OCCASIONAL PAPER 08

Towards more effective collaboration by higher education institutions

for greater regional development in the Gauteng City-Region

by Robert Bergman

November 2014

GCRO Gauteng City-Region Observatory

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List of Acronyms

DBE	Department of Basic Education
DHET	Department of Higher Education and Training
DST	Department of Science and Technology
FET	Further education and training (college)
GCR	Gauteng City-Region
GCRO	Gauteng City-Region Observatory
GPG	Gauteng Provincial Government
GVA	Gross valued added
HEI	Higher education institution
ICT	Information and communication technology
IP	Intellectual property
MIT	Massachusetts Institute of Technology
NQF	National Qualifications Framework
OECD	Organization for Economic Co-operation and Development
R&D	Research and development
SADC	Southern African Development Community
SET	Science, engineering and technology
SME	Small and medium enterprise
TVET	Technical and vocational education and training
UJ	University of Johannesburg
UNISA	University of South Africa
WIL	Work-integrated learning
WITS	University of the Witwatersrand

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1. Introduction

Higher education institutions (HEIs) in the Gauteng City-Region (GCR) and elsewhere are increasingly being called upon to do more than their traditional roles of teaching and research. They are now expected to collaborate and engage with other stakeholders with a view to contributing directly and indirectly to social and economic development in their localities. Such an orientation includes having HEIs actively fostering public-private partnerships and other initiatives that enhance equitable regional development. The adoption of such a focus has implications for all aspects of these institutions' activities, as well as for the policy and regulatory framework in which they operate. This Occasional Paper reflects critically on the role of HEIs in regional development. It surveys current debates on the matter and draws out some of the implications on how we ought to think further about the current state of government-industry-academia interaction and collaboration for development in the GCR.

It is motivated by an awareness of the increasing importance of higher education in the regional development discourse, alongside a body of international theory and practice on the contribution of HEIs to regional development. A cornerstone of this body of literature is the so-called 'triple helix' framework within which government, industry and academia work intimately, intensely and collaboratively towards a common vision of regional development. Within this framework, HEIs are considered to be a public good that must play a large, meaningful and relevant role in the development and improvement of the cities and regions where they are located.[1, 2] They do not, and cannot, stand completely outside the realities of their geographic, social, cultural and political environment.

The intended audience for this report extends beyond academics and HEI administrators to include government officials, business and labour leaders, civil society and citizens, because a discussion on stimulating and improving the GCR must be much more than an academic exercise. The collaboration that is essential to regional development requires stakeholders to be familiar with a wide spectrum of issues of importance to individual constituencies. Each constituency must add value and insight to the discussion by drawing on their specific knowledge, experience and self-interests. Establishing this common ground is fundamental to initiating meaningful debate about what the GCR can and should be, and how regional HEIs can work more collaboratively, creatively and effectively to improve and advance the region.

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1 Shellard, D. & Craig, J., 2012. *De Montfort University's Square Mile Project: The University as a Local Public Good*, in 'Blue Skies: New Thinking About the Future of Higher Education, a Collection of Short Articles by Leading Commentators, UK 2012 edition, Ch 9, pp. 43-45, Coiffait, L., (ed.) [Online] Available at: www.pearsonblueskies.com/wp-content/uploads/2012/09/Blue-Skies-UK-2012-FINAL.pdf. [Accessed 17 June 2014].

2 Holmwood, J., 2012. *Education: From a Public Value to a Positional Good*, in Blue Skies: New Thinking about the Future of Higher Education: A Collection of Short Articles by Leading Commentators. UK 2012 Edition, Ch 10, pp. 46-48, Coiffait, L (ed.). [Online] Available at: www.pearson-blueskies.com/wp-content/uploads/2012/ 09/Blue-Skies-UK-2012-FINAL.pdf. [Accessed 17 June 2014].

2. Economic development: a regional perspective

As a result of globalization, in the last 50 years the focus of economic growth and development studies has increasingly shifted away from nation-states to regions (or city-regions or mega-cities).[3] In classical economic theory, nations were the natural units of macroeconomic analysis. In the 21st century, however, national boundaries have become less important as capital and even labour – particularly highly creative and productive labour – is freely allocated across a region and around the world in pursuit of optimal returns.[4] Regions and regional development are now seen as the most relevant units of economic analysis.

Today, regions function in a similar manner (but on a much larger scale) to the great cities of the past where talent, productive capability, innovation and markets were amassed and used to create and drive economic and cultural growth. Unlike those great cities, however, today's regions are part of a world-wide economic system that compels them to compete on a global scale.[5] Thus, although global competition is a national challenge for most countries, in reality the battle is being fought at the regional level.[6] Regions are the crossroads where industries, labour, scientists, universities, entrepreneurs, venture capitalists and governments meet.

2.1 A snapshot of the Gauteng City-Region

The GCR is the largest and most influential city-region in South Africa, and the country's engine of growth. Between 1995 and 2008, its economy (as defined by the boundaries of Gauteng province) grew at an annual average rate of 3.6%, with some years (2006 and 2007) exceeding 6%. It has a diverse economy that is shifting increasingly towards providing goods and services to consumers using goods produced by other sectors.

According to a 2011 review by the Organization for Economic Cooperation and Development (OECD), manufacturing has emerged as a clear opportunity for boosting employment and exports in the GCR, since it is connected upstream to suppliers in other sectors with the potential for greater multiplier effects. The OECD has also suggested that the GCR could become a green technology export centre for the Southern African Development Community (SADC) region. Thanks largely to in-migration, the GCR's population grew rapidly between 1995 and 2009 (at a rate of 2.6% annually), compared with a national rate of 0.6%.[7] Table 1 presents some basic statistics for the GCR.

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3 Porter, M., 2003. The Economic Performance of Regions. *Regional Studies*, Volume 37(6-7), pp. 545-546, August/October 2003. [Online] Available at: http://dx.doi.org/10.1080/0034340032000108688. [Accessed 18 June 2014].

4 Florida, R., Gulden, T. & Mellander, C., 2008. The Rise of the Mega-region. *Cambridge Journal of Regions, Economy and Society,* 2008, Volume 1(3), pp. 459-476.

5 *Ibid.*

6 Council on Competitiveness, 2010. Collaborate: Leading Regional Innovation Clusters.

7 OECD, 2011b. *op. cit.*

Table 1: Basic statistics for the Gauteng City-Region[8]

Indicator	Value
% of national population	22.4%
Gauteng's contribution to national GDP (2009)	33.9%
Share of GDP of Africa	11.0%
Unemployment (narrow) (Q1, 2011)	26.9%
Share of national trade (2009)	62.7%
Share of provincial GDP in exports (2009)	41.6%
Share of working-age population (15-64) with tertiary education	15.5%
Share of national tertiary degrees conferred each year (2009)	41.7%
Life expectancy	51 years
Fertility rate	2.1 children
Share of national land area	1.5%

2.2 Higher education institutions in the Gauteng City-Region

2.2.1 South Africa's educational framework

The South African education system is structured within a National Qualifications Framework (NQF) consisting of 10 levels on which different qualification types are registered. NQF has three sub-frameworks, each administered by a quality council. These are:

- The general and further education and training qualifications sub-framework (essentially the first nine years of schooling)
- The higher education qualifications sub-framework (focusing on post-secondary certificates, diplomas and degrees, and post-graduate degrees)
- The trades and occupations qualifications sub-framework (focusing on technical and vocational education and training).

South Africa's higher education system is administered by the Department of Higher Education and Training (DHET). Broadly speaking, the sector is comprised of HEIs and Further Education and Training (FET) colleges[9]. The HEIs are classified into three categories:

Universities:	Established 'traditional' higher education institutions;
Comprehensive Universities:	Universities established from the merger of traditional universities and former Technikons;
Universities of Technology:	Universities formerly known as Technikons.

[8] *Ibid.*

[9] *FET colleges also form part of the higher education system, given that they deliver education and skills development programmes to post-secondary learners. It should also be noted that for every public FET college there are approximately nine that are owned and operated by the private sector (see Table 2).*

2.2.2 Basic education: solid platform or shaky foundation?

Quality basic education is the foundation of national development and the raw material of higher education. A higher education system cannot improve, grow and mature in an environment where its basic input – high school matriculants – are inadequately prepared to function at an advanced academic level. It is widely known that South Africa's education system is not delivering high quality basic education to a majority of learners, particularly in the areas of mathematics and science. For a myriad of socio-economic and structural reasons, the disastrous effects of apartheid are still evident in the system. As Sayed and Motala (2012) point out, "despite the plethora of education policy documents, plans, strategies and interventions, the third decade of democracy in South Africa is about to dawn amidst clear evidence at a national, regional and international level that the majority of South African learners are far from mastering the basic and minimum competencies required of them by the curriculum".[10]

The weak performance of the basic education system places a massive constraint on the South African higher education system and its ability to produce the quantity and quality of graduates with the knowledge and skills needed to compete in an international knowledge economy. Inevitably, it results in a massive waste of resources as a consequence of unacceptably high university dropout rates.

2.2.3 Higher education data and indicators

Table 2 lists the number of public HEIs, and public and private FET colleges in South Africa and their respective enrolments as of 2011.

Table 2: Number of higher education institutions and student enrolment: 2011*

	Public HEIs	Public FET colleges	Private FET colleges
Total number of institutions	23	50	449
Student enrolment	938 201	400 273	134 446**

Source: Adapted from data contained in Statistics on Post-School Education and Training in South Africa: 2011, Department of Higher Education and Training (DHET), Pretoria, 2013.

Notes: * The table excludes data from institutions that are not registered with the DHET.
**** Enrolment data for private FET colleges are incomplete.**

Figure 1 indicates the number of public and private HEIs and FETs in the GCR and illustrates their geographic locations.

[10] Sayed, Y. & Motala, S., 2012. Getting In and Staying There: Exclusion and Inclusion in South African Schools. *Southern African Review of Education: Making Rights Realities – Education Access, Equity and Quality in Education*, Volume 18(2), 2012, pp. 105-118.

Figure 1: Higher education provision in the Gauteng City-Region[11]

[11] Nyar, A., 2013. *GCRO Data Brief No. 4 - Transformation of Higher Education for Development in the Gauteng City-Region (GCR),* Gauteng City-Region Observatory (GCRO), March 2013.

As Table 3 shows, almost one million students (938 201) were enrolled in South African public HEIs in 2011. Of these, 59% (556 695) enrolled in contact programmes, while about 41% (381 506) enrolled in distance education programmes. Over one-third of all students who enrolled in public HEIs in 2011 were registered with the University of South Africa (UNISA), making UNISA the largest public university in South Africa in terms of student enrolment. In general, public HEIs vary greatly in terms of enrolment, ranging from about 7 000 to 60 000 students per institution (excluding UNISA).

Of the 23 public HEIs in the country, nine offer distance education programmes. UNISA is the only public HEI which is an exclusively distance education institution. It is therefore not surprising that over 85% of all distance-education students are enrolled at UNISA. Many of the other public HEIs that offer distance education programmes have relatively small proportions of their students enrolled in such programmes, with the exception being North West University (NWU), where over 40% of students are enrolled in distance education programmes.

Among public HEIs that offer mainly contact mode education programmes, the University of Johannesburg (UJ) and Tshwane University of Technology (TUT) had the highest headcount enrolment in 2011, at about 50 000 students each. Both of these are located within the GCR.

The table also shows that over 40% of all university students were enrolled in humanities programmes in 2011, while 31% were in business programmes and 28% in science, engineering and technology (SET) programmes.

Table 4 presents 2011 data on the headcount enrolment in HEIs, by major field of study and qualification type. It shows that the University of Pretoria had the highest number of students enrolled in SET programmes (22 328) of all HEIs, as well as the most students registered for master's degrees (6 400 in all fields) and doctoral degrees (1 660 in all fields).

