DA Policy on Innovation

December 2013

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1. Introduction

To deliver on the DA's vision of an Open Opportunity Society for All, we must ensure that our education system equips South African job-seekers with the skills they need to succeed.

This requires an integrated system of post-school education and training which provides a range of pathways for both young job-seekers and adult learners to obtain qualifications and skills that can help them be successful in the world of work.

To be a winning nation, South Africa must also be a place where new ideas are generated. This should include ideas to improve the way we deliver services, ideas to connect people to each other and with the information they need to make informed decisions about their lives. It should include ideas for new products that can generate income, ideas to improve the efficiency of processes in both the public and private sector and ideas to solve our key societal challenges - for example in education, health, housing, social protection and job creation.

We must establish support innovation that allows us to take ideas and turn them into new products, processes, services and technology that meet particular needs.

> *Innovation has always played a decisive role in the economic and social development of countries: it is the main source of economic growth, it helps improve productivity, it is the foundation of competitiveness, and it improves welfare.* (World Bank, 2010)

As the most important basis for competitive advantages in the global economy shifts from resources to knowledge, the success of our education and skills development systems and our capacity to innovate will become increasingly more important.

On a manufacturing level, the economic success stories from countries such as South Korea, Taiwan and Singapore show us that dedicated national strategies and actions to unleash innovation can change the economic destiny of a nation. Since 1960, South Korea has grown from one of the five poorest countries in the world to the 11th richest country in the world[1]. Between 2009 and 2012, South Korea's Gross Domestic Product (GDP) per capita averaged US$22 590 (versus US$7 508 in South Africa)[2]. South Korea managed this economic turnaround primarily through quality education, an unrelenting focus on innovation (specifically product innovation and design), and the development of products for niche markets in the global economy[3].

Knowledge economies that have moved beyond manufacturing rely on networks of insight and innovation that depend upon high level attributes of training and knowledge which allows individuals and groups to bring together ideas and learning in new ways. For example: the knowledge economy

[1] Viljoen, C. 2013. 'Watter Korea vir SA?', in *Die Burger.* Available. [Online]: http://www.dieburger.com/opinie/2013-10-31-forum-watter-korea-vir-sa (November 2013).
[2] World Bank. 2013. 'GDP per Capita: current US$'. Available. [Online]: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD (November 2013).
[3] Viljoen, 2013.

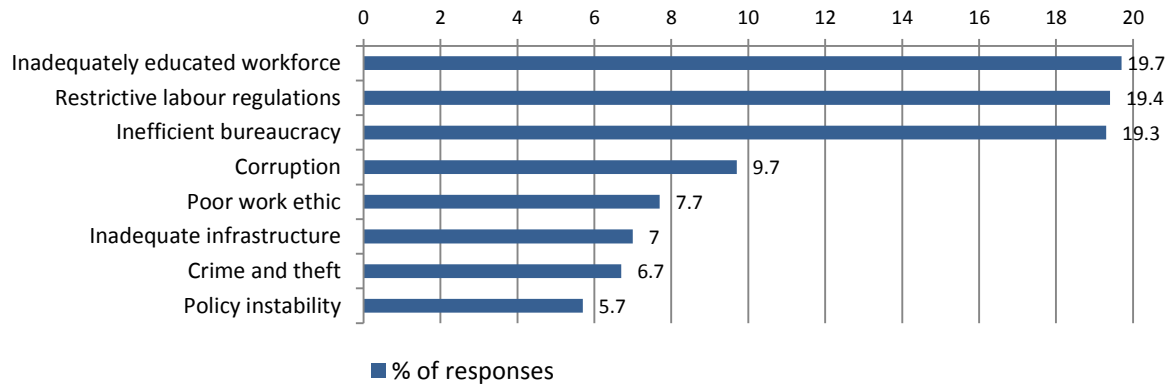
in Silicon Valley is driven by a multiplicity of high level skills as well as effective models for knowledge-sharing.

To bring us closer to the 8% economic growth that we need to create jobs and improve lives, we need an innovation system that can turn ideas into solutions for our social challenges and that can support the development of knowledge-based products and services in which the South African economy can be competitive.

South Africa can be a flourishing centre of innovative development and we are starting to establish the building blocks to deliver the kind of education, training, research and development opportunities that will equip enough people with high-level skills to meet the needs of an expanding economy.

But we are not there yet. The World Economic Forum still considers South Africa's "inadequately educated workforce" as one of the key constraints to doing business in South Africa.

