Part 1
TOWARDS RESEARCH UNIVERSITIES IN AFRICA
Chapter 1
From flagships to research universities

Discourses on the role of higher education in development in Africa

It is now widely accepted that for a country to thrive in the knowledge economy, it must develop high-level skills and competencies (human capital), as well as its scientific research, innovation and technological development capacity. Higher education, and universities in particular, are regarded as key to delivering these knowledge capabilities for development, based on their traditional role of producing, applying and disseminating knowledge, as well as educating the next generation of knowledgeable and suitably qualified workers. Research has suggested a strong association between higher education participation rates and levels of development (Bloom et al. 2006; Cloete & Gillwald 2014; Marginson 2018; Salmi 2017). Furthermore, there is evidence that high levels of education in general, and of higher education qualifications in particular, are essential for the design and productive use of new technologies, provide the foundations for a nation’s innovative capacity, and contribute more than any other social institution to the development of society (Carnoy et al. 1993; Powell et al. 2017). In short, as the main knowledge-producing institutions in any society, it is assumed that universities are well-placed to leverage their research and education capacities to foster more innovative and dynamic economic growth.

Today, many advanced industrialised countries have coordinated knowledge and innovation policies, and a national higher education system as the core of their development strategies. Increasingly, the importance of higher education for national development and global

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1 We have written more extensively on this subject in previous publications; in particular, Universities and Economic Development in Africa (Cloete et al. 2011) and Knowledge and Contradictory Functions in African Higher Education (Cloete et al. 2015).
economic competitiveness is being recognised by emerging economies such as China, India and Brazil. Research has suggested that investing in higher education can help developing country economies to compete in the knowledge economy through technological catch-up with advanced industrialised societies via, for instance, the production of graduates who are better able to use and generate new technologies (Bloom et al. 2006; Powell et al. 2017). Similarly, it is suggested that the ability of developing countries to absorb, use and modify technology developed at home or elsewhere will drive more rapid transition to higher levels of development and standards of living. Higher education also has a range of private and public benefits (Bloom et al. 2006) – the latter including ‘entrepreneurship, job creation, good economic and political governance, and the effect of a highly educated cadre of workers on a nation’s health and social fabric’ (Pillay 2011: 26). At the same time, others have warned of the exclusionary effects of global networks if developing economies and their knowledge-producing universities have little of value to contribute to science and innovation (Castells 2017).

To what extent has the idea of the university’s role in development become manifest in the African context? We begin to answer this question with reference to the dominant discourses that have emerged in the post-colonial era.

The post-independence ‘development university’ discourse

Since gaining independence in the 1960s, African countries have been faced with tremendous national development challenges and, to greater or lesser extents, have been grappling with whether and how higher education more broadly, and universities in particular, might contribute to development. Like so many aspects of Africa’s post-independence progress, higher education on the continent has been shaped, limited and skewed by colonial legacies, internal political wrangling, and the influence of international donor agencies’ agendas and aid.

Colonial rule left few universities behind. Most African countries lacked even a single university at independence. The development of higher education institutions remained limited until after the Second World War because the colonial authorities were generally suspicious of, and opposed to, the creation of a substantial modern, educated African elite and wished to suppress their nationalist demands for equality and freedom (Zeleza 2016). As a result, Africans seeking higher education were often forced to go abroad, including to the imperial metropoles themselves. Furthermore, the existing universities were elitist and based on European models.
Key challenges for the newly independent states included establishing or expanding their national higher education system and reforming the universities to make them more relevant to Africa’s socio-cultural contexts, and to increase access for students from different social backgrounds. The new governments embarked on ambitious development programmes in which universities were supposed to train highly skilled labour forces, create and reproduce national elites, and enhance national prestige. The new reformed institutions were often larger than their colonial predecessors and their missions were broader. They expanded their disciplinary and curricula offerings from the arts and social sciences to include professional fields of study such as business, medicine and engineering. They also incorporated graduate programmes. The growth in higher education after independence was exponential across the continent – from an estimated 120,000 students in 1960 to 782,503 in 1975, and to 3,461,822 by 1995 (Zeleza 2016). Enrolments doubled after 2000 from 6 million to more than 12 million by 2015 (Chipperfield 2016).

Following independence, many African countries, as well as international agencies such as the World Bank and UNESCO, turned their focus to the development and stabilisation of the new states. Talk of the potential role for universities in reconstruction and development began almost immediately, and a discourse of the ‘development university’ emerged in the 1970s with the associated idea that national governments should take some responsibility for steering universities in support of national development. However, realisation of this vision would face numerous challenges and opposition, both internally and externally, which kept African universities in the back seat of development efforts.

Politically, post-independence universities were viewed by governments as sites of opposition as they became embroiled in political and ideological debates about the development choices being made by the new governments, as well as a lack of service delivery, including funding for higher education institutions. While some academics were in support of a steering role for governments to move universities in a development direction, others were defensive of the traditional self-governing model (i.e. governed primarily by scholars) which, following the predominant model in the UK and US at the time, had been the status quo during the post-independence era. As a result, government steering of higher education towards a development role was often experienced as interference in university operations, and many governments, academics and other stakeholders became increasingly sceptical of the extent to which African universities could support national development. The development university discourse also came up against the existing broad consensus among university leaders and liberation governments.
that the role of elite public higher education institutions was to produce human capital to service the new African states.

The prospects for a strong role for the ‘development university’ were also thwarted by the influential agendas of international agencies and donor organisations, which had a significant influence on the trajectory of developments in African higher education. During the 1980s, the World Bank in particular presented a counter position to the development university idea which essentially devalued the contribution of higher education to development in Africa, in favour of an emphasis on primary education. At a meeting with African vice-chancellors in 1986, the World Bank went so far as to argue that higher education in Africa was a ‘luxury’, and that most African countries would be better off closing their universities at home and, instead, training graduates abroad. This had dire and long-term consequences for the nascent higher education systems in many African countries, including massive reductions in funding for universities, the closure of a number of institutions, and the introduction of various privatisation drives which had further negative consequences for the state of African higher education. A few years later the World Bank shifted its perspective on the role of higher education in Africa, partially influenced by a seminar it had hosted in the early 1990s on ‘Improving Higher Education in Developing Countries’ during which Manuel Castells presented his well-known paper on universities as engines of development (Castells 1993), but this turnaround did not result in any significant action by the World Bank.

Thus, despite calls for countries to find ways of incorporating universities into their development efforts, much of this remained at the level of rhetoric and, in most cases, the structure, focus and presumed functions of universities was business-as-usual. A handful of elite institutions, accompanied by a private sector of mainly low-quality institutions, and growth in undergraduate student enrolments was confined largely to the lower degree or diploma level in traditional fields such as law, humanities and social sciences. In addition, African universities were characterised by very weak research capacity which, Castells (2001: 215–217) argued, was owing to the difficulties they had faced in attracting and retaining talented local scholars, and in managing the often contradictory functions assigned to them – in particular, their political and ideological functions – alongside their core academic activities.

‘Revitalisation’ of the university for development and the knowledge economy

This bleak picture of African higher education persisted for a number of decades. By the turn of the century, research performance at African
universities was at an all-time low, and Africa was at the bottom of almost every indicator-based ranking and league table in science and higher education. The tide began to turn when, during the late 1990s and early 2000s, some influential voices on the international and continental stages began calling for the revitalisation of the African university and, once again, for the need to link higher education to development. Early on this was encapsulated by a statement made by then United Nations Secretary General Kofi Annan in a speech in 2000 that ‘the university must become a primary tool for Africa’s development in the new century’ (Annan quoted in Bloom et al. 2006: 2).