Table 5 shows the 'shape of student enrolment' by qualification for HEIs over the period 2008 to 2010. The data illustrates that certain HEIs have a larger concentration in certain types of qualifications. For example, universities of technology have a significantly larger number of students enrolled in under-graduate programmes leading to certificates and diplomas.

Table 3 : Overview of enrolment in public higher education institutions: 2011[12]

Institution	Headcount student enrolment			Black students as proportion of headcount total (%)		Female students as proportion of headcount total (%)		Percentage of contact and distance headcount enrolments in major fields of study (%)		
	Contact	Distance	Total	Contact	Distance	Contact	Distance	SET	Business	Humanities
Universities										
Cape Town	25 301	0	25 301	51	n.a.	52	n.a.	42	24	34
Rhodes	7 278	0	7 278	59	n.a.	59	n.a.	27	22	51
Stellenbosch	27 266	0	27 266	32	n.a.	51	n.a.	46	23	31
Western Cape	18 764	0	18 764	94	n.a.	60	n.a.	36	15	60
North West	31 663	24 978	56 641	50	87	59	75	19	16	65
Witwatersrand	29 004	0	29 004	74	n.a.	54	n.a.	48	16	36
Pretoria	44 745	13 383	58 128	46	100	55	72	38	16	46
Fort Hare	11 144	0	11 144	97	n.a.	57	n.a.	22	18	60
Free State	26 796	4 790	31 586	69	78	59	6	31	23	46
Limpopo	20 504	0	20 504	99	n.a.	54	n.a.	49	18	33
KwaZulu-Natal	35 514	6 248	41 762	90	99	57	71	35	19	45
Comprehensive Universities										
University of South Africa	13	32 8851	328 864	54	82	77	61	12	41	47
Johannesburg	50 528	0	50 528	85	n.a.	55	n.a.	30	41	29
Nelson Mandela Metropolitan	24 358	1 898	26 256	73	98	52	75	34	35	31
Venda	10 342	0	10 342	100	n.a.	54	n.a.	44	18	38
Zululand	15 592	0	15 592	100	n.a.	65	n.a.	16	12	72
Walter Sisulu	27 029	0	27 029	100	n.a.	57	n.a.	31	28	41
Universities of Technology										
Tshwane	49 025	1 050	50 075	92	96	52	47	40	34	26
Durban	24 840	0	24 840	96	n.a.	50	n.a.	47	36	17
Vaal	21 861	0	21 861	97	n.a.	46	n.a.	52	39	9
Central Univ. of Technology: Free State	12 363	281	12 644	89	95	47	72	44	27	30
Cape Peninsula	32 479	27	32 506	85	37	53	59	50	29	21
Mangosuthu	10 286	0	10 286	100	n.a.	51	n.a.	57	34	9
Total/average	**556 695**	**381 506**	**938 201**	**78**	**83**	**54**	**63**	**28**	**31**	**41**

[12] Source: Adapted from data contained in Table 2 of the DHET publication *Statistics on Post-School Education and Training in South Africa: 2011,* Department of Higher Education and Training (DHET), Pretoria, 2013.

Table 4: Headcount enrolment in public higher education institutions, by major field of study and qualification type: 2011[13]

Institutions	SET	Business and Management	Education	All other Humanities and Social Sciences	Total	Occasional Students	Undergrad Certificates and Diplomas	Undergrad Certificates and Diplomas	Post-grad Certificates and Diplomas	Master's Degrees	Doctoral Degrees	Total
Universities												
Cape Town	10 725	6 073	996	7 507	25 301	1 212	812	15 352	2 868	3 831	1 226	25 301
Rhodes	1 934	1 614	787	2 944	7 279	54	215	5 022	759	817	411	7 278
Stellenbosch	12 446	6 248	1 604	6 967	27 265	440	30	16 610	3 721	5 249	1 215	27 265
Western Cape	6 839	2 528	2 105	7 294	18 766	0	548	14 326	1 862	1 472	556	18 764
North West	10 562	9 058	25 496	11 526	56 642	155	18 068	23 843	10 842	2 774	959	56 641
Witwatersrand	13 959	4 714	3 332	6 999	29 004	305	1 020	18 587	2 415	5 420	1 257	29 004
Pretoria	22 328	9 280	17 986	8 534	58 128	558	6 224	30 423	12 863	6 400	1 660	58 128
Fort Hare	2 423	2 023	1 345	5 353	11 144	39	388	8 824	865	765	263	11 144
Free State	9 794	7 266	6 821	7 705	31 586	3 169	4 080	17 111	4 287	2 375	564	31 586
Limpopo	9 954	3 790	996	5 764	20 504	2	460	16 758	1 320	1 771	193	20 504
KwaZulu-Natal	14 723	8 131	8 911	9 998	41 763	1 131	5 084	27 106	3 109	4 046	1 286	41 762
Comprehensive Universities												
University of South Africa	38 820	135 527	65 001	89 516	328 864	15 019	85 760	188 629	32 290	5 909	1 257	328 864
Johannesburg	15 128	20 659	4 170	10 572	50 529	181	18 721	25 173	3 785	2 039	629	50 528
Nelson Mandela Metropolitan	8 846	9 186	3 593	4 632	26 257	541	11 428	10 808	1 183	1 856	441	26 257
Venda	4 510	1 879	1 610	2 343	10 342	234	464	8 314	675	537	118	10 342
Zululand	2 477	1 915	5 433	5 767	15 592	115	2 741	11 323	870	361	182	15 592
Walter Sisulu	8 388	7 688	4 619	6 335	27 030	0	16 655	9 332	627	385	30	27 029
Universities of Technology												
Tshwane	20 019	17 181	3 733	9 142	50 075	57	38 082	9 721	589	1 381	245	50 075
Durban	11 619	8 882	826	3 513	24 840	0	19 534	4 925	0	312	69	24 840
Vaal	11 431	8 535	3	1 892	21 861	186	18 939	2 529	51	134	22	21 861
Central Univ. of Technology: Free State	5 513	3 359	2 029	1 742	12 643	1	8 594	3 304	474	194	77	12 644
Cape Peninsula	16 098	9 463	3 545	3 401	32 507	137	22 111	8 507	733	846	172	32 506
Mangosuthu	5 914	3 490	0	882	10 286	0	9 973	313	0	0	0	10 286
Total	**264 450**	**288 489**	**164 941**	**220 328**	**938 208**	**23 536**	**289 931**	**476 840**	**86 188**	**48 874**	**12 832**	**938 201**

[13] Source: Adapted from data contained in Table 3 of the DHET publication *Statistics on Post-School Education and Training in South Africa: 2011*, Department of Higher Education and Training (DHET), Pretoria, 2013.

Table 5 : Shape of student enrolment by qualification type: annual averages for 2008 – 2010 (%)[14]

	Annual averages for 2008-2010					
Institution	Under-graduate certificates and diplomas	Under-graduate degrees	Total under-graduate	Post-graduate, below Master's level	Master's degrees	Doctoral degrees
Universities						
Cape Town	3	68	71	10	14	5
Rhodes	4	71	75	10	11	4
Stellenbosch	0	63	63	14	19	4
Western Cape	6	74	79	9	9	3
North West	36	40	76	18	5	2
Witwatersrand	5	63	69	9	19	4
Pretoria	14	53	67	20	10	3
Fort Hare	5	79	84	7	6	2
Free State	11	63	73	16	8	2
Limpopo	5	77	83	7	10	1
KwaZulu-Natal	12	67	79	8	10	3
Comprehensive Universities						
University of South Africa	28	61	89	9	2	0
Johannesburg	39	47	87	9	4	1
Nelson Mandela Metropolitan	45	42	87	6	6	2
Venda	4	87	91	4	4	1
Zululand	18	71	89	7	3	1
Walter Sisulu	58	39	96	2	1	0
Universities of Technology						
Tshwane	78	18	97	1	2	0
Durban	79	19	98	0	1	0
Vaal	87	12	99	0	1	0
Central Univ. of Technology: Free State	71	24	95	2	2	0
Cape Peninsula	69	25	94	3	2	0
Mangosuthu	87	12	99	0	1	0

[14] Source: Adapted from data presented in *Differentiation in the South African Public University System*. Presentation made by Prof. Ian Bunting, Centre for Higher Education Transformation (CHET), Cape Town, 24 January 2013. Filename: DATA Differentiation Data Tables-1.xlsx. Available at: http://www.chet.org.za/resources/open-data-differentiated-south-africa-higher-education-system.

2.3 The importance of HEIs to regional development

Research by the OECD and others indicate that, globally, an increasing number of HEIs are engaging more intimately with a broader array of regional stakeholders as part of a process to create more just, vibrant and competitive regional environments. This expanded perspective has implications for what HEIs do and how they do it, as well as for the policy and regulatory framework in which they operate. In many cases such efforts are hampered, however, when HEI leadership and management seeking to adjust their vision and mission to a more regional focus fall short of fully understanding the dynamics of regional development in a global economy.

Regional development is about social and economic cohesion within, as well as between, regions.[15] Each HEI is a critical asset of its region and has the potential to play a pivotal role in its economic and social development.[16] In collaboration with regional authorities – including government, industry and community leaders – an HEI has the potential to move from simply being located in a region to being a vital part of its growth and development. An OECD study claims that HEIs can make significant contributions to regional development in four areas:

1. **Innovation** (which is linked to an HEI's research function);
2. **Human capital and skills development** (which is linked to an HEI's teaching function)
3. **Community and business development and growth** (which is linked to an HEI's public service role)
4. **Regional capacity development** (through engagement of staff in local civil society).[17]

When an HEI successfully integrates these four domains, it is likely to be playing a proactive, not merely reactive, role in the regional development process.[18]

2.4 Connected versus disconnected regions

Successful regions demonstrate the ability to span the organizational boundaries of HEIs and the public and private sectors to establish mutually beneficial relationships.[19] They are able to 'connect all the dots' that separate these three spheres. Figure 2 illustrates these spheres and lists their core functions, as well as the key responsibilities they share with one or more of the other spheres in a region that is 'connected'.