Graph 1: The most problematic factors for doing business in SA

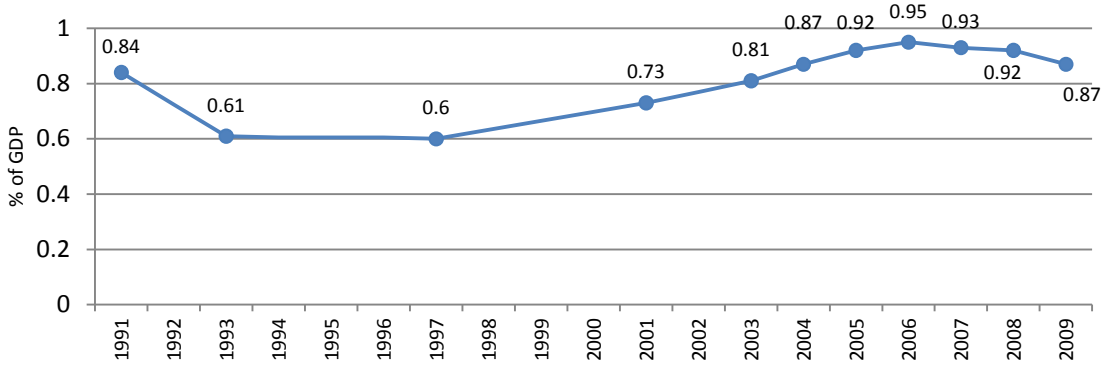


Source: World Economic Forum, *Global Competitiveness Report: 2013-14.*

Critically, South Africa has neglected to match its policy commitment to improved education and skills with a dedicated focus on innovation and design to drive job creating economic growth. The institutions created to promote innovation for growth (such as the National Advisory Council on Innovation) have been largely invisible and their activities have not been appropriately coordinated or integrated with initiatives in the private sector.

Our investment in research and development (R&D) to drive innovation is comparatively low. We are moving further away from our targeted spending of 1% of GDP, whilst in 2010, member-countries of the Organisation for Economic Cooperation and Development (OECD) invested, on average, 2.38% of GDP in R&D.

Graph 2: Investment in Research and Development as a % of GDP



Source: Human Sciences Research Council. 2013. National Survey of Research and Experimental Development: 2009/10 Fiscal Year.

The DA believes that the quality of South Africa's post-school education and training outputs and the country's innovative capacity can be strengthened through:

- A coordinated system for Post-School Education and Research driven through a single, integrated department;
- Demand-driven education, training and research institutions that meet social demands and develop the high-level skills and research that we need to grow the economy;
- Greater collaboration and coordination towards the achievement of shared goals between role players in the private sector; in public higher, further and adult education and training institutions; in vocationally oriented training; in local, provincial and national government; and in entities with a mandate to coordinate innovation.
- A streamlined institutional environment in which all stakeholders have clear mandates that feed into national strategic priorities;
- A much greater focus on vocational training;
- Support for occupational and professional education in dedicated institutions;
- Consolidation in the training environment for adult basic education and training;
- A differentiated support model for universities to ensure that they are able to deliver on their teaching, research and community interaction functions;
- The use of telematics and distance learning to expand education opportunities;
- Stronger incentives for private sector involvement in education, training and research-driven innovation – with a specific focus on pushing R&D investment to more than 1% of GDP;
- Innovative mechanisms to bring brilliant minds together;
- Making sure that the regulatory environment supports, rather than inhibits innovation and academic endeavour;
- Dedicated systems to ensure that innovation extends beyond research and ideas to the actual design of products, processes and services that can contribute to economic growth; and
- Strategic roll-out of flagship projects that showcase South Africa's attractiveness as an innovation-driven investment destination.

These proposals are discussed in more detail in section 3.

2. Key obstacles to building the skills base and promoting innovation

Our policies to improve the skills base in South Africa and to boost innovation must help to overcome the current obstacles to an effective post-school education and training environment and the constraints on investment in research and development.

The current constraints in our post-school education and training environment and innovation landscape have been comprehensively analysed in a 2007 review of South Africa's innovation policy by the OECD[4], in the 2008 Ten-Year Innovation Plan[5], in the 2012 Green Paper on Post-School Education and Training[6], in the 2012 report of the Ministerial Review Committee on Science, Technology and Innovation[7], and in the National Development Plan (NDP) released in 2012[8].

There is growing consensus around the obstacles faced by South Africa in these fields. These include the following:

Poor quality of basic education

Our basic education system does not currently produce enough learners who are prepared for the job market, have the knowledge and skills to become entrepreneurs, or have a sufficient academic grounding to succeed in further education.

A study released by the Council for Higher Education in August 2013 revealed that only one in four students in contact institutions graduated in time, only 35% of the total intake, and 48% of contact students graduate within five years, and only 5% of African and coloured youth are succeeding in higher education[9].

Poor performance in maths and science means that learners do not build the skills they need to become cutting edge innovators. The 2012 *Trends in International Mathematics and Science Study* (TIMSS) report ranks South Africa third last of the 63 countries and 14 participating benchmark countries for mathematics.

Skills shortages at all levels

South Africa is not producing enough learners and graduates with skills in mathematics, science and technology to succeed in a global economy increasingly driven by knowledge[10].

[4] OECD. 2007. *OECD Reviews of Innovation Policy: South Africa.* Danvers, MA: OECD.
[5] Department of Science & Technology. 2008 *Ten Year Innovation Plan.* Available. [Online]: http://www.info.gov.za/view/DownloadFileAction?id=94066 (September 2013).
[6] Department of Higher Education and Training. 2012. *Green Paper on Post-School Education and Training.* Available. [Online]: http://www.info.gov.za/view/DownloadFileAction?id=157779 (September 2013).
[7] Department of Science & Technology. 2012. 'Report of the Ministerial Review Committee on the Science, Technology and Innovation. Available. [Online]: http://www.info.gov.za/view/DownloadFileAction?id=167434 (September 2013).
[8] National Planning Commission. 2012. 'National Development Plan: Chapter 9 – Improving education, training and innovation'. Available. [Online]: http://www.npconline.co.za/ (September 2013).
[9] MacFarlane, D. 2013. 'Damning CHE report into university performance', in *Mail & Guardian.* Available. [Online]: http://mg.co.za/article/2013-08-20-damning-che-report-into-university-performance/ (August 2013).
[10] OECD, 2007.

We have also not succeeded in creating a sufficient corps of engineering designers and industrial designers who can close the innovation loop by turning ideas into real products, services or process improvements.

Where high-level skills do exist or are being developed, they are not being harnessed and connected effectively to form a sufficient human resource network for a knowledge-based economy.

Not enough focus on vocational and non-university based training

A diversity of pipelines towards job-ready skills and the "streaming" of learners towards vocationally oriented basic education and further training is now being emphasised in policy proposals made by government.

It has, however, long been neglected and has suffered in an environment where the patchy quality of Further Education and Training (FET) Institutions has discouraged learners from pursuing alternative training paths.

The Green Paper on Post-School Education and Training estimates that headcount enrolment for vocationally oriented and college-based courses was just over one third of total university enrolment.

This has left South Africa with an inverted pyramid of post-school education in which we are not building a strong skills based through good colleges and vocational training, but are attempting to push an increasing number of students through a straining and very expensive university system.

The Green Paper concedes that, in their current form, FET colleges cannot absorb significantly large numbers of students, cannot achieve acceptable levels of throughput and have not been successful in playing an effective role in providing the theoretical component for apprenticeship programmes.

Funding for post-school education

A lack of financial resources and insufficient financial aid for students are seen as important constraints in all forms of post-school education[11]. Whilst the National Student Financial Aid Scheme (NSFAS) is helping many young people to further their studies, it is agreed that demand still exceeds the available finance and that there is a need to increase support for students presently receiving aid support[12].

The Green Paper on Post-School Education and Training also concedes that the levy-funded institutions, including the Sector Education Training Authorities (SETAs) and the National Skills Fund are "poorly coordinated" with public institutions and that very little skills-levy funding is being used to pay for training and education in universities and public colleges.

Inept management in the tertiary sector

Many public education institutions are facing management problems. On university-level, this was perhaps most powerfully illustrated in the case of Walter Sisulu University, which faced closure in August 2013 after a protracted strike could not be resolved.

[11] Department of Higher Education and Training, 2012.
[12] Department of Higher Education and Training, 2012.

In September 2013, a reply to a DA parliamentary question indicated that since 2011, 20 of the 50 FET Colleges have been under administration.

Government must take steps to ensure that South Africa's education and training institutions, and particularly vocationally-oriented FET Colleges, are able to deliver the skills that our economy needs, are effectively managed and that structured interventions take place where managerial or governance break-downs occur.

Poor coordination

The Departments of Higher Education and Training and Science & Technology are highly inter-dependent in terms of the mandates on which they have to deliver.

Efforts to improve the coordination between the two departments, including a collaboration agreement drafted in 2010, have not been effective in building complementarity between the broader innovation system and the approaches to post-school education and training.

In addition, strategic focus in both the education and training environment and the innovation system is being compromised by a proliferation of institutions, including government departments, research institutions, advisory councils, science councils, universities and quality assurance bodies that lack the guidance of a coherent strategy and effective mechanisms to clarify mandates and allocate resources in the best interest of the country.

Training and research initiatives are not responsive to market and social demands

The education, training and research activities in South Africa are not sufficiently responsive to either the needs of the business community or the social demands in our society.

This skills mismatch has created the bizarre situation that South Africa is simultaneously experiencing a skills shortage *and* high unemployment.

The Ministerial Review suggests that the state's investment in innovation has been driven more by "big science" than supporting the research and technological needs of the economy and South Africa's "social development priorities". In addition, the OECD review found that South Africa's national system of innovation is not providing appropriate support for the transition from a resource- and commodity-based economy, to one characterised by "knowledge-intensive, high-value adding, high-income, productivity-raising activities"[13].

Innovation starts with an idea and ends with a product, a service or a process improvement[14]. Our current technical innovation system lacks support for the innovation process from an idea or concept to the development of specifications, the initial design, prototype development, evaluation, improvement, industrial production and marketing. Similarly, there is not a sufficient focus on bringing together innovators from a variety of disciplines to develop processes and models to

[13] OECD, 2007.
[14] Viljoen, 2013. Interview with DA representatives on 23 October 2013, Stellenbosch.

address our social challenges, test these in controlled circumstances and develop them for broader application.

To improve this situation, we need an integrated system of training and innovation that is able to:

- identify strategic training, learning and research needs;
- assess training offerings and the available support schemes for needs-driven research;
- monitor skills supply and research output;
- facilitate greater interaction between skills and training providers and the businesses and public entities that require skills; and
- make continued recommendations for targeted research support.

Insufficient incentives for business involvement and integration in the training and innovation system

In South Africa, nearly 60% of R&D is performed by the private sector[15]. The private sector has a particular focus on technology and the adaptation of research for commercial purposes. The state has, on the other hand, focussed more strongly on "big science", sometimes at the expense of applied research and technology-driven innovation.

It is imperative that the innovation activities funded or incentivised by the state are aligned with innovation needs, and particularly the applied research needs of the country and the economy. A significant increase in R&D investment will require active involvement by the private sector. This means that we need both public funding for research that is responsive to business needs and a system of incentives for private investment in R&D that recognises the value of active private sector participation in the national system of innovation.

Business involvement is also crucial in the post-school education system – particularly in identifying skills gaps, providing opportunities for work-based learning and participating in curriculum development.

SETAs have not been effective in performing an intermediary role in skills need identification and facilitating workplace skills training. Over the past ten years, South Africa has spent more than R57 billion on SETAs[16]. SETAs are inefficient, overly bureaucratic and unresponsive to the actual skills needs of the South African economy. The Minister of Higher Education and Training, Blade Nzimande, has criticised the poor quality of training provided through SETAs and has said that the country has little to show for the massive investment made in them[17]. The role of SETAs in our training landscape must be reconsidered.

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[15] OECD, 2007.

[16] Ramutloa, L. 2013. *Billions spent on training but the investment has not advanced transformation: Department's Transformation Indaba told.* Department of Labour. Available. [Online]: https://www.labour.gov.za/media-desk/media-statements/2013/billions-spent-on-training-but-the-investment-has-not-advanced-transformation-departments-indaba-told (May 2013).

[17] Ensor, L. 2012. 'Little to show' for Seta funds – Nzimande. in *Business Day.* Available. [Online]: http://www.bdlive.co.za/articles/2012/03/07/little-to-show-for-seta-funds--nzimande;jsessionid=A2C3D100C57F094D0F0CFAF73905380D.present1.bdfm (May 2013).

Our proposals around a new regime for vocational training are outlined in section 3.2.1., but it is worth mentioning here that we believe that the SETA system should be abolished and that the incentive to train should go directly to business through a system of outcomes-based measurement and rewards.

An ageing research cohort without a strong human resource pipeline

Strong innovation activity in the business sector must be supported by the expansion of university research. Whilst the current funding model for tertiary institutions is boosting research output, universities are not producing enough new "research-capable" or "research-trained" human resources – for example by increasing the output of Masters and Doctoral students or including a research focus in other degrees and qualifications[18].

> *The shortfall of human capital development is the key weakness of the national system of innovation. While the inadequacies of the schooling and training system are widely acknowledged, with consequent shortages of well-equipped school-leavers, artisans and technicians, deeper insights are also needed into the throughput of postgraduates and the production and retention of public sector academics, researchers and science council staff. Measures to optimise the availability of skilled individuals remain a vital framework condition.* (Ministerial review of Science & Technology, 2012)

Immigration policy

South Africa's immigration policies are inconsistent with the country's human resource needs. This impacts on the availability of skills to grow the economy and the skills supply in the innovation system and stifles collaborative teaching and research relationships in our post-school education system.

It is imperative that we make it much easier to bring high level skills into South Africa.

Measurement tools to improve policy

The national skills and innovation systems must be responsive to changes in the national and international environment. Effective adaptability is, however, reliant on good information on the relevant changes and on the status of current systems and their outcomes.

In the post-school education system, there is insufficient information on labour market needs, poor data on educational institutions and their offerings and little coordination in terms of how the available information is analysed.

The innovation system faces similar challenges in terms of coordinated identification of innovation needs and the fact that key reports, including the National Science and Technology Expenditure Plan and National Survey of Research and Experimental Development provide retrospective analysis rather than strategic direction for research planning.

[18] OECD, 2007.

Resources for innovation

There are limited resources available. This applies to both funding for formal research and development activities and venture capital funding for start-ups and innovation-driven enterprises. To kick-start innovation, the funding model for innovation activities must be reviewed.

This should include a much greater focus on applied research that can promote technology transfer from academia to industry and allow us to start building a competitive basket of marketable design products that can contribute to economic growth.

Investment in knowledge infrastructure

An effective training and innovation system requires effective knowledge infrastructure, including universities, vocational colleges, research facilities and state laboratories with equipment for research[19]. It also requires supporting infrastructure, such as fast, reliable internet access and reliable electricity supply.

South Africa's knowledge infrastructure is under pressure. The OECD expressed concern that without significant investment in the current public research and development system *and* the expansion of current facilities, the country's knowledge infrastructure would not be able to meet expanding demand.

Protecting and developing indigenous knowledge

Developed from the experience of indigenous and local communities, traditional knowledge is a valuable both for the members of communities who rely on it in their daily lives and for industry and agriculture that develop modern applications of this knowledge[20]. There is, for example, a growing recognition for the value of traditional knowledge in promoting biodiversity, to maintain healthy ecosystems and to develop plant-based medicines and health products[21].

In South Africa, research on and knowledge of indigenous knowledge remains limited. There are also serious concerns around the protection of traditional knowledge in our intellectual property laws.

The post-school education system must establish suitable support measures for the development of traditional knowledge and for the inclusion thereof in higher education curriculums. The development and protection of traditional knowledge will also be aided by a clear and efficient legal regime with regard to the protection of the intellectual property associated with it.

3. The DA's policy offer on skills, training and innovation

We need an integrated, efficient system of post-school education and complementary measures to promote knowledge-driven innovation in order to create a society in which opportunities are continuously broadened by finding new ways to grow the economy and address development

[19] Department of Science & Technology, 2012.
[20] United Nations Convention on Biological Diversity. n.d. *Living in harmony with nature: Traditional Knowledge, innovation and Practices.* Available. [Online]: https://www.cbd.int/undb/media/factsheets/undb-factsheet-tk-en.pdf (October 2013).
[21] United Nations Convention on Biological Diversity.

challenges and in which citizens are equipped with the skills and knowledge they need to use those opportunities.

To grow the economy and create jobs, our innovation system must have a sufficient focus on turning ideas into marketable products, services and process improvements.

The DA's key proposals for the reform of South Africa's post-school education and training landscape and to make the innovation system a driver for growth are outlined below.

3.1. An integrated system for Post-School Education and Research

3.1.1. A single department

The DA would merge the Department of Higher Education and Training and the Department of Science and Technology to form a single department of Post-School Education and Research – similar to the German Federal Ministry of Education and Research.

This Department and Ministry would be responsible for:

- Developing assimilated policies for post-school education and research-driven innovation;
- Clarifying mandates and overseeing training and research institutions and quality assurance bodies;
- Identifying priority areas for training, research and innovation;
- Maintaining an integrated view of the education and training landscape and identifying areas for development – particularly with regard to the academic foundation required for a thriving innovation system;
- Engaging with both private and public sector stakeholders to ensure that education, training and innovation meet the demands of the economy and work to address our most important development challenges – for example: poverty relief and improving education outcomes and health services;
- Developing effective models for the funding and incentivisation of education, training and research-driven innovation; and
- Determining needs and coordinating projects to maintain and improve knowledge infrastructure in cooperation with the private sector.

3.1.2. Institutional support for a national education, training and innovation system

To address problems related to coordination and collaboration between various institutions involved in post-school education, training and research-driven innovation, the DA supports:

- A comprehensive review of the functions and performance of the various supporting and quality assurance institutions with a view to rationalising the support environment and clarifying mandates.
- The establishment of a National Council on Research and Innovation with the capacity and authority to:
  - determine demands in the research sector,

- identify niche industries for development,
- make recommendations on strategic priorities,
- take responsibility for major funding allocations,
- provide effective oversight over large-scale projects (where funding exceeds a specified amount),
- oversee the work of public research entities like the Human Science Research Council (HSRC), the Council for Scientific and Industrial Research (CSIR) and bodies like the Agricultural Research Council and Medical Research Council that report to line departments, and
- establish and roll out a research infrastructure roadmap for South Africa – as per the recommendations of the Ministerial Review Committee on Science, Technology and Innovation.

We agree that this Council should be chaired by the Deputy President and propose that the Minister of Post-School Education and Research should be the Deputy Chair and that members should include Ministers of relevant departments and representatives from the private sector, higher education institutions and civil society.

- The reform of the National Advisory Council for Innovation into a secretariat for the National Council on Research and Innovation to compile evidence, map the innovation system, monitor and evaluate output and provide information to inform the decisions of the Council.
- The use of the National Research Foundation (NRF) as a central institution to provide merit-based and capacity-building funding for research to both established researchers and post-graduate and post-doctoral students.
- The roll-out of National Centres of Research Excellence - modelled on the Australian system which provides support to research teams to become involved in collaborative research in priority fields.
- The use of public-private partnerships subject to strict service level agreements to strengthen the scientific and technological service laboratories and the relocation of these laboratories to appropriate science councils – as proposed in the Ministerial Review Committee on Science, Technology and Innovation.
- The strengthening of the National Skills Authority to:
  - identify training needs;
  - advise the Minister of Post-School Education and Research on a national skills development strategy;
  - receive and collate information from workplace skills plans;
  - directly reimburse employers for training provided (in the absence of SETAs); and
  - allocate subsidies from the National Skills Fund.
- Scrapping the ineffectual system of SETAs and allowing employers to be reimbursed directly for training initiatives and for limited transfer of levy funding to industry-bodies in order to build their capacity to identify training needs and to engage with education and training institutions to develop demand-driven qualifications.
- Establishing a clear Memorandum of Understanding between the Department of Basic Education and the Department of Post-School Education and Research to ensure that the basic education system delivers learners that are able to succeed in post-school education and that can become the next generation of researchers, scientists and innovators (our plans to improve Basic Education are discussed in detail in our Basic Education Policy). The Memorandum must include

an agreement on the improvement of career guidance to make sure that learners make informed choices about their subjects, post-school options and career paths.

- Cultivating a more cooperative relationship between the Department of Defence and the Department of Post-School Education and Research to ensure that, where appropriate, scientific discoveries and technological advances developed for the military are studied and adapted for civilian application.

3.2. Reforming post-school education and training

3.2.1. Greater focus on vocational training

In national government, the DA will prioritise the re-introduction of nation-wide practical skills programmes. This will include:

- A renewed focus on vocational schooling for which curriculums will be developed in partnership with industry.
- Encouraging dual technical and vocational training programmes presented through FET colleges that includes simulated practical work and workplace based practical experience.
- Streamlining the confusing system of SETA-accredited non-technical learnerships and the technical apprenticeships (or artisan training) until recently run under the terms of the Manpower Training Act of 1981. There are currently nearly 1 000 registered trades and significant duplication in terms of certifications offered for a specific skill[22]. The DA supports the recommendation of industry experts that this should be rationalised into a uniform, cross-sectoral list of around 100 'generic trades'[23]. Quality assurance can be centrally managed through the Quality Council for Trades & Occupations and trade tests can be administered through relevant industry bodies.
- Tax incentives for employers who accommodate FET students for workplace experience.
- Encouraging greater flexibility in the labour regime regarding apprentices through minimum wage determinations that promote rather than inhibit the appointment of apprentices.
- Support for the establishment of a South African Institute for Vocational and Continuing Education and Training to build institutional capacity in the college sector – as proposed in the Green Paper on Post-School Education and Training.
- A specific focus on developing a corps of entrepreneurs that can take ideas and turn them into business opportunities.

3.2.2. Strengthening the FET sector

The DA supports the current efforts to revitalise the Further Education and Training Sector.

In national government, we would focus our efforts in this regard on:

- Ensuring that training and education programmes provided by colleges serve real needs and equip students with the skills they need to find employment in the South African economy;

[22] Van Rensburg, 2012. 'Reinventing the apprenticeship system in South Africa'. Available. [Online]: http://www.leader.co.za/article.aspx?s=6&f=1&a=4115 (September 2013).
[23] Van Rengsburg, 2012.

- Establishing effective coordination between basic education and the FET sector in providing a vocational training stream – as an alternative to academically focussed education;
- Making FET colleges the driving force behind a renewed focus on vocational training and establishing them as institutions of choice for school leavers and those wishing to expand their skills base;
- Strengthening institutional capacity and coordination in the college sector through the establishment of a South African Institute for Vocational and Continuing Education and Training;
- Continuing investment in the recapitalisation of colleges and the expansion of their infrastructure – including student housing that supports learning;
- Improving the quality of college lecturers (on both a technical and didactical level) - this can be aided by encouraging greater involvement of experienced private sector employees in teaching and research activities at colleges and using universities to train lecturers for the college sector;
- Developing a differentiated support system that would give strong institutions greater independence and allow weaker institutions to be assisted more directly;
- Integrating public colleges that currently fall under other government departments into a central college sector managed by the Department of Post-School Education and Research whilst maintaining strong links with relevant line departments to advise on curriculum and training needs;
- Encouraging provincial and local governments to support FET colleges that can provide critical skills for regionally-strategic industries;
- Establishing strong systems of articulation between basic education, the college sector and universities, allowing students to transfer relevant credits, to get appropriate recognition for prior learning, and to use the college sector to prepare for university education if they wish to obtain a bachelors degree but did not get the required marks in Grade 12 to qualify for university admission. In this, we will emulate the Californian system in which the successful completion of a 2-year course at a state college guarantees a student transfer to a state university focussed on undergraduate studies. The state college system feeds into the University of California campuses (Berkeley, Los Angeles etc.) which has a stronger focus on post-graduate training and provides undergraduate admission to only the top 12.5% of high school graduates.

3.2.3. A stronger focus on occupational and professional education

The DA supports dedicated occupational and professional education, preparing students for careers in a specific occupation or profession and providing opportunities for continued professional development.

As such, we support the establishment of:

- An additional institution providing training to veterinary scientists;
- Dedicated teacher training colleges (possibly linked to universities) offering both higher and continued education courses and that maintain strong links to schools that can provide workplace experience;
- Dedicated nursing colleges connected to hospitals that can offer workplace-based training;
- Colleges aimed at increasing the number of trained social workers and social auxiliary workers in the country;

- Agricultural colleges; and
- Occupation-specific academies (e.g. for the police).

Occupational or professional colleges can be affiliated to established universities and their activities should be coordinated and overseen by the Department of Post-School Education and Research.

3.2.4. Consolidating adult basic education in Community Education and Training Centres

The DA supports the proposals in the Green Paper for Post-School Education and Training to develop a consolidated system of adult basic education through Community Education and Training Centres that provide "second chance" learning opportunities for out-of-school youth and adults.

These centres must:

- Improve coordination in adult learner programmes that are provided by various entities – including civil society organisations, trade unions, social movements and government departments;
- Be encouraged to follow a core curriculum and standardised assessment methods;
- Be institutionally and financially stabilised to provide sustainable careers for a permanent corps of teachers;
- Have capacity to assist adult learners in preparing for National Senior Certificate examinations;
- Offer training that can build on the strengths and capabilities of learners to enhance their ability to develop sustainable livelihoods outside of the formal sector.

3.2.5. Universities that support a growing economy and a prospering nation

> *Innovation-driven economies tend to have strongly-differentiated higher education systems in which universities of applied science or technology play an important role in human capacity provision.* (Department of Science & Technology, 2012)

Universities are a crucial building-block in the higher education-innovation interface and must be supported to deliver on all three of their core functions, namely teaching, research and community interaction.

In national government, the DA would support the following initiatives to ensure that universities are able to prepare students for the world of work and can fulfil their functions of scientifically innovative, commercially oriented and socially relevant knowledge development:

- A differentiated system of university education which allows traditional universities, universities of technology and comprehensive universities to focus on their core strengths and to become building blocks in an integrated system providing a diversity of programme offerings and research outputs;
- Ensuring that appropriate funding is provided to different types of universities, based on their development trajectory and position on a continuum of higher education functions (from more teaching-oriented to specialist research oriented institutions);
- Greater integration with the FET sector – particularly in providing bridging programmes for learners to be accepted into degree-level qualifications;

- Strengthening universities of technology and comprehensive universities to play a greater role in developing practice-oriented skills;
- Greater involvement by public research entities and the private sector in postgraduate supervision;
- Boosting funding for posts for post-doctoral researchers to enhance the attractiveness of academic careers;
- Appropriate support for private universities that can help to address critical skills shortages;
- Greater investment in university infrastructure –particularly student accommodation;
- Encouraging the cross-border movement of staff and students to facilitate knowledge exchange and stimulate innovation;
- The establishment of dedicated units for curriculum studies – aimed at educating a corps of trained developers for basic, further and higher education curricula;
- The promotion of interdisciplinary courses that can develop the high-level skills required for effective participation in the knowledge economy; and
- Finding an appropriate balance between:
  - The humanities and social sciences, where people learn how to think, analyse and dissect;
  - The economic sciences, that are essential for advanced economies and can continue to bolster South Africa's competitive edge in the financial economy;
  - The technical sciences, that can form the basis of knowledge-driven products and innovation;
  - The pure sciences, that are a bedrock of the knowledge economy; and
  - Training in professions where South Africa is experiencing critical shortages.

3.2.6. Telematics and distance learning

In an environment of resource constraints, distance learning and the effective use of information and communications technology is an important tool to broaden learning opportunities.

In national government the DA would encourage the use of telematics to allow learners in various levels of the post-school education system to access learning on a non-contact basis.

This must be coupled with an initiative to achieve universal access to internet services (more detail on this is provided in the DA's Communication Policy).

Students should also be encouraged and assisted to access international opportunities for distance learning in areas where local institutions may not have expertise.

3.2.7. Research chairs

The Research Chair Initiative of the Department of Science and Technology has proved an effective tool for encouraging research-driven innovation at higher education institutions in South Africa.

The DA would continue to invest in this initiative whilst ensuring appropriate monitoring and evaluation of the projects initiated through this programme and its contribution to strategic research objectives.

3.2.8. *Incentivising employers to participate in work-based training schemes*

In national government, the DA would put greater emphasis on involving employers in work-based training programmes and provide incentives to employers who do offer training opportunities.

Key initiatives will include:

- Involving employers (through industry bodies) in identifying training needs and informing curriculum development for vocational training;
- Using the empowerment scorecard to recognise employers for accommodating interns and apprentices in their places of work;
- Allocating levy funding to industry bodies subject to clear commitments by employers to provide work-based training opportunities; and
- Making sure that wage agreements include appropriately lenient provisions for apprenticeship wages.

3.2.9. *Funding for post-school education*

To ensure that school-leavers, job-seekers and those wishing to upgrade their skills are not prevented or discouraged from obtaining the skills they need to succeed, a national DA government would:

- Encourage the use of skills levy funding for both short courses and long-term studies at universities and Further Education and Training (FET) Colleges;
- Support the use of preferential funding for the development of scarce skills;
- Expand the assistance provided through the NSFAS and implement current proposals to make NSFAS funding for the full cost of study available as loans to poor students which can be converted to bursaries if studies are successfully completed;
- Provide state sureties for students who do not qualify for NSFAS bursaries, but are seeking student loans from commercial banks;
- Allow students studying towards qualifications in areas where the public service is in need of skills to repay public loans through public service.

3.3. Kick-starting innovation

Innovation is an engine for job-creating economic growth. According to estimates by the OECD, a 1% increase in the ratio of R&D investment to GDP raises economic activity by 1.2%[24].

South Africa has a number of good universities, and a selection of top-flight research institutes, specifically in high-value industries such as pharmaceuticals and science and technology research. In the Global Competitiveness Report, South Africa is ranked 34th in the world in terms of the quality of our scientific research institutions and 30th in terms of industry-university collaboration on R&D[25]. South Africa has the intellectual assets to become a world-class centre for R&D.

[24] Faulkner, D., Loewald, C. & Makrelov, K. 2013. *Achieving Higher Growth and Employment: Policy Options for South Africa.* South African Reserve Bank Working Paper. WP13/03.
[25] World Economic Forum. 2013. *Global Competitiveness Report: 2012-2013.* Available. [Online]: http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf (August 2013).

The National Survey of Research and Experimental Development measures R&D investment by business enterprises, government, higher education institutions, not-for-profit institutions and science councils. The latest survey shows that South Africa's investment in R&D is actually decreasing[26]. We are moving further away from our targeted spending of 1% of GDP, whilst in 2010, member-countries of the OECD invested, on average, 2.38% of GDP in R&D.

Smart policy reforms will be needed at a national level to harness South Africa's intellectual assets to boost our country's overall competitiveness, to drive growth and to address development challenges.

Developing the manpower needs for innovation is an essential building block in developing an innovation system that can meet demands, solve problems and contribute to growth. An effective innovation system must, however, go beyond that. The system must allow and support innovators to turn ideas into products and solutions. This means that we must have a much greater emphasis on design, and develop the necessary infrastructure, financial support and incentives to sustain every phase of the innovation cycle.

3.3.1. A pragmatic agenda

The World Bank Guide on Innovation Policy in Developing Countries[27] suggests a pragmatic approach to innovation policy in which policy reforms and tools are implemented incrementally and are carefully monitored to determine their impact, to allow for fine-tuning and to prepare for broader roll-out.

In national government, the DA would adopt such an incremental approach to ensure that policy interventions serve their intended purposes and are improved over time to support national priorities.

3.3.2. Make sure that innovators know what support is available

A national DA government would develop an integrated information portal on the South African research landscape and funding system.

Good information on the support and funding available for research can also enhance South Africa's attractiveness as a global innovation and R&D hub and contribute to a "brain gain".

The portal can be modelled on the German "Land of Ideas" website, which brings together information on support available to students and researchers on different levels in a variety of areas. This website also provides information on support available in identified strategic areas (for example: biotechnology, energy technologies, medical technologies, production technologies etc.).

[26] Wild, S. 2013. 'R&D in SA: No rhythm, only blues', in *Mail & Guardian.* Available. [Online]: http://mg.co.za/article/2013-06-21-00-rd-in-sa-no-rhythm-only-blues (August 2013).
[27] World Bank. 2010 *Innovation Policy: A Guide for Developing Countries.* Washington: World Bank.

3.3.3. *Demand-driven innovation*

South Africa needs a greater focus on strategic and applied research of social and industrial relevance[28]. Our innovation policy must support innovators in turning their ideas into marketable products, services and solutions.

The DA supports initiatives to:

- Establish stronger links between higher education and industry – for example through the National Council on Research and Innovation, appropriately supported interaction between higher education institutions and industry bodies, and the encouragement of privately funded research by higher education institutions (which can also provide an important source of third-stream funding).
- Involve the private sector in post-graduate supervision;
- Strengthen capacity within the CSIR to provide an interface between industry and higher education institutions;
- Develop effective mechanisms to incentivise private sector R&D activities (see section on funding below);
- Increasing support for the linkage programme for public and industry researchers through the Technology and Human Resources for Industry (THRIP) project;
- Provide tax concessions for business-sponsored scholarships and bursaries for public research institutions;
- Make greater use of earmarked funding for research in niche areas;
- Strengthen the capacity of the Technology Innovation Agency to deliver on its mandate to provide financial and non-financial support for the development and commercialisation of competitive technology-based services and products;
- Improve the coordination between the activities of entities responsible for developing commercial applications for research – including the Council for Scientific and Industrial Research and the Technology Innovation Agency; and
- Increase the focus on innovation that meets societal needs, including improved service delivery and social development. Research in this regard should aim to find new solutions to social challenges, should originate responsibly-managed case studies and must develop mechanisms to roll out successful pilot projects on a wider scale.

3.3.4. *Funding for innovation*

The funding landscape for research-driven innovation in South Africa is currently complex and inaccessible and lacks strategic coordination.

The DA believes that this can be improved by:

- Allowing the National Council on Research and Innovation to identify research priorities and oversee funding allocation;

[28] OECD, 2007.

- Creating a web-based portal to access information on the types of support available for research in various areas, the funding cycles for financial support, application processes and opportunities for research partnerships;
- Making greater use of earmarked funding for research in priority fields;
- Using a range of funding models, including grants, low cost loans and free access to publicly owned land, buildings and knowledge infrastructure;
- Consolidating public grants in the NRF;
- Establishing a venture capital fund to support researchers to turn their work into marketable products;
- Securing funding for the development and protection of indigenous knowledge; and
- Providing support towards the cost of patenting.

3.3.5. Celebrating innovation and bringing innovators together

Creative research can benefit from greater interaction between researchers both nationally and internationally. To develop a innovation and design oriented culture, we must improve awareness around the value of innovation and design and promote great South African innovators as role models.

A national DA government would:

- Consider the cross-border and inter-institutional partnerships of higher education institutions in the allocation of funding;
- Encourage higher education institutions and public research organisations to establish student exchanges;
- Use the platforms provided by the multi-lateral organisations in which South Africa plays an important role (including the SADC, African Union and the BRICS) to stimulate regional and international research collaboration;
- Make greater use of funding for team-based research (such as the Centre for Research Excellence initiative); and
- Establish a more flexible system of immigration for skilled persons, including:
  - Reducing the complexity and time taken in visa application processes;
  - Allowing foreign doctoral graduates to obtain long-term work permits for South Africa – as proposed in the NDP;
  - Determining a window period wherein immigrants with refugee visas who can provide proof of tertiary qualifications or formal technical skills can be fast-tracked in converting their refugee visas to work visas; and
  - Creating a fast-tracked visa approval system for highly educated individuals (for instance graduates from the top business schools and universities in the world).
- Invest in awareness campaigns around great South African inventions, the people that are responsible for them and what they mean for growth and development.

3.3.6. An enabling regulatory environment

It is part of government's role in innovation to indirectly create a favourable environment for innovative activity. Innovation can be encouraged through a regulatory environment that both encourages R&D activities and provides sufficient protection for intellectual assets.

In South Africa, this can be achieved by:

- Strong tax incentives for private sector investment in R&D;
- