governance; and transparent, responsive and accountable governance. The extent to which institutional-level research has been able to address these national-level agendas is yet to be examined.

In almost all recent planning documents, the government has prioritised science, technology and innovation. This has culminated into the development of a National Science, Technology and Innovation Policy (Ministry of Environment, Science and Technology, 2010). The principal thrust of this policy is to harness the nation's science and technology capacity to

drive all the sectors of the Ghanaian economy. One key objective of the policy is to strengthen the appropriate institutional framework to promote the development of scientific and technological research. Within this objective, the policy provides for other sectoral policies in agriculture, health, education, environment, energy, trade, industry, natural resources management, human settlements and communication that seek to drive the national science, technology and innovation policy agenda.

Beyond 2016, Ghana is seeking to shift from the medium-term plans to long-term national development plans. The view is that 'the medium-term frameworks and their medium-term plans, developed by the central government and their district assemblies respectively, have not served Ghana well, hence the call for a long-term national plan' (NDPC, 2016: 39). In response to this view, the NDPC is leading the efforts to develop a 40-year development plan for Ghana (2018–57) that will address the following goals derived from the Directive Principles of State Policy:

i). Build an inclusive and resilient economy (economy)

ii). Build an equitable and tolerant society (society)

iii). Build safe and sustainable communities (environment – built and natural)

iv). Build effective and efficient institutions (governance/institutions across society)

v). Promote world peace and justice (global context of national development).

So far, the draft framework for this long-term plan recognises that, for the plan to propel the transformation agenda, there will be the need for human capital development, public sector reform/modernisation, land reforms, infrastructural development with immediate priority on energy, science, technology and innovation, and attitudinal change. Committed to the full implementation of global and regional agendas, the NDPC has indicated that, just like the Millennium Development Goals, the Sustainable Development Goals (SDGs) are at the centre of government's development discourse, and therefore it was anchoring the first 15 years of the 40-year development plan to the SDGs.[7]

4.2 Alignment of institutional-level research priorities to the national agenda

The acts or laws establishing public universities in Ghana empower them to set their own priorities for academic programmes, curriculum content and structure, teaching philosophy and research agenda. In most cases, the universities determine their research agenda and priority areas. These are aligned to their visions and missions, societal problems, availability of funding, and the critical mass needed to sustain the university enterprise. In the pursuit of these important aspects, Ghanaian universities have established departments, research institutes and centres to spearhead research in their priority areas in addition to introducing PhD programmes to develop needed expertise for research. Based on the focus areas of the research centres, institutes and PhD programmes in Ghanaian universities makes it rather difficult to come out with a comprehensive list of the research prioritisation. However, judging from the over 200 PhD research programmes that are currently run by the selected universities, it can be noted that the priority areas of research in the Ghanaian universities are vast and evolving. Indeed, they cover broad areas such as engineering and technology, agriculture and life sciences, medicine and health sciences, business and economics as well as social sciences and humanities. These are all linked to some of the priority areas identified in the 2010–17 strategy documents.

With there being no national research policy in Ghana, it is hard to evaluate the alignment of institutional research agendas to the national-level agenda. It is, however, not unreasonable to expect that insofar as research in the public universities is not funded by governments but through contracts from donor partners and organisations, it may not necessarily meet some of the aspirations of the nation and some key stakeholders, such as industry.

4.3 National-level support systems for promoting the national research agenda

Even though there is no single institution in Ghana with a specific mandate to regulate research, the NCTE and NAB both contribute to the regulation of the tertiary education sector in general and its research activities. Apart from the public universities that are expected to promote research, there are also

7. Progress towards the attainment of the Millennium Development Goals has been recorded since 2002 in Annual Progress Reports on the implementation of Ghana's medium-term development frameworks, namely, the GPRS I and II and the GSGDA I and II.

some research units within government ministries, departments and agencies that are equally expected to pursue research agendas that cascade into the national-level research agenda. In addition, the government has created other public research institutions to drive the agenda, including the National Development Planning Commission (NDPC), the Council for Science and Industrial Research (CSIR), the Ghana Atomic Energy Commission, Environmental Protection Agency, and Town and Country Planning Department. Of interest in national policy planning is the NDPC, which was established in 1992 to advise the president on development planning policy and strategy. It also studies and makes strategic analyses of macro-economic and structural reforms for the development of the country (NDPC, 2016: 5).

The CSIR, on the other hand, is responsible for the implementation of government policies on scientific research and development, and advises the minister on scientific and technological advances likely to be of importance to national development (CSIR Act, pp. III-1252: III-1253).

The CSIR is composed of 13 Research Institutes each with a specific mandate to develop and utilise innovative technologies in research and development activities. The research institutes cover the broad areas of agriculture, industry, agro-processing, fisheries, forestry, water resources, building and construction, environment, health, natural and social sciences. They are complementary to research activities of universities and thus in a way support PhD training. It is therefore important for universities to collaborate with these institutes to enhance existing capacities for PhD training.

5. Engagement with industry, the private sector and social challenges

Given the autonomy that Ghanaian universities have to determine their research priorities, different universities have adopted different approaches or strategies to shape their focal research areas. At one end of the spectrum, there are universities that apply the bottom-up approach; and, at the other end, there are those that apply the top-down approach. In KNUST for example, it is reported that individual researchers and departments set their own research agenda which should fit into the university's vision and objectives (Alabi, 2013). However, at the UG, it was noted that research priorities are identified by the faculty in alignment with the university's strategic priorities *(ibid.)*. After adopting the collegiate system in 2014, the governance structure at the UG is supposed to be decentralised, suggesting that colleges within the institution are supposed to be semi-autonomous and should be able to take more decisions on their own regarding academic programmes and research focus.

In line with its vision of becoming a research-intensive university and to reflect developments in research and development systems around the world, the UG introduced a new structure for its PhD programmes starting from the 2012–13 academic year. A major strand of the restructuring was to make the PhD a four-year programme and doctoral programmes conform to acceptable best practices. These included one year of compulsory coursework, one year of research training and attachment to research projects, and two years of independent research and thesis writing. The university also introduced doctoral schools to improve PhD delivery. These special schools, which have been opened to PhD students in other universities throughout Africa, focus on specific skills training and provide in-depth treatment of select topics such as the doctoral environment, the architecture of supervision, grants, fellowships, conferences and publication.

Research in Ghanaian universities has been traditionally focused on basic research while the private research institutions have focused on applied and action research (Manuh et al., 2007; Benneh, 2002). This situation has been attributed to the research orientations of the different institutions. While non-university research centres (such as CSIR) may be regarding research as critical in addressing the core mandates or disciplinary fields of these centres, most of university research is geared towards academic pursuits such as publications or promotion of academic staff to next cadres. In very rare cases are outcomes of university research translated to useful solutions to external stakeholders.

This trend is, however, changing, as there is increasing emphasis on applied research by Ghanaian universities. This development has been attributed to a number of factors including the severe cutback in government spending on research, growing links between universities and industries, research collaborations between universities, and the emergence of policy institutes or centres within the universities (Manuh et al., 2007; Benneh, 2002). This development is also escalated by the growing expectation on university research to respond to growing societal challenges. They are, however, still expected to conduct basic research, cutting-edge research to address local challenges and also not to lose focus on research that reflects the regional and international agendas by the African Union (Agenda 2063[8]) and UN (SDGs) respectively. These agendas require research to assess, monitor and track Ghana's progress toward achieving them. As one of the interviewees explained:

'The SDGs present a golden opportunity for universities to demonstrate their capacity and commitment to the promotion of national and global sustainable development. The goals span over a range of areas including poverty, energy, climate, peace, growth, health, water and sanitation, industry and innovation, and education. And, all

8. The Agenda 2063 is global strategy by the African Union to optimise the use of Africa's resources for the benefits of all Africans.

of these areas ought to be of national interest to Ghana under which our universities can make significant positive contributions through research, community engagement, advisory services or teaching.'

The focus group discussions with key industry representatives underscored the fact that links between the universities and industry were quite weak. As one of the respondents put it, *'the Ghanaian universities are more or less like ivory towers, where a lot of the researchers simply conduct research to advance their career but not to address any practical problem'*. This situation, in the respondents' view, has contributed to the weak engagements and interactions between the universities and the industries. The representatives of industry also took blame in the fact that they had also not fully done their part in engaging with the universities. They acknowledged the complementary roles that universities and industries could have if they worked together. The industry representatives expected that the universities could also conduct more problem-solving type of research which addresses the challenges of the world of business and which could unveil opportunities for industry to get more involved in supporting university research, offering research opportunities for students, making their laboratories and facilities available and even advising students.