Two major donor-driven events – the G8 summit held at the Gleneagles Hotel in Scotland in 2005 and the World Conference on Higher Education held at the headquarters of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in Paris in 2009 – served to stimulate further efforts towards, and to some extent galvanise commitment to, the revitalisation of higher education in the continent among African regional bodies and international agencies. Three documents emerging from the G8 summit had particular significance for African higher education. The first, a report from a workshop hosted by the African Union and the New Partnership for Africa’s Development, titled Renewal of Higher Education in Africa (AU/NEPAD 2005), signalled the importance attached to the topic on the continent. A second report, The Africa Action Plan (World Bank 2005) of the World Bank Group Africa Region, focused on developing research and higher education capacity, as well as information and communication technologies. A third document, Our Common Interest: Report of the Commission for Africa (Commission for Africa 2005), identified four developmental priorities – professional skills, physical infrastructure, human resources and research capacity – and called for the creation of a substantial fund to revitalise African institutions of higher education and to strengthen science, engineering and technological capacity. While the subsequent allocation of funds by the UK’s Department for International Development to the Association of African Universities in 2006 was significantly smaller than expected, the summit did see an important policy shift in support of African higher education and its role in development.

On the continent, the most positive outcome from the preparations for the 2009 UNESCO conference was unanimous support for the importance of higher education expressed by a group of 16 African ministers of education at a meeting on ‘New Dynamics on Higher Education and Research: Strategies for Change and Development’ held in Dakar in 2008. Discussions at this meeting revealed that these leaders exhibited a considerable awareness of the role of knowledge in driving development with a concomitant emphasis on reforming higher education.
systems in this regard, and called for ‘improved financing of universities and a support fund to strengthen training and research in key areas’ (MacGregor 2009).

However, closer examination of the different calls for a developmental role for universities reveals two somewhat contradictory notions: the first a direct instrumental (or service) role in which university expertise should be applied to solving pressing social and health problems; the second, strengthening knowledge production and innovation and hence contributing to the knowledge economy in direct and indirect ways. The instrumental discourse was the more predominant and had been strongly driven by foreign donors and multilateral agencies. This discourse was counterproductive for the aim of higher education playing a role in the knowledge economy. Furthermore, as Maassen and Cloete noted in their study of bilateral country investments and foundation partnerships to support higher education in Africa: ‘none of the donor countries involved subscribe to the engine-of-development approach in their development cooperation policies with respect to higher education’, although this is a core discourse in their own home countries (Maassen & Cloete 2009: 268).

In summary, into the first decade of the new millennium, African higher education was back in focus both on the continent and internationally. However, statements about the importance of higher education for development failed to clarify either what the university’s development role should be, and how such a role would fit with other expectations of the institution, or the role of governments or universities in pursuit of these aims.

**International funding for higher education in Africa**

A discussion of the nature of higher education in Africa at the start of the 21st century and its potential role in contributing to development would be incomplete without mention of the influence of the international funding landscape.

There is no doubt that international aid agencies have made significant contributions to the development of higher education in Africa. However, as is often the case (and as was highlighted earlier with regard to the World Bank in the 1990s), donors make specific choices on what to fund which, in turn, has various implications for the trajectories of higher education. This is evident in the African higher education context in that some aspects have been well-supported while others have been neglected.

In a study of development aid in Africa between 2000 and 2005, Maassen and Cloete (2009) reported that funding for higher education generally fell into three broad categories: capacity building, specifically institutional capacity such as academic programme development, quality
enhancement and networks; the provision of programmes and/or facilities relating to academic support activities and access; and policy focusing on strengthening the structure and functioning of higher education systems. However, the authors also noted three important gaps. The first was a lack of funding for the establishment or further development of any types of higher education institution other than the traditional university, which is necessary for the development of intermediate vocational/technical skills for African economies. A second gap was a lack of support for institutional capacity building in the area of research, and a third was relatively little support for strengthening the central government departments tasked with steering the higher education sector.

A separate survey (Maassen et al. 2007) showed that a strategic area which received virtually no direct support was higher education studies. Many of the externally-funded development programmes were either implemented around non-African expertise or were not empirically informed. In the words of Jeffrey Fine, an economist with considerable experience in Africa: ‘If you want to develop higher education in Africa, then you must study higher education in Africa’ (CHET 2006). More systematic knowledge about African higher education is required to improve higher education delivery, engage in a more informed manner with donors, and enable development agencies to make better investment and capacity-building choices.

In addition to the gaps in funding for higher education in Africa, as studies on development aid have shown (De Gast 2005; Maassen et al. 2007; Maassen & Cloete 2009), a lack of concentration, coordination and consistency among funding agencies resulted in somewhat haphazard contributions to the sector’s development on the continent. An important development in this regard was the formation in 2000 of the Partnership for Higher Education in Africa (PHEA), a joint project established by four major foundations in the US including the Carnegie Corporation of New York, the Rockefeller Foundation, Ford Foundation, Kresge Foundation and the Mellon Foundation. The formation of PHEA contributed to what De Gast (2005) described as a notable exception of coordination.

PHEA’s coordinating role among the foundations led to the creation of a comprehensive donor strategy that directed funds to particular higher education institutions with the aim of establishing centres of excellence in a range of fields relevant to the sector and to national development objectives. The risk of overlap (and oversight) in addressing project themes and objectives was reduced by PHEA’s leadership in ensuring cooperation among the foundations. Alas, the partnership disintegrated, leaving the recipients of donor funding wondering whether it was perhaps easier to advise others to cooperate and coordinate, than it was...
to implement one’s own advice.² Nevertheless, PHEA was instrumental in the conceptualisation and initiation of the Higher Education Research and Advocacy Network in Africa (Herana), a project that stretched over ten years, and in many ways filled some important knowledge gaps about universities in Africa.

Empirical evidence on universities in Africa

Higher education and science systems in sub-Saharan Africa have in the post-independence period been characterised as fundamentally lagging behind the rest of the world when it comes to the quality and productivity of their primary processes, the material conditions under which the higher education institutions had to operate, including the institutional capacity for enrolling students and conducting research, as well as their engagement with and relevance for their societies (e.g. Altbach & Balán 2007). This situation has started to change in the early 2000s, with especially the last five to ten years showing an impressive transformation of (especially sub-Saharan) African higher education and science in a number of core areas.

Even though higher education and science performance in a number of African countries is improving, there is still the general impression outside the continent that the quality of African higher education and science is in general too weak to form a strong enough foundation for academic cooperation, and the integration of African universities and scholars in global research projects and networks. This situation is often characterised as being part of a set of asymmetries between Africa and the rest of the world. At the same time, in the cooperation agreements especially the EU and China have reached with Africa, there is a strong emphasis on the need to invest in higher education and science as a crucial field for reducing the asymmetries.