[15] Goddard, J. & Kempton, L., 2011. *op. cit.*

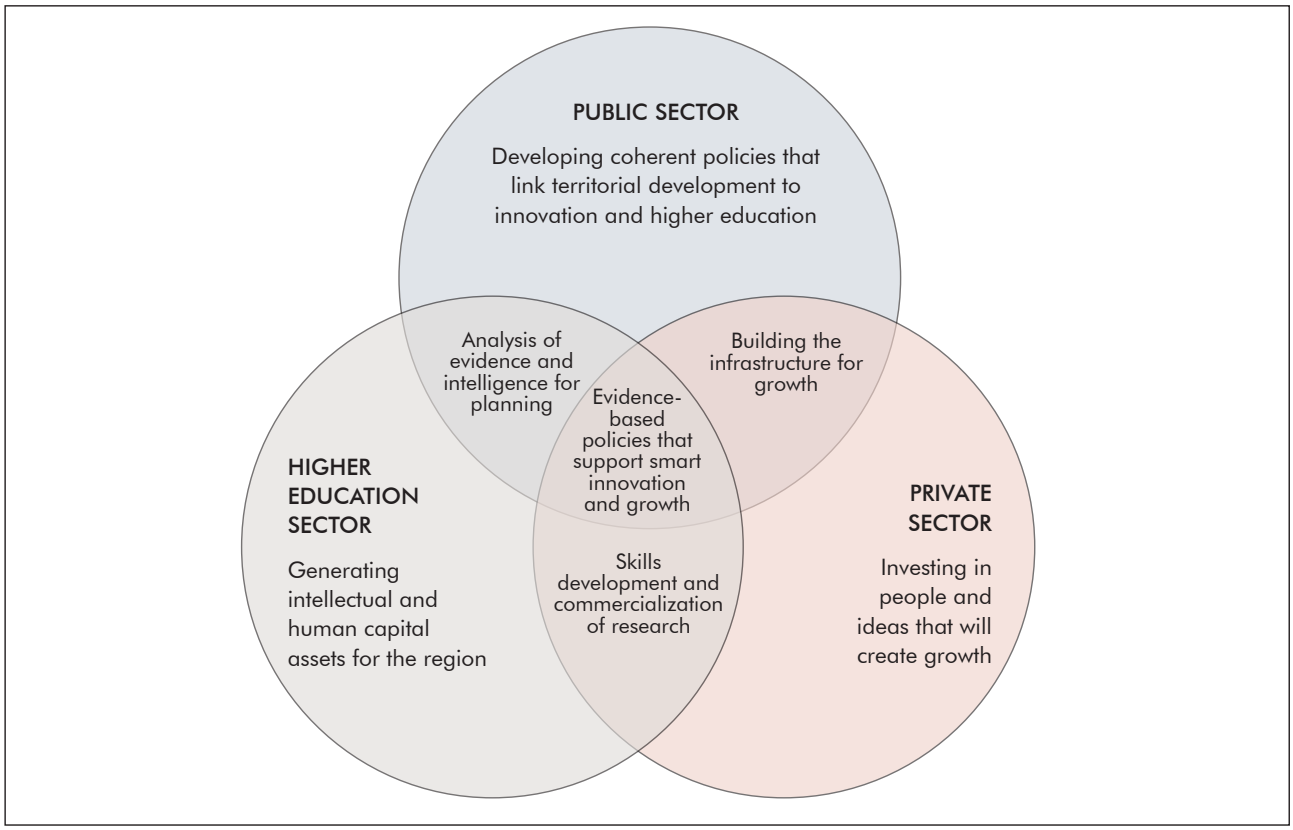
[16] Goddard, J. & Kempton, L., 2011. *op. cit.*

[17] *Ibid*.

[18] *Ibid*.

[19] Peach, D., Cates, C., Jones, J., Lechleiter, H. & Ilg, B., 2011. Responding to Rapid Change in Higher Education: Enabling University Departments Responsible for Work Related Programs Through Boundary Spanning. *Journal of Cooperative Education and Internships, Volume 45 (1), pp. 94-106*.

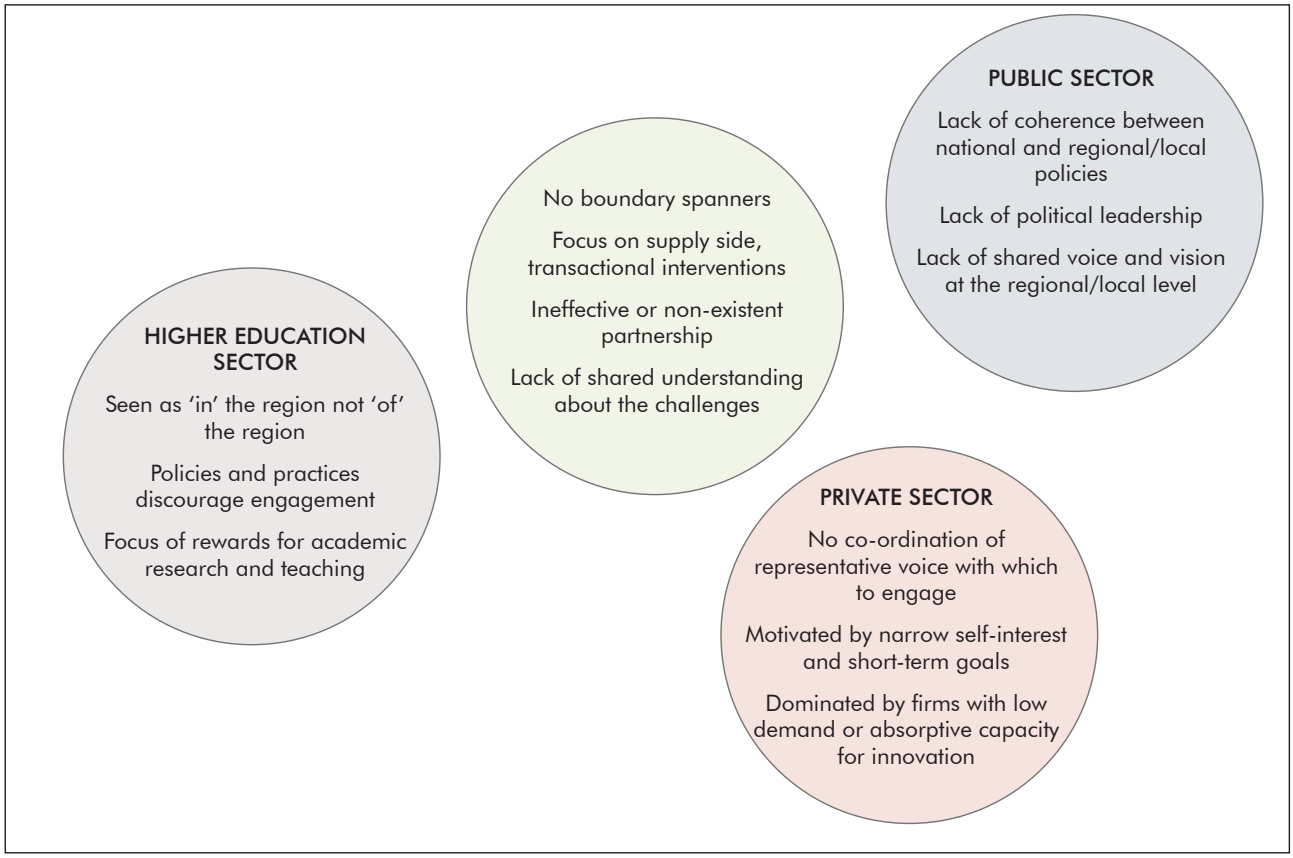
Figure 2: Features of a connected region



Source: Goddard, J. & Kempton, L. 2011. Connecting Universities to Regional Growth: A Practical Guide, European Commission, September 2011.

In contrast, within a disconnected region there is very little meaningful sharing or boundary spanning between HEIs and the public and private sectors. Figure 3 illustrates a disconnected region and presents reasons why the spheres and thus the region, remain disconnected.

Figure 3: Features of a disconnected region



Source: Goddard, J. & Kempton, L. 2011. Connecting Universities to Regional Growth: A Practical Guide, European Commission, September 2011.

There are many complex barriers, both internal to HEIs and in the wider enabling environment, that inhibit HEIs from fulfilling their potential to contribute to regional development.[20] Examples include a 'culture clash' involving the HEI and the public and private sectors in which academics might deliberately employ a hands-off approach because they feel the need to position themselves as 'critical observers' of a process rather than as active participants.[21] In addition, many HEI researchers may be excellent scientists but reluctant – or hopeless – entrepreneurs; they may be great at research but incompetent at applying their skills and knowledge on a practical level or for commercial gain.[22]

There may also be issues internal to the operating principles of an HEI which can be disincentives to engaging in 'non-academic' activities. For example, the reward and advancement structures of the HEI might compel an academic to engage only in 'pure' research that leads to publications in academic journals.[23] This approach is demonstrated in South Africa by the National Research Foundation's evaluation and peer-based rating system of researchers. Also, in regions with multiple HEIs, professional jealousy

[20] Goddard, J. & Kempton, L., 2011. *op. cit.*

[21] *Ibid.*

[22] Maguire, K., 2012. *Universities and Knowledge Transfer: Insights from the OECD Regional Innovation Reviews*. Presentation made at the OECD Roundtable on Higher Education in Regional and City Development 2012: Universities for Skills, Entrepreneurship, Innovation & Growth, OECD, 2012.

[23] Goddard, J. & Kempton, L., 2011. *op. cit.*

and competition for limited resources can create unhealthy competition, resulting in fragmentation and duplication of efforts.[24]

Other barriers include incompatibility between different types of HEIs (for example, research institutions versus polytechnics versus teaching colleges versus further education and training colleges), and HEI leaders who lack the authority to allocate and mobilize resources to address a regional development agenda.[25, 26] Additional issues relate to regional demand for HEI graduates and the absorptive capacity of regional companies, especially small and medium enterprises (SMEs), as well as the availability of venture capital for start-up companies resulting from HEI spinoffs.[27] The substantial lead times needed to design, approve and deliver dynamic and cutting-edge courses that respond to rapidly changing regional requirements can also be problematic for HEIs.[28] Insufficient involvement of HEIs in the development of regional strategies can also occur if the primary foci of the institutions are global, with little interest or time for local issues.[29]

At the same time, regional leadership must include and involve HEIs, but resist the temptation to let them 'run the whole show'. In some instances it is possible for the influence of HEIs in regional development to become excessive "in part because they are a stable partner, sometimes have strong representative groups, and are better able to attend meetings".[30] Excessive influence by HEIs in determining the regional agenda could result in a pronounced bias towards scientific discovery over economic growth and social advancement.[31] HEIs should always be part of the development and implementation of regional strategies, but with sufficient involvement by the private sector and the community to keep strategies balanced and based on consensus.[32] Policies intended to stimulate and promote the regional engagement of HEIs "will likely prove ineffective if implemented in a piecemeal fashion or with a compartmentalized focus on the transfer of knowledge rather than on regional competitiveness".[33]

24 OECD, 2010d, *op. cit.*
25 Maguire, 2012. *op. cit.*
26 Goddard, J. & Kempton, L., 2011. *op. cit.*
27 *Ibid.*
28 Harding, 2009. *op. cit.*
29 Maguire, 2012. *op. cit.*
30 *Ibid.*
31 *Ibid.*
32 *Ibid.*
33 OECD 2010b. *op. cit.*

3. Innovation as a catalyst for regional development

The published literature already suggests that most think-tanks and Universities in South Africa and elsewhere have begun to prove their utility in the domestic and international policy sphere as information transfer mechanisms and agents of change by aggregating and creating new knowledge through collaboration with diverse public and private actors (McGann & Weaver, 2002; Stone, 2001 and Rich, 2004). A key characteristic of the major activities done by the think-tanks and Universities is that they are now part of the group of influential actors that contributes to the formulation and implementation of local and global development policies. They also often create or participate in local and transnational networks that are intended to influence development policy (see Stone, 2001). Leading HEIs, industries and governments recognise the critical role innovation plays in economic, social and cultural development, and understand that organisations, regions and nations must innovate in order to stay competitive. Innovation has been described as a ubiquitous phenomenon that can take place at any time[34] and often involves an evolutionary, non-linear and interactive process.[35] It can manifest in incremental or major changes,[36] and involves the realization that risk and failure are part of the innovation process.[37, 38]

Creativity (that is, the generation of new ideas) and innovation (that is, the translation of ideas into viable products, services and processes)[39] go hand-in-hand. Research suggests that innovators have 'creative intelligence' which enables them to leverage 'discovery' skills to create and innovate.[40] These skills are listed in Table 6.

[34] Lundvall, B., 1992. (ed.) *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, p. 51, reprinted by Anthem Press, 2010.

[35] Fiore, A., Grisorio, M. J. & Prota, F., 2009. Do we Really Need Regional Innovation Agencies? Some Insights from the Experience of an Italian Region. Southern European Research in Economic Studies (S.E.R.I.E.S.), *Working Paper No. 0025*, University of Bari, Department of Economics, p. 6.

[36] Cooke, P. & Memedovic, O., 2003. *Strategies for Regional Innovation Systems: Learning Transfer and Applications*. United Nations Industrial Development Organisation, Vienna, p. 5.

[37] European Commission, 2013. *op. cit.*, p. 100.

[38] Davila et al, 2007. *op. cit.*

[39] Anonymous, 2006. *Clever Practices to Boost the Creative and Innovative Potential of Regions: Inspiration for the Districts of Creativity*. Report Prepared by Arthur D. Little Co. and Presented on Behalf of Creativity World Forum at the International Conference on Connecting Creativity for Economic Growth, Ghent, Belgium, 15-16 November 2006, p. 8.