To ensure that the outcomes of research by Ghanaian universities benefit industry, the respondents made several recommendations. First, they suggested that university–industry links should be seen as a two-way stream – *'It is about working together and that working together is not as strong as it should be'*. They proposed that *'industry should be speaking to university researchers, and, the academics and PhD researchers should also be speaking to industry'*. Second, universities must be prepared to spend part of their internally generated funds to support research and their institutional engagements with the industry to enable them develop mutual partnerships and collaborations. There was also strong recommendation to university leadership to put more efforts and commitment in reaching out to industry and other societal partners to create mutually beneficial links. Such links could also support the establishment of technology and knowledge transfer frameworks for university–industry partnerships. There was also the challenge for universities to create platforms for disseminating their relevant research outcomes to industry and other stakeholders rather than just publishing them in academic journals which are less accessible to these other stakeholders. Briefing sessions such as symposia with industry and other stakeholders were viewed as crucial in these engagements. Though the industry and private sector is not that big in Ghana, it was noted that Ghanaian universities have not made much effort to co-operate with these sectors to promote research and other areas in which they could have joint efforts. This is an area in which more could still be pursued.

6. Funding sources to develop and sustain PhD training

6.1 National and international sources of funding

Funding is one of the major constraints to research and PhD production in Ghanaian universities; currently they depend mainly on government funding for their research activities. As has been discussed earlier, government funding to research has been insufficient, leading to serious challenges to the universities and even to PhD students. The universities also receive their research budget allocation from the government through the NCTE. As far as the budgetary allocations to universities are concerned, there is no fixed amount that is allocated to all universities. According to Newman and Duwiejua (n.d.), the amount of money allocated to the NCTE for the whole tertiary sector is decided through a combination of mechanisms involving historical funding or incrementalism, bidding and bargaining, and discretion. The NCTE in turn allocates the funds to the universities per a set of criteria that is not performance-based and diversified. The system pays little or no attention to national priorities and is also not geared toward any specified research outputs *(ibid.)*. To rectify this anomaly, a new funding model that considers equity, efficiency, transparency and accountability has been proposed. It recommends that the NCTE base funding on the following categories: base grants; institutional factor grants; innovation grants; performance funding grants; and research grants. The research grants should be allocated to tertiary education institutions based on research publications, numbers of doctoral graduates and research master graduates.

It also proposes ways of supporting academic staff. In the public universities for example, academic staff receive an equal amount yearly to cover book and research allowances. In 2015, the book and research allowance stood at GHS 4,785 (equivalent to $1,256), which in essence does not provide adequate incentives for research. There are plans to establish a national research fund to replace the book and research allowances and also to link research to the structural transformational agenda of government programmes. Apart from government funding through the NCTE, the government also set up the Ghana Education Trust Fund (GETFund),[9] which is a public trust set up by an Act of Parliament (2000) to provide funding to supplement the provision of education at all levels. It provides grants to tertiary institutions to train brilliant students and develop new faculty members especially for research and other academic endeavours of relevance to national development. The fund also provides financial support for the development and maintenance of essential academic facilities and infrastructure.

The 2012 and 2016 Education Sector Performance Reports by the Ministry of Education indicate that over the years 2008–15, education expenditure as a percentage of GDP was between 5.3 per cent and 7.9 per cent. A sizeable proportion of this (between 15 per cent and 25 per cent) was allocated to tertiary education. Allocation to research remained below 3 per cent. In a survey of three public universities in Ghana (i.e. UG, KNUST and UPSA), Alabi (2013) reported that 10–20 per cent of the universities' total budget was earmarked for research.

In an earlier study, Benneh (2002) had noted that government spending on research in Africa at large had declined significantly, compelling academic staff and researchers in the universities to rely on other sources to fund their research projects.