One key challenge in this is the lack of data that are available outside Africa on the (recent) performance of African higher education and science systems as a whole, as well as of individual universities, research centers and scholars. This includes data on the collaboration between African and non-African scholars, as well as intra-African scientific collaboration. Myths and assumptions often dominate the political discourse, and there is clearly a need for a set of empirically-based academic publications showing amongst other things that the asymmetries in higher education and science performance are growing strongly within the continent, while the asymmetries between the

² Additional reasons for the collapse of PHEA was changes in presidential leadership in several of the member foundations, the new presidents either being antagonistic to their predecessors’ programmes or disinterested in higher education in Africa, or both.
strongest performing higher and science systems in Africa and the rest of the world are decreasing.

Bok (2013) argues that evidence-based policy and management is a discourse or set of methods based on empirical information which informs the policy process, rather than aiming directly to affect the eventual goals of the policy. Policy based on systematic evidence is considered to not only produce better outcomes, but also to provide more opportunity for democratic participation.

While evidence or data are the building blocks, evidence alone does not provide policy information as it is sometimes possible to read different policy implications from the same data. Research implies that the evidence has been given meaning, that there is, for example, a relationship between or a pattern observable in the data that is informative for policy-makers. Research is also more open-ended, communal and subject to verification or falsification, meaning that it is experimental rather than instrumentally-driven.

The problem for policy-makers, at the institutional and national levels, and for donor funders, was a gap in the broader literature on higher education and development and, in particular, the dearth of empirical work on higher education in the African context. Despite the growing global discourse about the relationship between higher education and development, the topic had largely been neglected in the academic literature. While a relatively small, but growing, number of scholarly studies have emerged over the past couple of decades, for the most part these have been econometric in nature, focusing on aspects such as the impact of higher education on economic growth; the rates of return of higher education; the role of higher education in producing human capital for the labour market; and the contribution of higher education to the absorptive capacity of private firms (Pillay 2010). By comparison, little research had been done on the characteristics and dynamics of the relationships between higher education and development, or on the contextual and institutional factors (at national or university levels) which facilitate or inhibit these relationships. This was especially so in the African context. These empirical gaps further indicated a relative absence of sociologically-oriented theory to explain the interrelated dimensions and dynamics at the institutional, national or broader contextual levels shaping the relationships between education and society and either impeding or fostering development.

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3 For an overview and review of studies on higher education and development, see Kimenyi (2011) and Pillay (2011).
The Higher Education Research and Advocacy Network in Africa (Herana)

Launched late in 2007, Herana spanned just over a decade, during which time it developed a network of scholars in higher education studies across countries in Africa, Europe and the United States; produced over 50 books, reports and articles; disseminated information and analytical commentary via its partnership with University World News, including supporting the publication of an African edition; and supervised more than 20 masters students in the field of higher education studies.4

The idea for the establishment of Herana was the result of a confluence of developments, including the emergence of a discourse around the necessity for universities to play a role in development in Africa, as outlined above; influential interactions with international scholars, and especially Manuel Castells who had been writing about higher education in developing countries and theorising, among others, about the (contradictory) functions of universities;5 and the establishment of a coordinated partnership of US donor organisations (PHEA) with a focus on higher education in Africa, which provided a funding opportunity for a project like Herana.

Herana was conceived as a project that would tackle the problem of the absence of a clear idea about how African universities could actually contribute to development beyond the rhetoric; focus on research performance which had been ignored by governments and international agencies alike, and was both lacking but necessary for development and the knowledge economy; develop a set of performance indicators and collect systematic empirical evidence, also then lacking in the African context; include an advocacy component that would assist governments, institutions and donors to undertake evidence-based policy and planning; and build the capacity of a new generation of researchers in higher education studies.

The work of Herana was carried out in three overlapping phases from 2007 to 2017. Phase 1 (2007–2010) focused on the broader topic of the relationship between higher education and development in eight sub-Saharan African countries – Botswana, Ghana, Kenya, Mauritius, Mozambique, South Africa, Tanzania and Uganda – and their ‘flagship’

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4 The masters in higher education studies programme was funded by the Norwegian Agency for Development Cooperation and was presented jointly by the University of Oslo, the University of the Western Cape and the Centre for Higher Education Trust (CHET).

5 For a detailed overview of Castells’s scholarly contributions on higher education in Africa, see Castells in Africa: Universities and development (Muller et al. 2017).
universities. The over-arching aim of the project was to investigate the complex relationships between higher education and economic development through the lens of the context in which the universities were operating, the internal structure and dynamics of the universities, and the interactions between the national and institutional contexts. It also aimed to identify factors and conditions that were facilitating or inhibiting universities’ ability to make a sustainable contribution to development. Phase 1 provided the groundwork for the Herana project as a whole and included a review of the literature on higher education and development internationally (Pillay 2011); case studies of three systems (Finland, South Korea and North Carolina in the US) which had successfully linked economic development and higher education policy and planning (Pillay 2010); the development of the analytical framework for the project; and case studies of the eight African higher education systems and the selected universities. These case studies and the associated synthesis report explored the three dimensions of the analytical framework; namely, the extent to which there was agreement about the role of the universities in development, the strength of the academic core of these institutions, and the extent of knowledge policy coordination and the connectedness of university activities to national development objectives. (The analytical framework is discussed in greater detail below). The main output of Phase 1 was the book *Universities and Economic Development in Africa* (Cloete et al. 2011) together with the individual case study reports. The first publication of the performance indicators and measurement of the eight Herana universities was *Cross-National Performance Indicators: A case study of eight African universities* (Bunting & Cloete 2012). In addition to empirical data which covered the period 2001–2007, this report also outlined the process of developing the performance indicators and the rationale underpinning their construction.

Phase 2 (2010–2014) continued the focus on the performance of the eight Herana universities, updating the data from Phase 1 to 2011, with an additional focus on building institutional information capacity and evidence-based policy-making in the participating universities. The main output of this component of the project was *An Empirical Overview of Eight Flagship Universities in Africa 2001–2011* (Bunting et al. 2014). In

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6 The flagship universities were the University of Botswana, the University of Ghana, the University of Nairobi, Eduardo Mondlane University (Mozambique), the University of Dar es Salaam (Tanzania) and Makerere University (Uganda). In South Africa, the Nelson Mandela University was initially selected for inclusion because it was comparable in size and profile to the other institutions in the group. The University of Cape Town, Africa’s top-ranked institution at the time, replaced Nelson Mandela University at the start of Phase 2 at the request of the other participating universities.

response to the weak institutional capacity to collect and analyse institutional data for policy and planning that became evident during Phase 1, the report was accompanied by a manual intended for use by institutions (Bunting 2014) which deals with the conceptual definitions and steps required to produce Herana data and the use of this data in specific instances of institutional planning. In addition, a number of smaller projects were undertaken which explored more specific aspects of higher education in Africa, including academic incentives for knowledge production, doctoral production, the role and functions of science granting councils and higher education councils, university engagement as interconnectedness, and student engagement and citizenship competencies.

These topics and others are captured in the main output of Phase 2, *Knowledge Production and Contradictory Functions in African Higher Education* (Cloete, Maassen & Bailey 2015). As the title suggests, a key focus of the book was a consideration of the aspirations of the participating universities to become research universities, and the realities and complexities of managing a research function with other, often contradictory, roles and commitments.

*Phase 3* (2014–2017) focused more on the performance indicator component, and the data were updated to 2015. This project had two additional objectives: to institutionalise data collection and analysis that could contribute to evidence-based research information, and to contribute to the process of strengthening knowledge production, in this group of emerging research-intensive flagship universities. The primary output of this phase was *An Empirical Overview of Emerging Research Universities in Africa 2001–2015* (Bunting et al. 2017). The complete dataset is available online on the CHET website8 for use by universities to assess their performance relative to their own institutional targets and to the performance of their peers across the continent, and by other interested parties such as higher education researchers, analysts and policy-makers who seek a detailed, empirically-based picture of African higher education. An additional output in Phase 3 of the Herana project was the book *Castells in Africa: Universities and development* (Muller et al. 2017), an attempt to revisit the ‘sustained and serious academic conversation carried out over nearly 20 years, between a group of South African scholars engaged in thinking about the future of higher education, and a prominent and provocative international scholar’ (Case 2018) and to bring this into productive dialogue with the insights provided by the 15 years of empirical university data collected by Herana.9

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9 See CHET (2017) for further information.
Researching the link between higher education and development

The analytical framework

As a point of departure, and in order to reach a better understanding of the relationship between higher education and development, the Herana research group studied three large-scale systems – Finland, South Korea and the state of North Carolina in the US – in which higher education had been closely integrated into their development strategies (Pillay 2010). In all these systems, a rethink of major economic policies had been accompanied by a deliberate attempt to link higher education to economic development. The study sought to identify the core conditions present in each of these systems that had enabled their higher education sectors to successfully and sustainably contribute to development.

All three systems featured a strong, agreed-upon development framework aimed at realising an advanced, competitive knowledge economy, and had assigned an important role to higher education in this regard. Despite major contextual differences, the three systems all exhibited the following conditions for harnessing higher education to economic development:

- They had been built on a foundation of equitable, quality schooling. There was also a common emphasis on achieving high-quality higher education.
- They had achieved high tertiary participation rates. The three higher education systems were differentiated as part of achieving national or state-wide human capital, research and innovation objectives for economic development.
- The relevant national and state governments ensured a close link between economic and higher education planning.
- There were effective partnerships and networks among the state, higher education institutions and the private sector to ensure effective education and training, and to stimulate relevant research and innovation.
- There was strong state involvement in other areas, including providing adequate funding for the sector, using this funding to steer higher education institutions to respond to labour market requirements, and incentivising research and innovation in the sector.

Referring to the findings of this study as well as the review of the international literature (Pillay 2011), the research group developed an
analytical framework which articulated the following three core theoretical propositions for the project:

1. The existence of a broad agreement among government, universities and key socio-economic actors, referred to as a ‘pact’, about the nature of the role of universities in development is essential for these institutions to contribute effectively to development.
2. As knowledge institutions, universities can only participate in the global knowledge economy and make a sustainable contribution to development if their academic cores are quantitatively and qualitatively strong.
3. A range of forms and methods of national knowledge policy coordination must be in place to link universities and development. The nature of the connections between the larger policy context, universities and development is crucial.

The analytical framework was first and foremost founded on the concept of a ‘pact’ defined by Gornitzka et al. (2007: 183–184) as ‘fairly long-term commitment to and from the university, as an institution with its own foundational rules of appropriate practices, causal and normative beliefs, and resources, yet validated by the political and social system in which the university is embedded’. The analytical framework was also informed by Burton Clark’s (1983) notion of a ‘coordination triangle’ comprising the state, the market and the academic oligarchy, the coordination of which, he argued, was essential for the integration of higher education systems. The Herana research group adapted Clark’s triangle to depict the three main nodes as government, universities and external stakeholders. The relationships among these three nodes described the dynamics of the analytical framework for the project and produced a range of working hypotheses about their interrelationships, including the following:

- without an implicit agreement, or a pact, coordination becomes almost impossible;
- without national policies and implementation of these policies, it is difficult for universities to develop strong academic cores (particularly in developing countries where the domestic markets are weak);
- strong academic capacity that is disconnected from development activities results in universities becoming insulated and isolated from their surrounding communities; and
• conversely, the contributions that universities can make to development are also undermined when these institutions are strongly connected to development but lack academic capacity.

The primary elements of the analytical framework and the key actors involved are depicted in Figure 1.1.

Finally, the analytical framework had to operationalise notions of the roles that universities could be understood to play in relation to development. Our point of departure was formed by the four visions of university organisation and governance identified by Olsen (2007: 28–33), that is, the university as a rule–governed community of scholars, the university as a representative democracy, the university as an instrument for shifting national political agendas, and the university as a service enterprise embedded in competitive markets. Drawing on these ideas, and borrowing from Castells (2017) the concept of the university as an ‘engine for development’, the Herana analytical framework proposed the following four notions of universities in relation to development:

1. The university as ancillary: National development policies and strategies emphasise investments in basic healthcare, agricultural production and primary education, and are not evidence–based. Therefore, no direct role is ascribed to universities in furthering development. Instead, their main function

Figure 1.1 Analytical framework for studying higher education and development in Africa
is seen to be the production of educated civil servants, professionals and community-service workers.

2. The university as self-governing institution: While the knowledge produced by universities is considered important for national development, particularly for the improvement of healthcare and agricultural production, universities are considered to be most effective when they are left to themselves and can follow their own institutional priorities rather than steered by the state, independent of their specific socio-economic context.

3. The university as instrument for development agendas: Universities have an important role to play in national development – but through sharing expertise and capacity-building, rather than through the production of new scientific knowledge. The focus of universities’ development efforts tends to be on contributing to reducing poverty and disease, improving agricultural production, and supporting small business development, primarily through consultancy for government agencies and as part of donor-funded projects and through engagement with local communities.

4. The university as engine of development: Knowledge is seen to play a central role in national development, not only in relation to improving healthcare and agricultural production, but also in relation to innovations in the private sector, especially in areas such as information and communication technology, biotechnology and engineering. Universities are thus seen as crucial to national development, the assumption being that they are the only institutions that can provide an adequate foundation for the complexities of the emerging knowledge economy, producing the relevant skills, competencies and use-oriented knowledge.

National development models and a pact about the role of higher education

To explore the views on the role of universities in the development of the eight countries interviews were conducted at the national level with central actors in selected ministries, the higher education councils/commissions and other key stakeholders, as well as with the institutional leadership, senior academics, administrators and project leaders within the universities. The analysis also drew on various policy and strategy documents, at both national and institutional levels, as well as quantitative data including national development indicators and statistics relating to the higher education systems and universities in the sample (Cloete et al. 2011).
Aside from different emphases and orientations across the eight countries, there were differences between the perspectives of national and university stakeholders about the role of the university in development. On the whole, national policy-makers favoured the instrumental notion of universities making a direct contribution to national development objectives via the deployment of academic expertise to addressing pressing socio-economic concerns such as poverty reduction and unemployment through consultancies and engagement activities. While the engine-of-development notion appeared in science and technology policies and in national vision statements, except for Botswana and Mauritius these were not translated into strategies and implementation plans. By contrast, university leadership generally favoured the self-governance or instrumental notions, which reflect the traditional debates about academic autonomy and community engagement, respectively. The University of Mauritius, in line with its government’s perspective, was the only institution at which the engine-of-development discourse predominated among the university leadership.