[40] *Ibid.*

Table 6: Discovery skills essential to creativity and innovation

Associating	The ability to successfully connect seemingly unrelated questions, problems, or ideas from different fields.[41]
Questioning	The courage to challenge assumptions by asking: 'why', 'why not' and 'what if'.[42]
Observing	The characteristic of being an exceptional observer of common phenomena who looks for small details that can provide new insights.[43]
Experimenting	The drive for intellectual exploration and experimentation, with the intention of provoking unorthodox responses and seeing what insights emerge.[44]
Networking	The ability to develop and cultivate a diverse network of colleagues and associates who have ideas and perspectives different to one's own, thereby extending one's knowledge domains.[45]

3.1 Innovation ecosystems

The type and degree of intimate and complex interactions between individuals and organisations and the processes that evolve to stimulate, support and manage these interactions constitute an innovation ecosystem. At the core of the ecosystem is the flow of knowledge and information. A fundamental tenet of innovation is 'how you innovate determines what you innovate'.[46] The elements of innovation – leadership, strategy, processes, resources, performance metrics and incentives — and how they are arranged (that is, organizational structure and culture) greatly affect the quantity and quality of innovation.[47]

Organisations seeking to create and nurture a culture of innovation can learn from the experiences and insights of proven innovators. One of the first lessons is that freedom is a prerequisite to creativity, which leads to innovation.[48] Secondly, innovation is not arrogant, it is curious about the successes of others. Its focus is turned outward, not inward, and it understands the value and importance of networks. Its internal and external communication skills and processes are highly effective. It is not driven by politicized buzzwords but by a genuine desire to achieve exceptional results. Its ethos is collaboration, not isolation. It is not afraid to fail and learn.

3.2 Closed innovation model

Traditionally, commercial innovation was conducted using a closed innovation model that followed a linear, internally oriented and centralized approach.[49] Companies rarely looked outside their own organisations for new ideas or innovations.[50] Many HEIs operated in a similar environment, as they competed aggressively for limited research funding and access to facilities, and as they vied to recruit the most respected faculty and cleverest students. The philosophy underlying closed innovation is that the

41 *Ibid.*
42 Dyer et al, 2009. *op. cit.*
43 *Ibid.*
44 *Ibid.*
45 *Ibid.*
46 Davila et al, 2007.
47 *Ibid.*
48 Jerome & Jordan, 2006. *op. cit.*
49 Chesbrough, H., 2003a. Open Innovation: *The New Imperative for Creating and Profiting from Technology*. Boston, MA: Harvard Business School Press.
50 Morgan, L. & Finnegan, P., 2008. *Deciding on Open Innovation: An Exploration of How Firms Create and Capture Value with Open Source Software*, in IFIP International Federation for Information Processing, Volume 287, Open IT-Based Innovation: Moving Towards Cooperative IT Transfer and Knowledge Diffusion, León, G., Bernardos, A., Casar, J., Kautz, K. & DeGross, J., (eds.). Boston: Springer, Ch. 13, pp. 229-246.

innovator must control all stages of the innovation process in order to be the first to get to market and monopolize market share (or be the first published, in the case of academics). Although organizations that practise closed innovation may develop reputations as leading innovators if they can successfully exclude all others from participating, they could also be seen as inhibiting innovation because their actions restrict and isolate the ecosystem from external ideas, information and knowledge.

3.3 Open innovation model

The closed innovation model began giving way to an open model towards the end of the 20th century.[51] Organizations practising open innovation believe it is more important to be a 'first mover' than it is to protect an idea, information or knowledge at all costs.[52,53] Collaboration is at the heart of open innovation.[54] With open innovation, diverse resources, people and knowledge sets are blended together to accelerate the pace of innovation.[55] The model uses an extensive networking approach and incorporates a philosophy of innovation as being a co-creative and user-driven collaborative process.[56] Open innovation emphasizes adaptive networking and multiple forms of engagement between role-players, which increases the flow of information and knowledge between them.[57]

One of the main benefits of open innovation is that participants in the innovation network have access to a much larger stock of ideas and technologies.[58] Collaborative networks enhance efficient forms of collective learning because role-players learn of new technologies, opportunities and challenges more quickly due to the density of interaction within the network. Learning is of a higher quality because it is subject to discussion and debate among horizontal counterparts whose perspectives and backgrounds may differ.[59]

When a group of organizations develops the ability to work together for mutual productive gain, it is creating 'social capital'. Like other forms of capital, social capital accumulates when used productively.[60] Social capital is largely incompatible with the closed innovation model which emphasizes individualism, closely held information and autonomy. In today's innovation environment, an important ingredient of the glue that holds collaborative networks together is the trust, or enlightened self-interest, among decision-makers that makes collaboration feasible.[61]

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51 *Ibid*.

52 Chesbrough, H., Vanhaverbeke, W. & West, J., 2006. (eds.) *Open Innovation: A New Paradigm for Understanding Industrial Innovation*, in Open Innovation: Researching a New Paradigm, Oxford University Press.

53 Brouwers, 2009. *op. cit*., p. 4.

54 Brouwers, 2009. *op. cit.*

55 Jerome, L., 2010. *Collaborative Innovation in Triple Helix Networks: Examining the Link between Informal Social Networks and Innovation.* International Conference on University, Industry and Government Linkages, 20-22 October 2010, Madrid, Spain. [Online] Available at: www.leydesdorff.net/th8/TRIPLE%20HELIX%20%20VIII%20CONFERENCE/PROCEEDINGS/0053_Jerome_Leigh_O-026/New%20Folder/TH8%20paper%20Jerome%20submission.pdf. [Accessed 17 June 2014].

56 European Commission, 2013. *op. cit.*

57 Bachtler, 2005. *op. cit.*

58 De Backer, K. & Cervantes, M., 2008. *Open Innovation in Global Networks.* Organisation for Economic Co-operation and Development (OECD), Paris.

59 Fountain, J. E., 1997. *Social Capital: A Key Enabler of Innovation*. Chapter 5 in Investing in Innovation: Towards a Consensus Strategy for Federal Technology Policy. Branscomb, L. M. & Keller, J. (eds.), Cambridge, Mass.: MIT Press, pp. 85-111. [Online] Available at: http://belfercenter.hks.harvard.edu/publication/2062/investing_in_innovation.html?breadcrumb=%2Fpublication%2Fby_type%2Freport_chapter%3Fpage%3D5. [Accessed 17 June 2014].

60 Fountain, 1997. *op. cit.*

61 *Ibid*.

Geographic regions that include highly functional collaborative networks are referred to as 'learning regions'.[62] Merely constructing a network of organizations, however, does not ensure collaboration. Even within a network, participants too often establish working silos where they "focus on their own tasks, sectors, organizations and disciplines, working to optimise their own work",[63] whilst paying inadequate attention to the work of network partners. Another potential risk of open innovation is the potential for theft or mishandling of intellectual property. Today's collaborators can become tomorrow's competitors, and the knowledge that is shared today can become the strategic blunder or career mistake of the future. Uncertainty about the appropriation of the benefits of collaboration can also be a problem, particularly for smaller and weaker organisations which have fewer resources and limited expertise in intellectual property rights.[64]

The circulation of ideas and people is facilitated when role-players are physically located in close geographic proximity to other members of their network.[65, 66] Research shows that HEIs and companies located in close proximity tend to have more linkages, enhanced knowledge flows and less reliance on internal research and development (R&D).[67] These effects are attributed in part to the increased trust and levels of reciprocity created within regional clusters.[68]

Facilitating the innovation process can be challenging and filled with nuance. Experience suggests that it is not possible to manage many of its aspects. What is needed is a combination of management and 'orchestration'. Orchestration involves providing an innovation support structure that creates "conditions where the diverse parties can work together with the right balance of inner and outer focus", thereby reinforcing their own work and benefiting the ecosystem as a whole.[69] Orchestrating the right balance of inner and outer focus requires implementation tools and facilitation processes that promote creative problem-solving, user-centred co-creation, synergy building, silo breaking, overcoming resistance to change and creating breakthroughs.

3.4 Motives and objectives

One of the keys to understanding innovation is recognizing the motivation and objective of the innovator. HEIs, industry and government are often driven by different, and sometimes seemingly incompatible, motives for innovation. Successful regions have collaborative relationships between HEIs, industry and government that start early, are mutually beneficial and have shared goals.[70] In simple terms, HEIs are expected to be motivated by their thirst for pure knowledge, insight and understanding – with perhaps a dash of altruism. Business, by definition, is motivated by profits and market share – with altruism an acceptable by-product if it can be converted into a marketing advantage. Government is motivated by the desire to improve the economic and social welfare of its citizens – with ethics and the common good as guiding principles that are superseded only by the requirement for a strong showing by the ruling party in election polls.

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62 *Ibid*.
63 European Commission, 2013. *op. cit.*
64 De Backer & Cervantes, 2008. *op. cit.*
65 Huang, F., & Rice, J., 2013. Does Open Innovation Work Better In Regional Clusters?. *Australasian Journal of Regional Studies*, Volume 19(1), 2013, pp. 85-120.
66 Cooke & Memedovic, 2003. *op. cit.*
67 Huang & Rice, 2013. *op. cit.*
68 *Ibid*.
69 European Commission, 2013. *op. cit.*, p. 96.
70 Jones et al, 2006. *op. cit*.

3.4.1 Innovation and academia

Traditionally, HEIs tended to be "closed rather than open institutions, supply-driven rather than demand-driven, directive rather than responsive".[71] In the innovation environment of today, HEIs are being driven to make radical changes in who they are, what they do and how they do it. A new theme developing across HEIs is the importance of creating connections between faculty and the outside world.[72]

A 2010 OECD study of HEI contributions to regional and city development along the border separating Mexico and the United States drew conclusions which would seem to apply to many academic settings internationally. One of the points made in the report was that the HEIs failed to "present themselves as a coherent system" and made "no attempt to set out the collective needs of the region in terms of innovation infrastructure, or for the universities to coordinate their actions in meeting such needs".[73] As a result, the HEIs were found to be replicating efforts and initiatives, as well as placing too much emphasis on science disciplines, to the detriment of meeting the needs of business and industry more effectively.[74]

In the past, HEIs were accused of producing knowledge flows to their communities that were largely one way (via courses, research results or trained students). In addition, their institutional boundaries were characterized as being thick rather than permeable, which limits opportunities for interaction with communities and industry.[75] Today, innovation and entrepreneurship are seen by an increasing number of HEIs to be both inseparable and essential to their future success.

A 2013 report on "the innovative and entrepreneurial university" in the United States claims that American HEIs have "got the entrepreneurial bug".[76] The report discusses the changes that HEIs are undergoing in the transition to embrace "the importance of innovation, commercialization, entrepreneurship, and the creation of economic value for their communities".[77] HEIs are creating innovation support systems to guide businesses, communities and their own faculty and students in identifying collaborative and entrepreneurial opportunities.[78] They are hiring skilled professional staff in areas such as intellectual property law and licensing, or tapping into institutional resources such as law and business graduate students and faculty. Many HEIs are creating a technology transfer office or similar mechanism that works to protect their innovations, and develop and manage university-industry partnerships.[79]

3.4.2 Innovation and the private sector

As noted above, the private sector has steadily moved away from a strict closed innovation system to a more open model that encourages the involvement of external partners. A 2008 OECD study reported that from a business perspective, the most sought-after innovation partners for the private sector are suppliers and customers, not HEIs. The report claimed that "while universities and public research institutes are generally considered an important source of knowledge for companies' innovation activities, especially

71 Allison & Eversole, 2008. *op. cit.*
72 US Department of Commerce, 2013. *op. cit.*
73 OECD, 2010a. *op. cit.* p. 142
74 OECD, 2010a. *op. cit.*
75 Allison & Eversole, 2008. *op. cit.*
76 US Department of Commerce, 2013. *op. cit.*, p. 9.
77 *Ibid.*
78 US Department of Commerce, 2013. *op. cit.*
79 *Ibid.*

in more upstream research and exploration activities, they represent only a small share of innovation collaborations" to most major companies.[80]

3.4.3 Innovation and the public sector

Creating innovation to drive economic and social development is not confined exclusively to HEIs and industry. In many countries the public sector both sets the rules for innovation (through policies and legislation) and plays the game (through national research agencies and public-private partnerships). Yet innovation models developed for academia and industry do not fully apply in the public sector context.[81] For example, whereas industry strives to create stakeholder value, the public sector is committed to generating 'public value'. Although public value is a debatable concept, it typically refers to increased equity, efficiency and democracy.[82] HEIs and industry need to broaden their relationships with the public sector to increase access by officials to their innovation resources, and to provide input and support in the development of the "regulations, laws, policies, and programs that promote responsible innovation and economic development goals".[83]

Regional leaders can fail to capitalize on their HEIs as major drivers of regional development because they do not create a mutually beneficial partnership,[84] or they lack either an organized strategy or willingness to involve HEIs.[85] Actions such as waiting too long to involve the HEI in conversations about regional strategy and priorities, or demanding too much of their time in too many activities that do not help the HEI achieve its own objectives, can yield negative returns.

In 2007, the Department of Science and Technology (DST) published a *Ten-Year Innovation Plan* to help drive South Africa's transformation towards a knowledge-based economy. The plan presents the "grand challenges" that the country will face in science and technology in the year 2018. The purpose of the plan is to eliminate the tremendous gap that currently exists between South Africa and countries with knowledge-driven economies.[86]

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80 De Backer & Cervantes, 2008. *op. cit*. p. 10.

81 *Ibid*.

82 *Ibid*.

83 US Department of Commerce, 2013. *op. cit.*, p. 37.

84 Jones, A., Williams, L., Lee, N., Coats, D. & Cowling, M., 2006. *Ideopolis: Knowledge City-Regions,* The Work Foundation, 2006.

85 Maguire, 2012. *op. cit.*

86 Department of Science and Technology, 2007. *Innovation Towards a Knowledge-Based Economy: Ten-Year Plan for South Africa 2008 – 2018.* South Africa.

4. The triple helix model of academia-industry-government collaboration

4.1 A new approach to higher education

In the 1950s, Stanford University in the United States began implementing a series of institutional innovations with the goal of creating a community of technical scholars that would continuously foment new ideas and stimulate challenges.[87] These innovations, particularly as they related to increased interaction and collaboration with industry (particularly the Hewlett Packard Corporation), laid the foundations for what is known today as Silicon Valley. Unknowingly at the time, these were also the precursors to the transformation of Stanford into what by the early 21st century became known as an 'entrepreneurial university'. This and other experiences in the United States and elsewhere generated international interest in novel relationships and greater collaboration across academia, industry and government.

4.2 Emergence of the knowledge-based economy

Although knowledge has long been recognized as important to economic growth and development, in the 1960s the expansion of science-based industries led economists to begin exploring more comprehensively the role of knowledge in economic and social change.[88] These investigations gave rise to the concept of knowledge-based economies (or simply, knowledge economies).

A knowledge-based economy is one which is directly based on the production, distribution and use of knowledge and information.[89] The World Bank defines a knowledge-based economy as one "where organisations and people acquire, create, disseminate, and use knowledge more effectively for greater economic and social development".[90] A basic tenet of a knowledge-based economy is that organisations must "efficiently and effectively create, locate, capture, and share their organisation's knowledge and expertise in order to remain competitive".[91]

It has been said that knowledge has a polyvalent nature, which is "at the same time theoretical and practical, publishable and patentable".[92] Polányi (1958) distinguished between two types of knowledge: codified (explicit) and tacit (implicit).[93] Codified knowledge is knowledge that can be precisely and

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87 Saxenian, A., 1995. *Creating a Twentieth Century Technical Community: Frederick Terman's Silicon Valley*. Paper Prepared for Inaugural Symposium on The Inventor and the Innovative Society, The Lemelson Center for the Study of Invention and Innovation, National Museum of American History, Smithsonian Institution, 10-11 November 1995. [Online] Available at: http://people.ischool.berkeley.edu/~anno/Papers/terman.html. [Accessed 18 June 2014].

88 Powell, W. W. & Snellman, K., 2004. The Knowledge Economy. *Annual Review of Sociology,* 2004, Volume 30, pp. 199-220, doi: 10.1146/annurev.soc.29.010202.100037. [Online] Available at: www.stanford.edu/group/song/papers/powell_snellman.pdf. [Accessed 18 June 2014].

89 OECD, 1996. *op. cit.*

90 World Bank, 2014. [Online] Available at: http://web.worldbank.org/WBSITE/EXTERNAL/WBI/WBIPROGRAMS/KFDLP/0,,contentMDK:20269026~menuPK:461205~pagePK:64156158~piPK:64152884~theSitePK:461198,00.html. [Accessed 18 June 2014].

91 Zack, 1999. *op. cit.*, p. 45.

92 Ranga, M., Hoareau, C., Durazzi, N., Etzkowitz, H., Marcucci, P. & Usher, A., 2013. *Study on University-Business Cooperation in the US*, Final Report EAC-2011-0469. LSE Enterprise Limited, London School of Economics and Political Science, May 2013, p. 21.

93 Polanyi, M., 1958. Personal Knowledge: *Towards a Post-Critical Philosophy*. University of Chicago Press, Chicago.

formally articulated and readily conceptualized in words and transmitted through formal language. Codified knowledge is the language of scientists, intellectuals, executives and policy-makers – it is the code they use to share their secrets and, at times, obfuscate ideas. Although scientific knowledge in particular can be extremely abstract, it can also be readily documented, transferred and shared. It can be accessed by reading books and research papers, attending lectures and 'surfing the net'. It can be recorded in patents and licensing agreements. Codified knowledge is generated through organizational processes that involve exploration (basic research), examination (tests/trials and applied research) and exploitation (commercialization).[94]

In contrast, tacit knowledge is understood and applied on a subconscious level and has 'personal characteristics'. It is developed from direct experience and action, and is difficult to formalize and communicate precisely. Polányi used the example of riding a bicycle (made possible by the offsetting of centrifugal and gravitational forces) to illustrate tacit knowledge.[95] Tacit knowledge is most often transmitted through highly interactive face-to-face conversation, story-telling and shared experience. This requires the frequent repetition of personal interactions and the development of trust, and introduces physical, social and institutional proximity as constraints.[96,97] Asheim and Gertler (2005) maintain that tacit knowledge does not travel well, whilst de Geus (2009) supports this notion by stating that in the era of globalization, the exchange of tacit knowledge takes place in cities and regions.[98,99,100]

Knowledge created and shared in communities of practice (that is, in groups performing similar tasks or focusing on similar issues) is often context specific and difficult to codify. This implies that collaboration and knowledge transfer in such communities is facilitated by geographical proximity.[101] Allison and Eversole (2009) discuss the notion of the role that "placed-based knowledge" – particularly the tacit knowledge that is unique to a specific place – can play in generating innovative and distinctive solutions to regional issues and contextualizing them into their particular social, economic and cultural contexts.[102]

Proximity facilitates knowledge spillovers by providing opportunities for interactions that occur through planned interaction, as well as serendipity.[103,104] Knowledge spillover is considered a basic principle of knowledge management economics, and has been called the lynchpin of innovation.[105] It refers to a phenomenon that occurs when knowledge or innovation generated for one purpose is shared with or 'spills over' to other users who are then inspired to apply it in new and often unintended ways. This

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94 Cooke, 2005. *op. cit.*

95 Polanyi, 1958. *op. cit.*

96 Zack 1999. *op. cit.*

97 OECD 2010b. *op. cit.*

98 Johnsen, I. H. G. & Isaksen, A., 2009. *Innovation Modes, Geography of Knowledge Flows and Social Capital*. Paper to be Presented at the DRUID-DIME Academy Winter 2009 PhD Conference on Economics and Management of Innovation, Technology and Organisational Change, Aalborg, Denmark, 22-24 January 2009.

99 Asheim, B. T. & Gertler, M., 2005. The Geography of Innovation. Regional Innovation Systems, in Fagerberg, J., Mowery, C. & Nelson, R.R. (eds.). *The Oxford Handbook of Innovation*, Oxford University Press, Oxford, pp. 291-317.

100 de Geus, A., 2011. Speech presented at the Conference for the Dissemination of the Outcomes of the 2nd Round of OECD Reviews of Higher Education in Regional and City Development: Higher Education and Regional and City Development: For Stronger, Cleaner and Fairer Regions, Seville, 10 February 2011.

101 Johnsen and Isaksen, 2009. *op. cit.*

102 Allison and Eversole 2009. *op. cit.*

103 Jerome, 2010. *op. cit.*

104 Saublens, C. et al, 2007. *Regional Research Intensive Clusters and Science Parks.* Report Prepared by an Independent Expert Group, EURADA, Brussels, Belgium, September 2007.

105 Jerome, 2010. *op. cit.*

catalytic process demonstrates how knowledge and innovation, once created, are difficult to contain and will often spill over to benefit those who are vigilant and able to recognise its potential.[106]

According to Lucas (1988), the quality and innovative capability of the labour force (that is, the stock of 'human capital') are the primary engines of economic growth.[107] If a country has sophisticated technologies or other resources but insufficient or unskilled human capital to use them for generating optimum value, then it is using its resources inefficiently.[108] A primary role for most HEIs is the development of the human capital required in a knowledge-based economy.

The traditional model of innovation is linear. In a knowledge-based economy, innovation is based on an interactive model driven by the interaction of producers and users as they exchange codified and tacit knowledge. This means that the configuration of a national innovation system, which consists of the flows and relationships among academia, industry and government in the development of science and technology, is an important determinant of economic development.[109] An economy is considered knowledge-based when the sustained use and creation of knowledge are at the centre of its economic development process[110] and knowledge becomes the basis for decisions made by individuals, organisations, businesses and government.[111]

4.3 A third mission for HEIs

Historically, the mission of HEIs has been first to provide quality teaching and secondly to conduct relevant research that meets national and international standards of excellence. Through teaching they are expected to be leaders in knowledge transfer and the development of human capital, and through research to be leaders in knowledge creation.

Today, higher education is only one of several key players – albeit an important one – in a complex global knowledge-intensive industry. Accordingly, governments are becoming much more directive in defining the role of higher education in national development. In response, HEIs are re-examining their mission, strategies and organization, which can lead to tensions between government policy and what HEIs perceive to be their mission.[112]

The globalization of the world economy has generated renewed interest in a third mission for HEIs: more direct interaction between HEIs and society, especially at a local and regional level. In addition to generating knowledge and producing human capital, HEIs are now expected to be pro-active in engaging in activities that make significant contributions to regional development.[113] There is growing awareness that the impact HEIs must make in the world "starts at their doorstep".[114]

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106 Aharonson, B. S., Baum, J.A.C. & Feldman, M. P., 2004. *Industrial Clustering and the Returns to Inventive Activity: Canadian Biotechnology Firms*, 1991-2000. Danish Research Unit for Industrial Dynamics Working Paper No 04-03 (as cited in Jerome and Jordan, 2006), op. cit.).

107 Lucas, Robert E., Jr., 1988. On the Mechanics of Economic Development. *Journal of Monetary Economics*, Volume 22, 1988, pp. 3-42.

108 Kumar, K. B. & Van Welsum, D., 2013. *Knowledge-Based Economies and Basing Economies on Knowledge: Skills, a Missing Link in GCC Countries*, RAND Corporation.

109 OECD, 1996. *op. cit.*

110 Chen, D. H. C. & Dahlman, C. J., 2005. The Knowledge Economy, the KAM Methodology and World Bank Operation. *Working Paper*, The World Bank, Washington D.C., 19 October 2005.

111 Kumar and van Welsum, 2013. *op.cit.*

112 Hazelkorn, 2005. *op. cit.*

113 OECD 2010b. *op. cit.*

114 *Ibid.*

Goddard (2011) disagrees, however, with efforts to focus development exclusively in economic terms, and characterizes this third mission in terms of a "civic university" which he describes as an HEI that bridges the disconnect between a university and its 'place'.[115] In Goddard's view, an HEI should be an institution that engages in a "holistic, progressive and sustainable"[116] manner with its surroundings to reconnect the HEI with its city and its development, and operates on a global scale whilst using its location to define its identity.

An expanded focus and renewed emphasis on regional involvement for HEIs raise many questions and challenges related to concepts such as collaboration, competitiveness, open versus closed innovation, regional innovation clusters, learning regions, knowledge spillover, entrepreneurial universities, the knowledge economy, translational research, university-industry linkages, higher education policy and others. The organizational structure most often cited as a guiding framework for regional development and innovation is the 'triple helix' model involving academia, industry and government.[117]

4.4 Emergence of the triple helix model

In 1995, Etkowitz and Leydesdorff first described the 'triple helix' model in which they claimed that the increased importance of knowledge creation to economic development, that is, the knowledge-based economy, would stimulate closer collaboration between academia, industry and government.[118,119] Within this policy framework, HEIs are considered to be a public good that must play a large, meaningful and relevant role in the development and improvement of the cities and regions where they are located by promoting, enabling and engendering regional innovation.[120] As Martorell (2013) notes, in 1998, Etzkowitz and Leydesdorf[121] formulated an academic model that soon gained widespread acceptance amongst regional policy-makers. The model described the implications of:

> *"a new social contract between higher education and society, which gives rise to a new interactive arrangement based on the operation of equivalent and overlapping institutional spheres with each group sharing responsibilities and with hybrid organizational structures emerging at the interface".*[122]

The underlying thesis of the triple helix thesis is that "the potential for innovation and economic development in a knowledge[123] society lies in a more prominent role for the university and in the hybridization of elements from university, industry and government to generate new institutional and social forms for the production, transfer and application of knowledge". During the last two

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[115] Goddard, J., 2011. *The Civic University: Reuniting the University and the City to Jointly Meet the Challenges of Social, Economic and Community Development*. Paper presented at OECD Conference: Higher Education in Cities and Regions – For Stronger, Cleaner and Fairer Regions, Seville, 10-11 February 2011. [Online] Available at: www.eua.be/libraries/sirus_conference/john_goddard_paper_for_seville.sflb.ashx. [Accessed 18 June 2014].

[116] Pike, A., Rodríguez-Pose, A. & Tomaney, J., 2007. What Kind of Local and Regional Development and for Whom?. *Regional Studies* 41, pp. 1253-1269.

[117] OECD, 2010c. *Higher Education in Regional and City Development: Berlin, Germany*. OECD 2010.

[118] Etzkowitz, H. & Leydesdorff, L., 1995. The Triple Helix: University-Industry-Government Relations: A Laboratory for Knowledge-based Economic Development. *EASST Review*, Volume 14(1), pp. 14-19.

[119] Etzkowitz & Leydesdorff, 2000. *op. cit.*

[120] OECD, 2010c. *op. cit.*

[121] Etzkowitz, H & Leydesdorff, L., 1999. The Future Location of Research and Technology Transfer. *Journal of Technology Transfer*, Volume 24, pp. 111-123.

[122] Martorell, G., 2013. *How Industries With No Previous Collaboration With Research Centers Behave To Approach Them For The First Time?* A Review, p. 32, in (eds.) Kliewe, T., Meerman, A., Baaken, T. & Van der Sijde, P., University-Industry Interaction: Challenges and Solutions for Fostering Entrepreneurial Universities and Collaborative Innovation, 2013 Conference Proceedings, 2013 University-Industry Interaction Conference, Amsterdam, The Netherlands, 27-29 May 2013, pp. 27-43.

[123] Ranga et al, 2013. *op. cit.*, p. 18.

decades, the original model has been expanded and adjusted, embraced by many countries and regions, and widely debated and criticized.[124] It has spawned a substantial body of academic literature, international institutes and annual conferences. Massive amounts of money have been spent in attempts to re-create or at least emulate the technological and financial success of Silicon Valley,[125] which remains the crown jewel in the triple helix model.

4.5 Inside the workings of the triple helix: the role of academia

4.5.1 HEI engagement

The triple helix model predicts that in a knowledge-based economy, the potential for regional innovation and economic development is linked to the hybridization of academic, industrial and government functions to generate "new institutional and social forms for the production, transfer and application of knowledge".[126] Although the model describes an evolution in the relationship between academia, industry and government, in many respects the principal mission of each entity remains institutionally (and to some extent legally) defined. Generating wealth and job creation are still considered the primary domain of industry, and regulation and policy remain a government function, while knowledge creation and education are within the ambit of academia. At the same time, there has been convergence, with academia making major strides in generating income from its intellectual and physical assets, while industry has become an important knowledge producer.[127]

One of the major changes for HEIs within the triple helix model is their increased engagement with the community and region. Previously, an 'un-engaged' or 'un-civic' university viewed its primary functions as illustrated in Figure 4.[128]

The illustration shows that an un-engaged on un-civic university considers teaching and research as its core functions. How well it performs in these areas is determined largely by the academic rankings of its teaching staff and the excellence of its research, as determined by the number of its research papers published in peer-reviewed journals. The 'third mission' of the university is represented by the local community, which is located at the periphery of its activities and on the other side of a "hard boundary between enabling and non-enabling environments". The level of involvement in 'third mission' activities by the un-engaged university is dependent on funding levels.

[124] Cooke, P., 2004. *Systemic Innovation: Triple Helix, Scalar Envelopes, or Regional Knowledge Capabilities, an Overview*. Paper prepared for the International Conference on Regionalisation of Innovation Policy – Options & Experiences, Berlin, 4-5 June 2004.

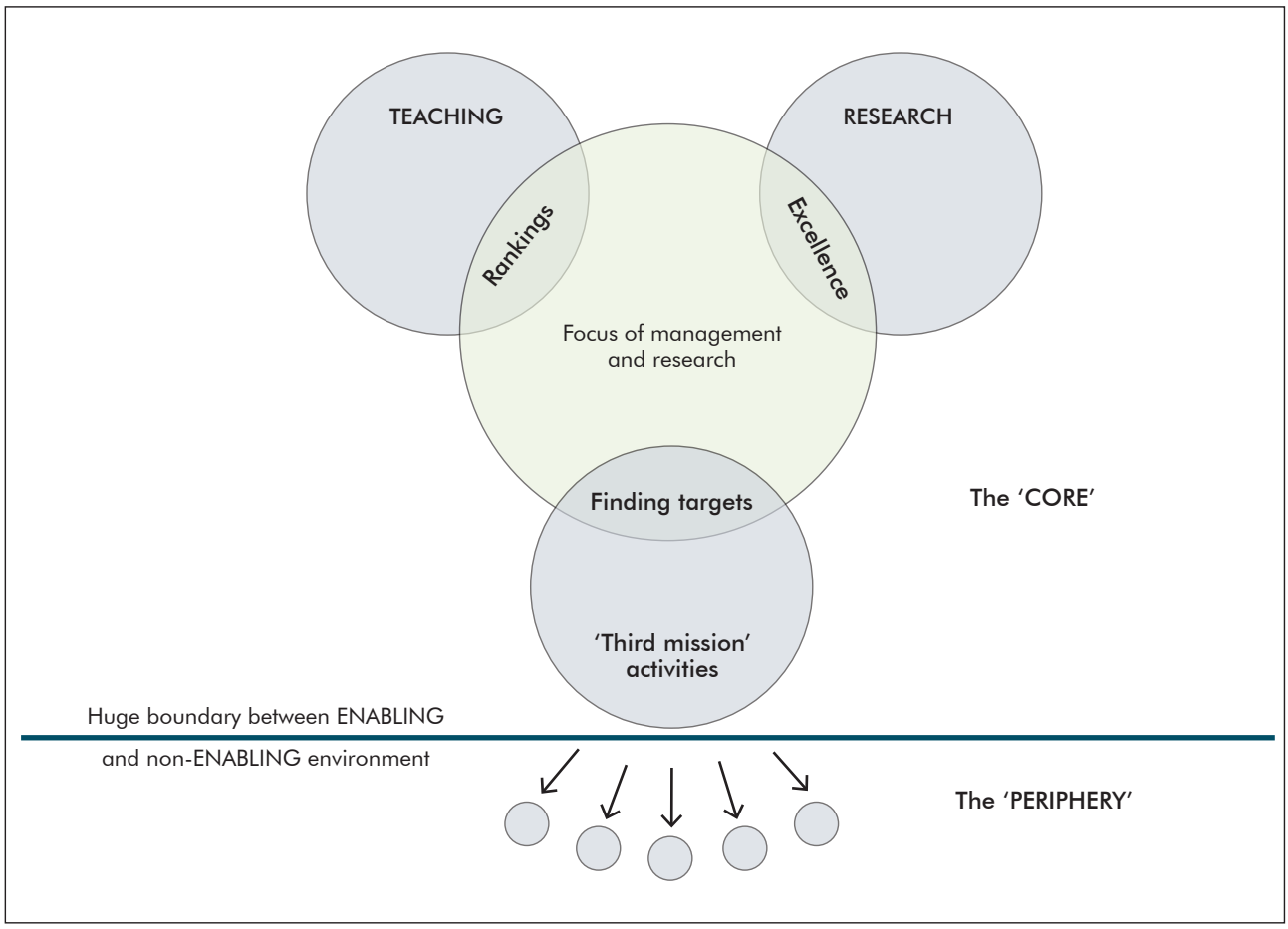
[125] Leydesdorff, L., Perevodchikov, E. & Uvarov, A., 2014. Measuring Triple-Helix Synergy in the Russian Innovation Systems at Regional, Provincial, and National Levels. *Journal of the Association for Information Science and Technology JASIST* (in press).

[126] Ranga et al, 2013. *op. cit.* p. 18.

[127] Leydesdorff, L. & Meyer, M., 2010. The Triple Helix Model and the Knowledge-Based Economy. *Journal of Northeastern University (Social Science)*, Volume 12(1), 2010, pp. 11-18. [Online] Available at: 72e7e52b030e7c6de0.pdf.

[128] Kempton, L., Goddard, J., Edwards, J., Hegyi, F. B. & Elena-Pérez, S., 2013. Universities and Smart Specialisation. *S3 Policy Brief Series, No. 03/2013*, Joint Research Centre's Institute for Prospective Technological Studies, European Commission, Seville (Spain), November 2013.

Figure 4: The un-engaged (un-civic) university



Source: Kempton, L., Goddard, J., Edwards, J., Hegyi, F.B. & Elena-Pérez, S. 2013. Universities and Smart Specialization, S3 Policy Brief Series, No. 03/2013, Joint Research Centre's Institute for Prospective Technological Studies, European Commission, Seville (Spain), November 2013.

4.5.2 Getting down to business – the entrepreneurial HEI

Another concept central to the triple helix model is the expansion of the mission of HEIs to include the notion of the entrepreneurial university.[129] An entrepreneurial university is seen as a key component of the transition to a knowledge-based economy, and is promoted as "an advance, rather than a distortion of academia".[130] The idea of an entrepreneurial university gives rise to the concept of the 'entrepreneurial scientist', who attends to advancing the frontiers of knowledge whilst also mining its practical and commercial application for industrial and financial returns.[131] This 'academic entrepreneurship' is described as an overlay on the teaching and research missions of HEIs, which co-exists with them in a 'creative tension'.[132]

[129] Ranga *et al,* 2013. *op. cit.*
[130] *Ibid.,* p. 18.
[131] Ranga *et al,* 2013. *op. cit.*
[132] *Ibid.*

4.6 Inside the workings of the triple helix: the role of industry

A significant change began occurring in corporate management in the 1990s when openness to collaborative research through R&D alliances became an important form of knowledge generation and was no longer considered a company weakness. These new alliances (for example, partnerships, consortia with universities, government laboratories and other companies) emerged in response to increased efforts by businesses to "access external sources of technology and knowledge and to identify trained human resources, new partners and markets".[133] Such alliances started to be seen as "key instruments to facilitate knowledge transfer and enhance firms' capabilities for learning and for dealing more effectively with technological and market uncertainty, or as avenues for internalizing new skills".[134] Learning and R&D became more strongly integrated into corporate strategy for maintaining competitive advantages. This search for external knowledge allowed firms to share the risks and costs of conducting competitive research.[135]

As collaboration with HEIs increased and expanded, the borderline between basic research (considered the stronghold of HEIs) and applied research/technology (seen more as the realm of business) became less distinct. The benefits to businesses of collaborating with HEIs included the opportunity to access complementary expertise that was unavailable 'in-house', and to interact with the best and brightest students and establish links with them prior to graduation. The relationship between HEIs and business has thus undergone significant transformation, resulting in new forms of collaboration designed to meet new economic and technological challenges.[136]

The expected outcomes and benefits of industry-HEI collaboration are often framed in terms of research results that create an opportunity for a company. But these are only of incidental importance. From the company's perspective, what really matters is not outcome, but impact. How will the knowledge derived from collaborating with an HEI contribute to a company's performance? Will new products and more effective manufacturing processes be made possible as a result? Will it produce materials, designs or processes that enhance competitive advantage, and can these be patented to provide a proprietary advantage to the company?[137]

A 2010 study conducted by the Massachusetts Institute of Technology (MIT) – which has significant experience with the triple helix model – suggests that there is an "outcome-impact gap" in many industry-HEI collaborations. Many companies view working with academia "as beneficial only to the extent that it advances the company toward its goals", and the promising outcomes of these collaborative projects often fail to translate into tangible impact for the companies.[138] The main finding of the MIT research was that industry-HEI collaborations "often produce interesting outcomes — for example, an insightful technical paper, a proposed process or a new computer code — but those outcomes have minor or no impact on company productivity or competitiveness".[139]

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[133] *Ibid.*, p. 16.

[134] *Ibid.*, p. 16.

[135] *Ibid.*

[136] *Ibid.*

[137] Pertuzé, J. A., Calder, E. S., Greitzer, E. M. & Lucas, W. A., 2010. Best Practices for Industry-University Collaboration. *MIT Sloan Management Review 83*, Summer 2010, Volume 51(4), Reprint Number 51416, Massachusetts Institute of Technology.

[138] *Ibid.*, p. 83.

[139] Pertuzé *et al,* 2010. *op. cit.,* p. 84.

4.7 Inside the workings of the triple helix: the role of government

Government can influence the pace, trajectory and geographical location of advances in innovation through its laws, regulations, policies, investments and incentives.[140] Etzkowitz (2003), one of the originators of the triple helix model, contends that without the positive role of government, it is only possible to develop HEI-industry relations to a point. He suggests that the key is to find an optimum balance between 'too little' and 'too much' government so that actors from the three spheres, especially at the regional level, can co-operatively create and implement policy initiatives.[141]

Each country has distinctive assets and constraints that shape the context in which a government crafts its innovation strategy. Creating an environment that successfully stimulates and supports innovation requires government to address a range of inter-dependent factors, including legal, fiscal and taxation issues. A country that understands its comparative advantages and then designs innovation legislation and policies to exploit those advantages will be in a better position to achieve success.[142] At the local level, government needs to build the infrastructure and provide the services that equate to a higher quality of life, for example, high quality schools, roads, open spaces, public transportation, arts and recreation facilities, and services and utilities.[143] There are limits, however, to the extent that innovation can be driven top-down by government policy. A creative and diverse bottom-up process is also required.[144] Barriers to effective government include local governments not engaging with innovation policies because of incoherent strategies emerging from central government.[145]

Policy-makers and other regional leaders must be originators, not copycats. Research shows that regions which try to replicate or clone the policies and best practices of successful regions often fail. The reasons for this are varied, but include the fact that every region has very different economic and socio-institutional environments, as well as intangible regional assets (for example, knowledge bases and institutional settings) that are specific to a particular context and the result of long histories. Many regions would like to be the next Silicon Valley, but to date none have successfully copied its blueprint. Each successful region has had to develop its own approach and find what worked for them.

Setting regional policy in a diversified, globalized economy can be compared to creating a mosaic using pieces whose order and placement are not pre-determined.[146] Of key importance is the level of institutional and governance capabilities that exists in the region, as well as the extent to which large cities and regions have the capacity and authority to formulate their own policies within a national framework.[147]

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[140] PwC, 2010. *Government's Many Roles in Fostering Innovation*. PricewaterhouseCoopers, 2010.

[141] Etzkowitz, H., 2003. 'Innovation in Innovation: The Triple Helix of University-Industry-Government Relations', Social Science Information 2003 Volume 42, pp. 293, DOI: 10.1177/05390184030423002.

[142] PwC, 2010. *op. cit.*

[143] Fieldsteel, 2013. *op. cit.*

[144] Garmann, J., Christian, H. & Ennals, R., 2012. *Introduction: Collaborative Advantage in Regional Economies*, in Creating Collaborative Advantage: Innovation and Knowledge Creation in Regional Economies, Christian, H., Garmann J. & Ennals, R. (eds.). Gower Publishing Company, May 2012.

[145] OECD-CDRF, 2010. *op. cit.*

[146] European Commission, 2006. *Constructing Regional Advantage: Principles – Perspectives – Policies*. Report Prepared by an Independent Expert Group (Chairman: Prof. Phil Cooke).

[147] OECD-CDRF, 2010. *op. cit.*

4.8 Collaborative competition

Collaboration is a non-negotiable characteristic of innovation and the triple helix model. And whilst the mantra in academia and industry has become 'you have to collaborate to compete', in practice a lack of collaboration remains a major barrier to progress. Without effective collaboration, the pace of innovation is much slower and the implementation of the triple helix model proceeds at an inconsequential rate.

So why do many role-players acknowledge the benefits of working as a team and for the common good, but behave in the opposite manner? The answer lies in the culture of collaboration that exists – or not – in an organization and across society in general. Too often it is very easy for individuals to 'do their own thing' and make token efforts at collaboration. In the scientific world, barriers to collaboration exist because scientists have not been socialized for wide-ranging collaborative research. The point has been made that some professions do not respect the knowledge of other professions (for example, the 'hard' sciences versus the arts and social sciences) and are skeptical about the contributions some fields of study can make to innovation.[148] In the 21st century, however, the development and nurturing of collaboration (in its broadest sense) must be a strategic policy of HEIs.

4.9 If you build a world-class African city, they will come

In the past, the rules of the economic-development game stated that businesses would locate their factories and offices where there was the best combination of comparative advantages such as abundant raw materials, low operating costs, efficient transport and tax incentives. Neo-classical economic theory held that the workforce followed jobs and relocated to those city-regions chosen by business. Today, the rules have changed. In the 21st century, many businesses make location decisions based on the key input in a knowledge-based economy: human capital.[149] In other words, businesses seeking to innovate are deciding to locate in city-regions where well-educated, creative and innovative people already live.

Logically, then, a key to successful regional economic development is for city-regions to create an environment that both produces and attracts the most valuable human capital. Setting aside for the moment the issue of developing human capital locally through quality schooling and higher education, the question that regional leaders must ask is: what attracts and entices innovative and creative people to move to a city-region, thereby drawing businesses – at least theoretically – to the area? Why do people from around the world want to move to places like Silicon Valley, Boston and New York as their first choice, but are less interested in relocating to other city-regions, even though they may also have positive characteristics such as prestigious HEIs or reasonable living costs? [150]

Richard Florida has been a leader in the debate on the impact of culture on the development of a city-region. His proposal that a "creative class"[151] is attracted to a location by the presence of cultural assets has played a major role in transforming the thinking on what it takes to be seen as a competitive location in the knowledge-based economy. Florida originally proposed that in order for a city-region to prosper in the creative age, it must demonstrate three characteristics: talent, technology and tolerance. The notion of talent and technology seems straightforward, so the novel element of this trio is tolerance.

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[148] Arar, N. H. & Nandamudi, D., 2012. Advancing Translational Research by Enabling Collaborative Teamwork: The TRACT Approach. *Journal of Research in Interprofessional Practice and Education*, Volume 2(3), August 2012, p. 311.

[149] Florida, R. & Gates, G., 2001. *Technology and Tolerance: The Importance of Diversity to High-Technology Growth*. Center on Urban & Metropolitan Policy, The Brookings Institution, Washington D.C., June 2001.

[150] *Ibid.*

[151] Florida, R., 2002. *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community, and Everyday Life*. New York: Basic Books.

Florida's theory links the notion of tolerance and cultural openness directly to development by suggesting that as a region becomes more open and tolerant of people with differing beliefs and practices (for example, ethnic, cultural, linguistic and sexual), it attracts more people engaged in creative activities (including engineering, science, architecture, music and art). Recently, Florida added another 'T' to the mix – 'territorial assets', which he defines as a location's quality of place: "the unique set of characteristics that defines a place and makes it attractive".[152] In short, Florida contends that locations seeking economic growth and development need to create an environment that is attractive to those creative and innovative individuals who are essential to businesses participating in the knowledge economy.[153]

The GCR can boast that its regional assets – education, security, infrastructure, public transport, arts and culture – are 'better' than for many city-regions in Africa and elsewhere. But are they world-class? What is world-class about a city-region where rolling blackouts are always likely because the electricity grid has not or could not be maintained and developed to meet demand, where xenophobia and other forms of discrimination remain everyday occurrences, where serious crime is too common and service delivery too rare? Many people relocate to the GCR every day, but are the 'best and brightest' from the continent and the world included among them?

4.10 Unlocking regional potential

4.10.1 Clusters

Research has revealed the importance of clustering to regional economic development, as well as how innovation, knowledge creation and entrepreneurship contribute to defining a region's character. One of the key findings of this research is the importance of identifying a region's competitive advantages, and then directing public and private investment to exploit them.

A cluster can be described as a group of enterprises, and related economic actors and institutions, that operate in the same sector, and that draw productive advantage from their mutual proximity and connections.[154, 155] Enterprises in a cluster have common competitive strengths and needs, and benefit from being located near other similar or related enterprises.[156] Porter (1998) is credited with pointing out that these enterprises can simultaneously compete and collaborate with each other, with both activities enhancing their competitiveness.[157]

Clusters are now seen as the foundation of a successful and growing region. The cluster approach is attractive to policy-makers, particularly in the area of innovation policy, because innovators depend on scientific, innovation, commercial and financial markets for ideas and markets.[158] A key concept underlying cluster analysis is that a cluster is not simply a collection of unrelated enterprises. This

[152] Florida, R., 2012. What Draws Creative People? Quality of Place. *Urban Land Magazine*. [Online] Available at: http://urbanland.uli.org/industry-sectors/what-draws-creative-people-quality-of-place/. [Accessed 18 June 2014].

[153] Morgan, J., 2012. *"Territorial Assets" and the Latest from Richard Florida*. University of North Carolina, School of Government, Community and Economic Development Program. [Online] Available at: http://ced.sog.unc.edu/?p=4349. [Accessed 18 June 2014].

[154] Cortright, J., 2006. *Making Sense of Clusters: Regional Competitiveness and Economic Development*. Discussion Paper Prepared for the Brookings Institution Metropolitan Policy Program, March 2006.

[155] European Creative Industries Alliance, 2013. *Developing Successful Creative and Cultural Clusters Measuring: Their Outcomes and Impacts with New Framework Tools*. January 2013.

[156] Cortright, 2006. *op. cit.*

[157] Harding, R., 2009. *Fostering University-Industry Links*. Chapter 4 in Strengthening Entrepreneurship and Economic Development in East Germany: Lessons from Local Approaches, OECD Local Entrepreneurship Reviews, Final Report Prepared by the Organisation for Economic Co-operation and Development, March 2009.

[158] Harding, 2009. *op. cit.*

thinking is shaping regional development policy and practice, and orients it towards addressing the common problems of a group of enterprises in a cluster (for example, training or financing), rather than responding to their needs on an individual basis.[159] Clusters create synergies as local companies trade with one another, collaborate on projects and establish a platform for shared marketing activities.[160]

4.10.2 Smart specialization

Smart specialization is an innovative policy framework that encourages regions to identify and select a limited number of priority areas for investment, focusing on their strengths and comparative advantages. It combines industrial, educational and innovation policies into a focused strategy for leveraging regional dynamism to stimulate development. Although many elements of the smart specialization approach are not new to the regional development discourse, it is distinguished by its emphasis on strategies that promote experimentation in existing and new areas of activities, and then adjusting policies according to lessons learnt from these experiments. Smart specialization aims to explore and discover new technological and market opportunities, and open new domains for creating regional competitive advantages.

A goal of smart specialization is to concentrate scarce public resources on selected domains of knowledge and expertise that optimize the exploitation of regional strengths and opportunities. For many decades, the obvious smart specialist for the GCR was mining, but as regional mineral reserves become exhausted and the cost of extracting what remains becomes increasingly uncompetitive, new alternatives are desperately needed. The approach advocates that regions practise resource concentration and focus by developing distinctive and original areas of specialization. Smart specialization is intended to reduce the wasting of public resources by eliminating the fragmentation and duplication of policy interventions, and seeking to create synergies between public support mechanisms for research and innovation, industrial promotion and training institutions.[161, 162] A basic tenet of smart specialization is that a region that tries to do a little of everything in an effort to satisfy every demand will not only fail, but will be unable to generate the necessary size and critical mass effects that can be achieved by concentrating its resources on the development of distinctive and original areas of specialization.[163]

The smart specialization approach calls for an 'entrepreneurial-driven' allocation of resources in which a variety of regional leaders (including institutions) are able to set regional priorities and design an effective strategy.[164] A criticism of smart specialization is that it could deteriorate into government 'picking winners' and favoring some technologies and activities at the expense of a market-driven allocation of resources. Its proponents point out, however, that the strategy includes a strong top-down/bottom-up interactive and transparent decision-making process in which decisions are evidence-based. This is intended to deter regional leaders from making decisions based only on a desire to please every constituency and avoid having to make difficult choices.[165, 166] Smart specialization requires a long-term vision from policy-makers and stakeholders, and highlights the role of government, knowledge-based

[159] Cortright, 2006. *op. cit.*
[160] Goddard, J. & Kempton, L., 2011. *op. cit.*.
[161] OECD, 2013. *op. cit.*
[162] Foray & Goenega, 2013. *op. cit.*
[163] *Ibid.*
[164] OECD, 2013. *op. cit.*
[165] *Ibid.*
[166] Foray & Goenega, 2013. *op. cit.*

institutions and entrepreneurs in shaping regional specialization and competitiveness using a holistic place-based approach.[167]

4.10.3 Regional leadership

Leadership is essential to regional development, but the concept of regions does not fit into a standard administrative framework, so applying conventional leadership principles that are relevant to established organisations or governance structures is problematic. Regions lack defined governance structures, boundaries and legal authority, and so must often rely on other structures to serve as systems integrators and enablers of collaboration. This reality calls for a new kind of regional leadership that can build consensus, create a shared narrative, institutionalize innovation, lead change and induce co-operation and collaboration.[168] When it comes to regional leadership, research suggests that, like regional strategies, one size does not fit all. There are many forms of regional leadership that are context specific.

4.10.4 Regional collaboration

Collaboration at the regional level involves a combination of conversation, connection and capacity. An ongoing regional conversation is needed to build consensus and move the region forward, but this can be difficult because regions are very fragmented.[169] As Isaacs (1999) noted, human beings create, refine and share knowledge through conversation. In a knowledge-based, networked economy, "the ability to talk and think together well is a vital source of competitive advantage and organizational effectiveness".[170] In today's technological world, the glue that holds things together is no longer 'telling' but 'conversing'. Regional conversations can take many forms, but they should be a continuous and permanent part of the process of developing a regional identity and culture.[171]

Capacity is also critical to regional development. In many ways, building a region's capacity is the point of acting like a region. The leveraging of regional assets is only effective if those assets have underused or underdeveloped potential which is then deployed productively. Assets such as HEIs and companies must have cutting-edge research capacity, laboratories and factories must have highly skilled workers, and highly trained professionals (for example, lawyers, specialist financiers and accountants) must provide the services that facilitate core business and operational processes.[172]

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[167] OECD, 2013. *op. cit.*
[168] Council on Competitiveness, 2010. *op. cit.*
[169] *Ibid.*
[170] Isaacs, W., 1999. Dialogic Leadership, *The Systems Thinker*, Volume 10(1), 1999, p. 2.
[171] *Ibid.*
[172] *Ibid.*

5. Summary and discussion

The stated intention of this paper is to provoke debate around the central question: Are regional HEIs in the GCR playing a significant, proactive and innovative role in transforming and optimizing regional development? A simple answer would be yes, as most of the basic components needed to transform the region to a knowledge-based economy and achieve meaningful regional development are in place. Many elements of the triple helix model seem to be operational; government has developed strategies and policies, established agencies, and promoted and funded innovation programmes; the region is densely populated with HEIs, including several of the best in South Africa and Africa and even a few with international stature; the region is the economic epicenter of southern Africa (if not the entire continent); and business is keen to get on board, diversify and expand.

But although the stage appears to be set for the developmental transformation and optimization of the region, concerns remain about whether the outcomes are truly significant and innovative, and whether regional HEIs are being proactive in their role as educators, researchers and civic leaders. One message that comes through clearly from studies around the world is that the competition to create and innovate is intense. Other countries and regions – including some already on par with Silicon Valley – that began decades ago to shift their focus to innovation and knowledge creation are unrelenting in their efforts to improve. So the GCR and others are getting into the innovation game late, as well as having to try and catch up to a 'moving target'. No region or country can afford to rest on its laurels for fear of falling further behind. In short, even if it is presumed that creativity and innovation in the GCR are robust – and this paper would argue that the quantity and quality of cutting-edge creativity and innovation activities in the GCR are modest at best – much remains to be done.

Another important insight from the literature is that effective communication that includes and embraces every constituency is essential to creating, implementing and nurturing innovation in a region. It cannot be one-sided, top-down from government. It cannot be self-absorbed academic rhetoric, nor the completely self-serving and profit-driven approach favored by industry. It cannot exclude the masses who not only deserve to participate and benefit, but who may also hold the potential to make contributions that might yield remarkable breakthroughs. The conversation needs to start immediately, continue through the difficult times when there seems no point to it and, most importantly, – be creative and innovative.

A successful regional development strategy cannot be developed without the committed involvement, consideration and co-ordination of the full range of regional stakeholders. It cannot be developed if everyone remains in their compartmentalized 'silos', refusing to take part in and contribute to significant conversations that build a shared framework. Regional leaders must understand and accept the legitimacy of each other's needs and goals to gain new insights into opportunities and methods of aligning their individual interests for mutual benefit. Purposeful conversations allow innovative ideas to emerge that incorporate diverse points of view and integrate different perspectives and needs, and lead to strategic alignments. HEIs are well positioned to create and maintain the 'public space' where these crucial and complex conversations can take place.[173] HEIs must have the willingness and capacity to 'reach out' to the region, whilst public and private sector role-players must also be motivated and able to 'reach in' to HEIs to seek expertise and knowledge that can contribute to regional growth and development.[174]

[173] US Economic Development Administration, 2009. *op. cit.*

[174] Goddard, J. & Kempton, L., 2011. *op. cit.*

The GCR has had some success in transforming the region and making it relevant in the knowledge-based world economy, but it must do a great deal more. At the very least, each role-player in the GCR must continue to question whether the region is doing enough of the right things in the most effective ways to live up to its self-promotion as a world-class African city. The list of questions is long and fascinating. Some say 'the important and difficult job is not necessarily to find the right answers, but rather to find the right question'. So, are HEIs, industry, government and communities in the GCR asking the right questions to drive regional development? Listed below are several questions that emerge from the information presented in this paper:

- Can the GCR currently be described as a 'learning region'?
- What can and must HEIs, industry and government do to stimulate a 'revelation of truly original insights' in the GCR? What are the main problems in the GCR networks? Where are the 'silos'? Why do they exist? How can they be made transparent, or at least more penetrable?
- How can differences between the pursuit of scientific excellence, commercial reward and civic upliftment be rationalized to address the economic and social challenges facing South Africa?
- Does South Africa really know what it means to 'collaborate in order to compete'?
- How porous is the innovation boundary between HEIs, industry and government in the GRC? How easily does innovation move between them?
- To what extent, if any, do HEIs, industry and government in the GCR exhibit a philosophy of innovation as a co-creative and user-driven collaborative process?
- Is the GCR producing the number of highly educated and skilled workers needed to fuel an open innovation ecosystem?
- What are the barriers to more active engagement and involvement by HEIs in the development of the GCR? Where are the opportunities for them?
- What forms of engagement currently exist that enable HEIs, industry and government to interact productively? What is the 'density of interaction' within the network of HEIs, industry and government in the GCR? What more is needed? How can these forms be improved and extended?
- It has been suggested that the innovation process must be 'orchestrated' rather than managed. Is that true? What does it mean in practical terms for role-players in the GCR?
- Given the political structures of the country, who is authorized and capable of providing 'regional leadership'?
- In the context of Florida's thesis that technology, talent and tolerance (the so-called '3Ts') are important factors in regional development, where does the GCR rank in the '3T sweepstakes'?
- What must be done to get the private sector to engage in more activities that benefit the GCR?
- What can be done to overcome some of the inertia that is endemic in government?
- Do role-players in the GCR really believe that it is possible to turn a competitive disadvantage into a collaborative advantage?
- How well are HEIs in the GCR fulfilling their education and training role (including professional development and life-long learning)?

- How effective is the GRC in capitalizing on its HEIs as drivers of knowledge generation and innovation? How well does the GCR understand the objectives, priorities and obligations of HEIs and how these affect their capacity and motivation to become involved in regional development?

Regional development is a complex and multi-faceted concept that extends beyond economic growth and job creation. The GCR requires a focused but flexible approach to regional development that allows it to explore the diversity of perspectives, experience and assets embedded in the region. It must identify what it is, what it can be and what it wants to be. It should not strive to be the next Silicon Valley, because every region is unique and must be smart about how it chooses to become a competitor in the global knowledge-based economy. In order to become a 'regional triple helix space'[175], HEIs, industry, government and communities (which makes it a quadruple helix) need to embark on a process of self-evaluation on how well they are working together towards the development of the GCR. This can then fuel a creative, innovative and ongoing conversation on how to make the constituent parts of regional development in the GCR work together more effectively.

[175] Smith, H. L., Romeo S. & Waters, R., 2013. Entrepreneurship, Innovation and the Triple Helix Model: Evidence from Oxfordshire and Cambridgeshire. *Working Paper 12*, CIMR Research Working Paper Series, Centre for Innovation, Ma

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