One of the alternative sources of funding that is gradually gaining prominence among some Ghanaian universities is funding from external partners and donors. At the UG, for example, for the 2014–15 academic year, external funding received by the university was $16,826,747.29, representing 32 per cent of the total research funding for the year, which was $52,524,883.11 (University of Ghana, 2016). The major donors towards this were the Alliance for a Green Revolution in Africa, the Bill and Melinda Gates Foundation, the Danish International Development Agency, the UK Department for International Development, the European Union, the Food and Agricultural Organization, the International Development Research Centre, the Leverhulme–Royal Society, the National Institute of Health, the United States Agency for International Development, the World Bank and the World Health Organization. Based on the interviews with the deputy vice-chancellors, these external donors also fund research projects in other Ghanaian universities. The UG also benefited from the DAAD in support of the Ghana/German Centre of Excellence in Development studies PhD programme, as cited by some of the alumni working in the university.

9. The sources of money for the fund are: a) 2.5 per cent Value Added Tax (VAT) rate; b) money allocated by parliament; c) money from investments made by the fund; d) grants, donations, gifts and other voluntary contributions; e) other monies or property that may in the manner become lawfully payable and vested in the Board of Trustees for the Fund.

6.2 How students finance PhD studies

Generally, apart from government funding to the universities, students registered on PhD programmes in Ghanaian universities are mainly self-funding. Government support to PhD students is mainly through bursaries and grants for thesis writing. For the 2014–15 academic year, the bursary funds allocated to PhD students was GHS 400 (equivalent to $105) while the thesis/dissertation grant was GHS 1,100 (equivalent to $288). Table 11 shows the other possible sources of funding for PhD studies and how they were ranked by the respondents.

Table 11: Major sources of financial support for PhD studies according to alumni [10]

Source	Received funding	1st	2nd	3rd	4th
Federal government	65	-	85	12	3
Regional government	0	-	-	-	-
The university	32	94	6	-	-
Your employer	8	75	-	25	-
Industry/business sector	0	-	-	-	-
International donors	27	26	22	52	-
Local donors	4	100	-	-	-
Self-sponsored	63	38	6	25	30

Source: field survey data (2016); n=65

Just under half the students received some financial support from their university, and most of these reported that this was their main (most important) source of funding (94 per cent ranked it as 1st, six per cent ranked it as 2nd). Just under half the students also reported receiving funding from international donors, although it more often constitutes a third, alternative source of funding (52 per cent), rather than the primary source (26 per cent). All the students received federal government funding, although for these students it was never the primary source of income, indicating that it serves to complement other major sources of funding (e.g. universities and international donors). Almost all the students reported self-funding their studies at least in part.

Compared to the actual cost associated with the processes of research and thesis production, the amounts paid to the doctoral students is severely inadequate. This compels them to explore other ways of supporting their training. In some cases, they have relied on foreign grants and the Scholarship Secretariat of Ghana for support. In other cases, students have resorted to engaging in different forms of employment, especially part-time teaching to augment the funds for their studies. Though several options such as international research grants and possibilities through links and collaborations could make a difference to the funding of PhD studies, not so much has been done in this regard by most Ghanaian universities. So far, it is only the UG that has attempted this through its Accelerated *PhD Training* through University of Ghana – Diaspora Linkages (APT-Ghana). This initiative, according to the vice-chancellor of the UG, is funded by the Carnegie Corporation of New York and supports the establishment of the University of Ghana Pan-African Doctoral Academy to enhance PhD output; the expansion and institutionalisation of the University of Ghana Diaspora Linkage Programme to support postgraduate programme delivery and the development and delivery of new PhD programmes.

10. Eighty per cent of the alumni completed their PhD studies between 2013 and 2015.

7. Role of international collaborations in building research capacity

International collaborations have a significant role to play in building research capacity in Ghana. Through such collaborations universities are able to develop their institutional capacities for research and PhD training. Such collaborations also provide useful possibilities for universities to share expertise and specialised research facilities which can be transformative in developing PhD programmes and facilitating PhD training. Over the years, Ghanaian universities have benefited from international collaborations. In this too, the UG has taken the lead by having several collaborative programmes with universities from other parts of the world. Some of these are dedicated to supporting research and PhD training.