In addition to dominant discourses, the classification of national economies in relation to the value placed on the university as an engine of development was explored. The development model adopted by the three Organisation for Economic Co-operation and Development (OECD) systems studied in the first phase of the Herana project (Pillay 2010) all fall within the World Economic Forum’s classification of ‘innovation-driven’ – in other words, these countries have agreed that knowledge and education are key productive factors in development. Among the national economies of the eight Herana African countries, three (Mauritius, South Africa and Botswana) could be characterised as ‘efficiency-driven’ – a phase conceived as preceding the ‘innovation-driven’ phase, meaning that improved efficiency and higher education and training were playing an increasingly important role in economic development. The other African countries in the study were in the process of moving from the ‘factor-driven’ phase, characterised by an emphasis on exploiting natural resources and a low skills base, towards the ‘efficiency-driven’ phase and were, by implication, increasingly prioritising education and training.

The study revealed that the three efficiency-driven systems already had substantially higher participation rates in higher education, although, with the exception of Mauritius, none of the Herana countries had established a consistent, broadly accepted model for national development or reached agreement that knowledge was a key productive factor in such development. Although knowledge policies were emerging in the other seven countries, they tended to be located mainly in one government department and lacked adequate coordination and implementation.
strategies. In most of the countries in the sample, grand national visions had been forged as a kind of substitute for the absence of an actual development model. These visions, some of which looked forward as far as 2030, were not accompanied by implementation plans or systematic monitoring mechanisms. Mauritius was the only country where, at both the national and institutional levels, knowledge was seen as a key driver of development, and where the government and the higher education institutions were in broad agreement about the role of universities. However, even here, the pact had not been properly operationalised in relation to its coordination and implementation, or its impact on the academic core.

In summary, with regard to the pact in the Herana countries, there was a lack of clarity and agreement about the national development models and the roles of the higher education sector in development, at both central government and university levels. There was, however, an increasing awareness, particularly at government level, of the importance of universities within the context of the global knowledge economy. Furthermore, in none of the countries in the sample was there a coordinated effort among the government, external stakeholders and universities to strengthen the contribution that the universities could make to development in a systematic way.

The strength of the academic core

Our interest in the academic core of the universities in the study was framed as follows: (1) What was the strength of the academic cores of these universities? and (2) Had there been a strengthening or weakening of these academic cores over time?

To rate the strength of the academic core of the universities in the study, eight performance indicators were identified, all of which refer to characteristics or activities that reflect the knowledge-based production of high-quality scholarship which, in turn, forms the basis of each university’s potential contribution to development. Some of these indicators are based on traditional notions of the role of flagship universities (e.g. the production of new knowledge and the next generation of academics), while others (e.g. science, engineering and technology enrolments and student–staff ratios) are pertinent to the African context. The indicators were agreed to following consultation with the participating universities, and are divided into five input and three output indicators (see Bunting et al. 2017 for further detail on the indicators and data collection).

Based on the indicators for each university, the institutions were categorised based on their ratings into the following four groups:
1. ‘Strong’ ratings for all measured inputs and outputs: University of Cape Town;
2. ‘Medium’ or ‘strong’ ratings on both the input and output sides: University of Mauritius, Makerere University and Nelson Mandela University;
3. ‘Medium’ and ‘strong’ ratings for the measured inputs, but were ‘weak’ on the output side: University of Dar es Salaam, University of Nairobi and University of Botswana;
4. ‘Weak’ ratings for both the measured inputs and outputs: University of Ghana and Eduardo Mondlane University.

Overall, the Herana data indicated that, with the exception of the University of Cape Town, research production at the participating universities was not strong enough to enable them to build beyond their traditional undergraduate teaching roles and make a sustainable, comprehensive contribution to development through new knowledge production. A number of universities had manageable student–staff ratios and adequately qualified staff, but lacked sufficient funds for staff to engage in research. In addition, the incentive regimes for research did not support knowledge production.

Nevertheless, some positive trends were noted. The majority of the universities could boast relatively strong inputs in terms of academics with doctorates, student–staff ratios, and increasing enrolments at the masters level. There was also an increase in research outputs, albeit from a very low base. However, the increase failed to keep pace with the rising productivity in the rest of the world, indicating that the relative position of Africa as knowledge producer was gradually weakening, at least in the early years of Herana (French Academy of Sciences 2006).10

Finally, what also emerged through the process of collecting the data was that there was a need to improve and strengthen the definition of key performance indicators, as well as the systematic, institution-wide capturing and processing of key data (Cloete et al. 2011).

From flagship to research universities

The eight universities that were selected for inclusion in the Herana project were chosen because they were the most prominent national universities in their respective countries since independence, and because each had incorporated broad flagship goals into their vision and mission

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10 However, by 2015 Africa’s proportion of global knowledge production had started to increase (Beaudry et al. 2018).
statements. According to Cloete et al. (2011), each of the eight universities aimed to:

- attain a high academic rating which would make it a world-class university or at least a leading or premier university in Africa;
- be a centre for academic excellence;
- engage in high-quality research and scholarship; and
- produce knowledge products that would enhance both national and regional development.

During Herana Phase 2 (2010–2014), the project’s discourse shifted, and it increasingly referred to the objects of its inquiry as ‘research-intensive’ universities rather than ‘flagship’ universities, in line with the global discussion about the nomenclature for higher education institutions and the use of the terms ‘flagship’, ‘world-class’ and ‘research-intensive’ in relation to universities.

According to Douglass (2014), a ‘world-class university’ may be defined as one that boasts highly ranked research outputs, a culture of excellence, top quality facilities, and a brand name that transcends national borders. Perhaps most importantly, such an institution should be included in the upper ranges of one or more world rankings, which are regarded as proof of excellence by many government ministers and much of the global higher education community. However, although such rankings are useful and informative, they represent a limited idea of what it means to be a leading university. Accordingly, Douglass advocates the notion of the ‘flagship’ university as an alternative and more relevant model for public, and even some private, institutions, a more attainable goal to be pursued by government ministries and universities in their drive for status and socio-economic impact. He defines a ‘research-intensive flagship’ university as an academic institution committed to the creation and dissemination of knowledge in a range of disciplines and fields, and featuring the appropriate laboratories, libraries and other infrastructure which permit teaching and research at the highest possible level. In this regard, the flagship model that Douglass proposes does not ignore international standards of excellence, which are focused largely on research productivity, but is grounded in an ethos of service to the nation and the region in which the university is situated. The characteristics and responsibilities that need to be adopted in pursuit of this model do not readily lend themselves to easy measurement and ranking regimes. Indeed, according to Douglass (2014) the advancement of the flagship model for universities entails forging a new path and articulating a new language for defining the
success of universities beyond research and the current international ranking system. The great challenge for such institutions, which should seek to lead their own national higher education systems, is to shape their missions in order to increase their role in, and impact upon, the societies that give them life and purpose.

Worldwide, the role of flagship universities includes delivering on the core mission of producing research and training students to engage in research (Altbach 2013). But flagship universities also have wider recognised goals (Douglass 2014), a view that is supported by Berdahl (2014) who argues that American flagship public universities, which compete for talent with the nation’s best private higher education institutions, are an essential component of the US research enterprise. They serve the nation as well as their respective states.

The Herana project, which explicitly aimed to help planners strengthen knowledge production at flagship universities in order to contribute to development, found little use in the popular notion of ‘world-class’ universities or in the Shanghai Jiao Tong and Times Higher Education university rankings. However, this is not to imply that university leaders in Africa do not monitor such rankings closely. As Cloete et al. (2017: 141) observed: ‘Rankings are interesting in how institutions use them, irritating (but not irrelevant) when your institution is not featured, and important for stimulating change […] to achieve excellence.’ The Herana team also concluded that the notions of ‘flagship’ and ‘world-class’ encompassed all university functions and that this would not focus the Herana universities on the knowledge production functions.

The focus on research universities also came about because it became clear within the Herana project that the study of the link between universities and development had provided much information and many insights, but that a key factor in the development chain is the university itself – only a university with certain research capacities can contribute to development. The assumption from many development agencies that universities had surplus capacity and therefore had an obligation to participate in development activities proved to be a fallacy. Equally problematic is the expectation of politicians and civil society that universities must produce knowledge directly linked to the national, regional or global grand challenges. Universities are not development agencies, they are knowledge producing and dissemination organisations that contribute indirectly to development. Moreover, universities are the core knowledge institutions; in Africa and elsewhere there are no substitutes (Maassen 2012; Powell et al. 2017; Beaudry et al. 2018). One of higher education’s most important roles in development is to educate and train self-programmable knowledge workers (Castells 2017) and this is not equivalent to the mass certification of traditional qualifications.
Knowledge workers are those who are educated within the higher education complex, who can understand and use knowledge but who can also and should be expected to re-programme themselves in economies increasingly driven by information.

In the second phase of Herana, the focus was on expanding the network; on the research university and therefore, by implication, on the academic core; and on improving and institutionalising data collection to assess the performance of the university in relation to its core functions.

Herana Phase 3 (2014–2017) continued the focus on institutionalising data collection and analysis, and the contribution of evidence-based planning and steering the process of strengthening knowledge production in a group of research-aspirant universities in Africa. The goal was to support the institutionalisation of six years of capacity building in performance data collection within the universities, and to link this to the promotion of policies enhancing knowledge production capabilities (such as by enrolling and graduating more PhDs, increasing the proportion of staff with PhDs, and increasing research outputs). More broadly, the project aimed to support the development of a group of research-orientated universities as a model for other countries on the continent.

The importance of research universities for global science

The global comparative project ‘Science Productivity, Higher Education, Research and Development and the Knowledge Society’ (SPHERE) produced a comprehensive, longitudinal and worldwide dataset of scientific journal publications on science, technology, engineering and mathematics plus health (STEM+). The publications had been catalogued in the Science Citation Index Expanded (SCIE), and customised and acquired especially for this project from Thomson Reuters’ (now Clarivate Analytics) Web of Science (formerly ISI Web of Knowledge) (Powell et al. 2017).

The SPHERE project coded and analysed over 20 million records from the SCIE dataset to show that the number of STEM+ papers published in scientific journals over the twentieth century grew extraordinarily rapidly. Starting from just under 10,000 in 1900, the annual number of new publications grew to about 50,000 in 1960. This trend was called ‘big science’, one later transformed into ‘global mega-science’. There was an exponential growth in peer-reviewed publications between 1980 and 2010, resulting in over half a million SCIE publications in 1995 and doubling to reach more than 1 million by 2011 (Powell et al. 2017: 4). SPHERE also reported that coinciding with the massive rise in the absolute number of published STEM+ papers, especially post–1960, a
concomitant phenomenon was the globalisation of science. Furthermore, they found that while in 1900 only around two dozen countries and territories participated in the production of STEM+ papers, by 1950 the number had increased to three dozen, and by 2000, almost 200 countries and territories were producing published science. This remarkable expansion of research output was, among others, driven by rising competition across nations and universities at the macro and meso levels, combined with globe-spanning collaboration among universities and research groups.

These developments must be understood in the context of the global knowledge society, driven by three trends. The first is the institutionalisation of schooling and education at all levels and throughout the world (Baker 2014). The second is the massive and continuing expansion of university enrolments around the world that has transformed science into an everyday activity (Meyer et al. 2008). Thirdly, as new universities were founded around the world, and tertiary education became increasingly accessible as well as institutionally embedded, the research university ‘became a global model for higher education and knowledge production and this strengthened research capacity worldwide’ (Baker 2014: 6).

Altbach (2013) describes research universities as academic institutions that focus primarily on research, at times at the expense of teaching undergraduates. In order to fulfil their research mission, they offer instruction up to the doctoral level; possess the necessary infrastructure such as libraries, laboratories and information technology; employ high quality academic staff, generally holding PhDs; ensure the appropriate working conditions; and select the best students available. Research universities combine their research function with training future generations of scholars and researchers.

While research universities are regarded as the most effective institutions for conducting research, they are not the only bodies in which research is conducted. Others can include publicly- and privately-funded research institutes, private company R&D divisions, laboratories and agencies, often connected to the global scientific community. In some countries – for example, Russia – networks of research institutes have been established, particularly in the hard sciences and engineering in which research universities play a relatively minor role except as suppliers of appropriately trained academics. Although research universities have been key sites of knowledge production, some scholars have questioned the role of universities in knowledge production and innovation, and even predicted that the locus of scientific research would shift away from largely state-funded higher education to a variety of other organisational forms (Nowotny et al. 2001). But, Powell et al. (2017: 8) concluded that
even if ‘tremendous diversity exists in the organizations producing science today, our analyses show that the very centre of scientific productivity has become and remains the research university.’

Research universities are important for Africa

At the same time that scholars such as Douglass emphasised the importance of knowledge-producing flagship research universities, a broader international discourse emerged lauding the crucial role that research universities in low- and middle-income countries can play in developing differentiated and effective academic systems, and in making it possible for their countries to join the global knowledge society to compete against sophisticated knowledge economies. This is well summed up by Olsson and Cooke (2013: 18) as follows:

Top research universities in industrialised countries (often referred to as the Super RUs) usually dominate the global ranking tables. In contrast, their counterparts in middle and low-income countries have, if anything, more important missions because they are the engines of local and regional knowledge development and natural leaders of their own evolving academic systems. As these systems become increasingly complex and the need to nurture knowledge networks for research grows ever more essential, the success of these institutions becomes even more crucial for national development policy.

Echoing these sentiments, Altbach (2013) noted that while research universities in the developing world have not yet ascended to the top level of the global rankings, they are very important in their countries and regions, and are steadily improving their reputations and competitiveness on the international stage. A key point is that research universities around the world are part of an active community of institutions which share values, foci and missions.

Most universities are not research universities. Indeed, such universities constitute a relatively small percentage of the higher education sector. In America, the ratio is about 5% (220 research universities in a system of more than 4 000 post-secondary institutions); in Britain 25% (25 research universities among 100 universities); and in China 3% (100 research universities out of more than 3 000 institutions countrywide). In many smaller developing countries there is often only one research university, and many countries have none.

A clearly differentiated academic system is needed for research universities to flourish. For that, developing countries need to clearly
differentiate the missions of the institutions in their post-secondary systems, and to organise these institutions in a rational way. However, according to Altbach (2013: 328):

The fact is that few if any developing countries have a differentiated academic system in place; and this central organisational requirement remains a key task [...] These institutions must be clearly identified and supported. There must be arrangements so that the number of research universities will be sufficiently limited so that funding is available for them and that other resources, such as well-qualified academics, are not spread too thinly.

Discussions of university performance in the post-independence period in sub-Saharan Africa have often been dominated by perspectives that emphasise the ineffectiveness of African states (see Evans & Rauch 1999), and the idea of ‘African exceptionalism’ – that is, the notion that the continent constitutes a special case to which the standards for analysis elsewhere cannot be applied. In relation to the latter, some scholars have considered models for examining university performance in the OECD states applicable to developing countries in (East) Asia and Latin America, but less relevant to those in Africa. Such exceptionalism is arguably justified by a lack of available data or experts, or assumed differences in governance challenges and institutional formation in sub-Saharan Africa. For example, Altbach and Balán (2007) elected not to include Africa in their discussion of the transformation of research universities in Asia and Latin America in their book, *World Class Worldwide*. They justified the continent’s exclusion on the basis that it faced greatly different academic challenges from those encountered in Latin America and Asia without providing any empirical evidence for this omission (Altbach & Balán 2007: vii).

Such views of the continent also persist in the ‘failed-state’ narrative for Africa. Many media outlets, development cooperation agencies and academics emphasise the governance problems facing the continent, including corruption, nepotism, a lack of expertise, and weakly functioning, ineffective institutions. Such analysis continues despite the continent’s *Wirtschaftswunder* (‘economic miracle’) since the early 2000s during which many countries have shown clear signs of progress in three core institutional spheres or ‘pillars’: civil society, science and the (market) economy (Olsen 2007: 28). For example, between 2012 and 2013, more than one third of the 49 countries in sub-Saharan Africa posted growth rates of over 6% (Africa Progress Panel 2014), suggesting that the economic gap between sub-Saharan Africa and the rest of the
world might have stopped growing (Huntington 2006). It should be noted that actual growth rates and economic performance differ greatly among countries on the continent.

At the same time as the continent’s economic prospects have apparently improved, the national development strategies of African countries have shifted from emphasising the realisation of targets similar to those of the Millennium Development Goals, which included halving poverty rates and providing universal primary education, towards the active inclusion of a long-term vision aimed at creating knowledge economies. This change was expressed in the African Union’s Agenda 2063: The Africa we want (African Union Commission 2015), a long-term vision and action plan agreed upon in January 2015 by African heads of state and government. Although the first two strategic targets listed in the action plan (the eradication of poverty and the provision of affordable housing) may be regarded as conventional, the third target concerns the building of an ‘African knowledge economy’, and goes beyond the ‘Education for All’ goals agreed to at the World Education Forum in Dakar in 2000. The Agenda 2063 target is to ‘catalyse [the] education and skills revolution and actively promote science, technology, research and innovation, to build knowledge, human capital, capabilities and skills to drive innovations’ (African Union Commission 2015: 14).

This political focus on building an African knowledge economy resembles the goal promoted by the European Union’s Lisbon Strategy 2000 to strengthen Europe’s economic competitiveness and bolster its social cohesion by making the continent the most competitive knowledge economy (Maassen & Olsen 2007). Just as officials and experts gathered after the Lisbon 2000 summit in Europe (Gornitzka 2007), so have they been meeting in Africa to interpret and operationalise Agenda 2063’s strategic aims in the areas of (higher) education and research. The first such meeting, a political summit of Africa’s ministers of education and science, took place in Dakar in March 2015, under the title ‘Revitalizing Higher Education for Africa’s Future’. The summit’s final declaration and action plan addressed governance-related concerns in Africa’s higher education sector, innovation issues, and the harmonisation of relevant policies across the continent. The plan’s overall aim was to support the higher education sector in becoming a driving force for the vision of inclusive growth and sustainable development outlined in Agenda 2063. In this regard, it sought in particular to strengthen the research productivity of the continent’s universities.
Can we talk of research universities in Africa?

A range of indicators may be considered in order to assess the level of research outputs globally: international rankings, the number of scientific journal citations relative to a country’s population, the production of patents, and the capacity of higher education systems to prepare PhD graduates.

In order to consider the performance of African universities as sites of new knowledge production, it is useful to review their positions in the global university rankings. Generally speaking, universities in developing countries, particularly in Africa, fare poorly in the Shanghai ranking11 (Table 1.1), which measures the research outputs and strength of universities. The developing world did not have a single university in the top 100 in 2015 and represented less than 10% of the total number of universities among the 500 that are ranked. The big ‘winner’ in this rankings competition is China: in 2000, it had only nine universities in the top 500, but this had increased to 44 by 2015. Tsinghua and Peking were the first developing country universities to be included in the top 100 in 2016.

Five African universities appear in the top 500 of the Shanghai ranking for 2015: the University of Cape Town and the University of the Witwatersrand were placed in the 201–300 range; and Stellenbosch University, the University of KwaZulu-Natal, and Cairo University in the 401–500 range. In the same year, the Times Higher Education Supplement placed the University of Cape Town at position 103, Stellenbosch and Witwatersrand in the 251–275 range, and Alexandria University in Egypt in the 301–400 range. Of the six African universities in the top 500 in these two main ranking systems, four were from South Africa and two from Egypt.

Table 1.1 Shanghai ranking results for low- and medium-income country universities: 2015

<table>
<thead>
<tr>
<th>Country groupings</th>
<th>1-100</th>
<th>101-200</th>
<th>201-300</th>
<th>301-400</th>
<th>401-500</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asia and the Pacific</td>
<td>0</td>
<td>10</td>
<td>9</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>South Asia</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>12</td>
<td>13</td>
<td>20</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: Shanghai Ranking Consultancy, Academic Ranking of World Universities (ARWU)

11 See http://www.shanghairanking.com/index.html
Another ranking, the CWTS Leiden Ranking,\(^\text{12}\) measures not only the number of publications but also their impact (based on citations). This provides a further assessment of the research performance of universities in developing countries (Table 1.2). The 2016 CWTS Ranking is based on the Web of Science bibliographic database produced by Clarivate Analytics. Universities worldwide are ranked according to their publication outputs in five broad scientific fields: biomedical and health sciences, life and earth sciences, mathematics and computer sciences, natural sciences and engineering, and social sciences and humanities.

While the proportion of universities in low- and medium-income countries in the Leiden ranking is higher than in the Shanghai ranking, this is largely because of the progress of Chinese universities (67 ranked universities). Only a handful of universities from 12 other low- and medium-income countries have a scientific output sufficient to be included: India (7), Brazil (6), Iran (6), Malaysia (4), South Africa (3), Thailand (2), Argentina (1), Chile (1), Egypt (1), Mexico (1), Serbia (1) and Slovenia (1). The results show that sub-Saharan Africa, with the exception of South Africa, performs very poorly. The continent’s performance is quite comparable to South Asia (India, Bangladesh), but not East Asia (Singapore, Taiwan, China), Latin America (Chile, Uruguay), or the Middle East and North Africa (Israel, Saudi Arabia, Egypt).

### Table 1.2 Leiden ranking results for low- and medium-income country universities: 2016

<table>
<thead>
<tr>
<th>Country groupings</th>
<th>1-100</th>
<th>101-200</th>
<th>201-300</th>
<th>301-400</th>
<th>401-500</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asia and the Pacific</td>
<td>15</td>
<td>11</td>
<td>17</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>South Asia</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>14</td>
<td>22</td>
<td>25</td>
<td>24</td>
</tr>
</tbody>
</table>

Source: Salmi 2017: 76

Figure 1.2 presents the number of scientific citations of the top five countries in each region of the world and among OECD countries, relative to their population size. It shows that the research outputs of low- and medium-income countries lag far behind those of OECD economies. China is the only research powerhouse in this group of countries reflecting the low performance of their research universities. By this measure, it is five times more productive than India. Brazil, Iran and South Africa are the only other low- and medium-income countries with significant research outputs.

\(^\text{12}\) See http://www.leidenranking.com/
Another indicator of impact and knowledge transfer and development to which research universities are expected to contribute is registered patents. Figure 1.3 shows the annual number of registered patents per one million inhabitants in the top five countries of each region of the world, as well as among the OECD economies. China and, to a lesser extent, Iran are the only two low- and medium-income countries with a substantial output. Sub-Saharan Africa barely registers in the count.

According to Salmi (2017), the lagging research outputs of most universities in developing countries is largely caused by the lack of a critical mass of PhD graduates, as is reflected in the low numbers of new PhD graduates (Figure 1.4). South Africa is the only sub-Saharan African country producing a significant number of doctorates, although it should be noted that more than 30% of doctoral enrolments were from other African countries (Cloete et al. 2015: 92) (see Figure 1.5).

However, there have been areas of improvement. Following a study by Tijssen (2007) showing that Africa’s annual output (as measured by articles in the Web of Science) was stagnating, more recent studies...
(AOSTI 2014; Mouton & Boshoff 2010) have noted the beginnings of an increase in the number of African-authored papers. Updating these reports from an analysis of African-authored papers in the Web of Science shows that annual outputs have been steadily increasing over the past
decade: from 15 285 in 2005 to 49 015 in 2015 (Figure 1.6). What is perhaps most striking is that this rate of increase has surpassed growth rates globally over the same period, with the result that Africa’s share of world publication outputs more than doubled from 1.58% in 2005 to 3.18% in 2016 (Beaudry et al. 2018). Considering the increase in scientific production from East Asia over the past decade, this is an encouraging trend for African science.

Herana universities are the most research-productive in their countries

Table 1.3 shows the relative share of the Herana universities in relation to publication outputs in each country over time.
Table 1.3 Relative share of the Herana universities in relation to publication outputs in each country: 2000–2016

<table>
<thead>
<tr>
<th>University</th>
<th>Country</th>
<th>2000–2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Botswana</td>
<td>Botswana</td>
<td>2 074 of 3 397 (61.1%)</td>
</tr>
<tr>
<td>University of Cape Town</td>
<td>South Africa</td>
<td>23 209 of 133 385 (17.4%)</td>
</tr>
<tr>
<td>University of Dar es Salaam</td>
<td>Tanzania</td>
<td>2 499 of 9 411 (15.9%)</td>
</tr>
<tr>
<td>Eduardo Mondlane University</td>
<td>Mozambique</td>
<td>768 of 1 956 (39.3%)</td>
</tr>
<tr>
<td>University of Ghana</td>
<td>Ghana</td>
<td>3 761 of 8 586 (36.3%)</td>
</tr>
<tr>
<td>Makerere University</td>
<td>Uganda</td>
<td>5 146 of 9 263 (55.5%)</td>
</tr>
<tr>
<td>University of Mauritius</td>
<td>Mauritius</td>
<td>858 of 1 311 (65.4%)</td>
</tr>
<tr>
<td>University of Nairobi</td>
<td>Kenya</td>
<td>3 191 of 17 893 (17.8%)</td>
</tr>
</tbody>
</table>

Source: Clarivate Web of Science, compiled by the Centre for Research on Evaluation, Science and Technology (CREST), Stellenbosch University.

Note: In compiling this data, if a paper had multiple authors from different institutions (e.g. the University of Botswana and Harvard University), each university was credited with a paper.

In Botswana, the next best–performing institution after the University of Botswana was the Botswana College of Agriculture with 4.8%. In South Africa, the next best–performing institution after the University of Cape Town was the University of Witwatersrand (12.6%) followed by the University of KwaZulu–Natal and the University of Pretoria. In Tanzania, the University of Dar es Salaam was followed by the School of Medicine at the Muhimbili University of Health and Allied Sciences (12.6%) and the Sokoine University of Agriculture (11.5%). Both of these institutions were originally part of the University of Dar es Salaam. In Mozambique, the Manhiça Health Centre, a non–governmental organisation funded by ISGlobal, produced 12.6% of national research outputs.

Ghana and South Africa were the only countries where other universities made a substantial contribution to research outputs. In Ghana, Kwame Nkrumah University of Science and Technology produced 22.9% of outputs, University of Cape Coast 7.7%, and Ghana Health Service 5.8%. In Uganda, Makerere University accounted for 56.5% and Mbara University of Science and Technology only 7%. Of all the Herana universities, the University of Mauritius accounted for the highest percentage of national research outputs (65.4%), with the second biggest contributor the Mauritius Wild Life Foundation producing only 5.1%. In Kenya, the second highest contributor was the Kenyan Government Medical Research Centre (11.3%), followed by Moi University (5.2%) and the University of Kenyatta (4.9%).

A surprising feature of this analysis is that apart from South Africa, Ghana and Tanzania, the second highest author citations were from the University of London, Harvard University and the University of Barcelona. This highlights the existence of strong international collaboration. At the
same time, Figure 1.7 shows that while there has been an increase in international collaboration, there has not been an increase in research collaboration amongst scholars within Africa. This suggests that Africa-based researchers seek global rather than continental collaboration.

![Figure 1.7 Research collaboration among African scientists: 2005–2016](chart.png)

Source: Beaudry et al. (2018)

**Conclusion**

This chapter began by exploring the various discourses on the role of the university in development on the African continent. African universities have relatively recently come back into focus as productive forces for development. However, the exact role of universities within defined national development frameworks has remained unclear. This lack of clarity permeates through different levels of national higher education systems, from the universities themselves to their governments and the donor funders that support the development of universities in Africa countries. Nevertheless, an attempt at coordinating international donor funders in higher education to introduce some consistency in their funding programmes and a scarcity of empirical evidence on the actual state of universities in Africa, led to the establishment of the Higher Education Research and Advocacy Network in Africa (Herana) in 2007.

Having provided an overview of the context within which the Herana project emerged, the chapter turned its attention to the research undertaken by the project to provide an empirical basis for the link between higher education and development. This second half of the
chapter provided an outline of the analytical framework, the key concepts of the project and of the evolution of the project.

The Herana project was not one that stuck religiously to its original design. There was a narrowing of focus from one phase to the next. In Phase 1 of the project, the project team were interested in exploring national higher education systems, their flagship universities and the relationship between the university, the national system and development. By Phase 3 of the project, the focus was exclusively on the university and the project no longer talked about ‘flagship’ universities but about ‘research’ universities. In effect, the Herana project’s focus shifted from the university as an agent of development to the development of the university.

The reason for this shift was that by the end of Herana Phase 1, the evidence showed that, with exception of the University of Cape Town, the levels of new knowledge produced by the other seven universities were unlikely to contribute to national development. It was therefore necessary to change tack so that the participating Herana universities could develop an appreciation of the characteristics of a research university and work towards strengthening their knowledge production to realise their aspirations of becoming research universities. From the project’s point of view, this focus on the institutions themselves would place universities in a more favourable position to contribute to the development of their countries.

To do so required the identification of the characteristics of a research university in Africa, the development of measurable indicators, and the collection of performance data by each participating university. In the end, the development of indicators for, and measurement of, the research performance of the eight participating universities was the central thread that ran through all three phases of the Herana project but became the singular focus of the project by Phase 3. These characteristics and their associated indicators were to define the standards of an emergent network of African research universities (see Chapter 7) and came to define by the end of the third phase of the project the extent to which the participating universities could be categorised empirically according to their research performance.