According to the dean of international programmes at the UG, the Carnegie Corporation of New York has been supporting their Next Generation of African Academics programme, which grants scholarships to PhD students, strengthens PhD programmes, trains supervisors and mentors of PhD students, and organises seminars and workshops aimed at improving the quality of research. The target disciplines are Computational Sciences, Social Sciences and Biosphere Sciences. The University of Ghana Diaspora Linkage Programme, which was established in 2011, promotes partnerships with African professors in the diaspora to enhance the university's PhD training capacities. It includes short visits, teaching and co-supervision of PhD students. It was also reported that the UG had acquired a $650,000 grant to support the establishment of the University of Ghana Pan-African Doctoral Academy aimed at developing new PhD programmes to support the university in becoming a regional hub for PhD training and attract excellent PhD candidates. The university is also part of the Cambridge–Africa Partnership for Research Excellence, which awards scholarships, develops new training and research models and has opportunities for post-doctoral fellowships.

From the interview data, it was notable that most of the collaborations were mainly North–South with very few South–South collaborations. One of the examples of South–South collaborations was the African Economic Research Consortium's Collaborative PhD Programme supported by the African Capacity Building Foundation and the World Bank. Even with these developments, the respondent from the International Office noted that they still faced challenges of low supervisory capacity, limited graduate accommodation, disruptions to the academic calendar and lack of demand for PhD programmes.

8. Conclusion

Like many other African countries, universities in Ghana continue to dominate the research landscape in terms of research outputs within the country. This has been possible not only because research capacities are concentrated in the universities, but also based on the mandate of universities to conduct research and train researchers through masters and PhD programmes. To support Ghanaian universities to increase their research outputs and relevance to industry and national-level research agenda, this study has investigated PhD capacities and research systems in Ghanaian universities with a goal to providing answers to some critical questions that can be used by donor institutions, governments and businesses looking for opportunities to support and develop the research capacity and capability in these institutions and to promote sustainable knowledge production and applications in Sub-Saharan Africa at large. The findings are summarised as follows.

First, the findings showed that within the last decade, there have been several initiatives and reforms to increase the availability, quality and thematic priorities of PhD programmes as well as research outputs of universities in Ghana. These initiatives included the restructuring of existing PhD programmes and the introduction of new ones, the establishment of research management offices and provision of small grants. The combined effects of these initiatives and reforms have yielded marginal increases in PhD enrolments and completion rates, albeit far below other African countries such as South Africa. Some of the chartered universities are yet to introduce PhD programmes and their major challenge has been the lack of technical and professional capacity.

The analysis of the qualifications of academic staff in the public universities in Ghana indicates that the country's public universities lack the requisite capacity and capability to produce adequate numbers of PhDs for the higher education sector. The existing capacity is far from ideal, especially when compared to the prevailing situations in other countries and the ever-growing demand for PhD holders. The interviews with the old universities corroborated this point, and for the relatively new universities that are yet to introduce PhD programmes, the lack of qualified experienced lecturers to teach and supervise doctoral students was even more binding and prohibitive. In recognition of these challenges, the NAB considers it too high to set PhD as the minimum standard for teaching in Ghanaian universities. However, as Ghanaian universities build capacities and train more PhD graduates, the board will raise the minimum standard for teaching in Ghanaian universities to a doctoral degree.

Second, the responses to the questions on quality of PhD programmes and availability of resources pointed to the fact that in some universities certain quality-assurance policies were not available. These policies involved 'systems and procedures for assessing quantity and quality of research related to PhD', 'institutional system and mechanisms for funding PhD research', 'institutional system for periodic review of PhD programmes' and 'systems to promote a stimulating research and working environment for PhD students'. Effective supervision and mentoring were also mentioned by the majority of the interviewed alumni as enablers for the successful completion of their PhD programmes within recommended periods. However, these enablers together with library facilities (such as study space, books, electronic journals and other reference materials), internet, workstations and career development support were reported to be inadequate and in some cases unavailable.

Third, the study showed that although Ghana might be said to have a national-level research agenda, implied from various medium-term national policy and strategy documents, this agenda has not been contained in a single document and therefore has the tendency to create fragmentation in national research efforts. Also, it is noted that due to the lack of a documented national-level research agenda it is hard to determine if institutional-level research efforts are aligned with the national-level research priorities. The Report of the President's Committee on Review of Education Reforms in Ghana acknowledged this problem and observed that the overall research output of Ghanaian universities has been low with relatively little impact on national development. The report made several recommendations which are yet to be implemented.

However, it should be noted that the opinions of university leaders were divided as to whether a national-level agenda is even necessary. For that reason, the issue of having a documented national-level research agenda ought to be investigated further, and if it is found out that a national-level research agenda is needed, then the other logical questions to be addressed must include: who should champion it? How should it be developed? What should be the focal areas?

Fourth, there was consensus among industry professionals that the links between Ghanaian universities and industry were weak, contributing to the low impact of universities' research on society. To ensure that Ghanaian universities' research is more beneficial to society and responsive to industry needs, the respondents made a number of recommendations. They expressed the view that Ghanaian universities' research was in the form of basic research more than applied. While acknowledging that the universities could not do without basic research which goes to complement teaching and scholarship, they were of the view that the universities could conduct more problem-solving types of research to address societal challenges such as food security, climate change, poverty, health, education, sanitation and resource management.

Fifth, funding to support PhD training was reported to be a major challenge, an inhibitor to introducing new PhD programmes, and a hindrance to the production of more PhDs. For most of the PhD alumni interviewed, they depended largely on their personal finances to pay their tuition fees, cost of producing their theses and related costs such as data collection expenses. Thus, they could hardly have enough funds to participate in conferences and build networks. The government's support for PhD study in the form of bursaries and thesis/dissertation grants, was recognised as important but noted to be grossly inadequate (less than $400 per annum). Also, there were limited cases of international donor support for PhD studies in Ghanaian universities. A few universities such as the UG however augmented their funding sources with funds from international partners and support from the private sector.

Finally, the findings also revealed that international collaborations and donor support have focused more on knowledge production and generation and not so much on developing capacity and capability for sustaining PhD programmes. In other words, a proportion of donor support to Ghanaian universities was noted to be geared towards funding faculty research and not supporting PhD programmes.

9. Recommendations

Based on the findings of this study, the following key recommendations are made:

1. Considering the challenges of availability of doctoral programmes, it is recommended that universities with limited resources seek partnerships and collaborations with other more endowed institutions to build the requisite capacity and capabilities for research and PhD training. Some of the private universities may also merge together or collaborate with other research institutions such as CSIR to bring synergy to bear on their capacities.
2. Ghana could consider investing in one or two of the public universities as hubs where most of the country's research masters and PhD programmes would be based. These universities should aim at the national norm of 25 per cent or more postgraduate enrolment with sizeable PhD programmes and enrolments.
3. To ensure quality PhD programmes and doctoral students' satisfaction with their programmes, it is recommended that the universities need to develop all such relevant policies, strengthen their research systems and build capacity for effective supervision and student mentoring. To this end, donor support in building these capacities may be warranted.
4. Although a national-level research agenda may be gleaned from national development policies, the NDPC should develop a document detailing national priority research areas to give direction to research-oriented universities. This recommendation was also proffered by the President's Committee on Review of Education Reforms in Ghana in 2003 and is yet to be implemented.
5. Universities should strengthen their links with industry to make their PhD training more responsive to industry and societal needs. This can be done by establishing functional technology and knowledge transfer units with clear modalities and policies for industry–academia partnerships, establishing research chairs and endowments and creating forums whereby the universities could engage industry on topical issues of interest and issue industry briefs on their PhD research findings.
6. As a sustainable way of supporting research, the Ghanaian government, through its agencies, should also increase its budget allocation to funding research and development. The GETFund, which has been recommended by the President's Committee on Review of Education Reforms to allocate a substantial proportion of its funds to support PhD research and improve facilities in the universities, should take steps to implement this recommendation. The universities must also be prepared to spend part of their internally generated funds to support PhD research so that when they approach industry for support, they can seek partnerships and collaborations instead of 'donor-recipient' relationship. Donors should expand their activities and provide support to funding and sustaining PhD programmes. Grants could be made available to support PhD dissertations' data collection and conference participation.
7. In relation to international collaborations and donor support, it is recommended that efforts should be channelled more into developing capacity and capability for sustaining PhD programmes. Regarding North–South collaborations, efforts must be put in place to ensure the full participation and involvement of South collaborators. These can be done by ensuring that PhD capacity-building proposals are co-developed and based on mutual interests.

In conclusion, while the findings of this study are very insightful in terms of what can be done to build sustainable capacity for PhD programmes, they do not in any way bring finality to the subject. The study has exposed many data limitations and there is a need for better data collection and reporting on research agendas and priorities, availability of PhD programmes, enrolment and graduation statistics, research outputs and impacts at both institutional and national levels.

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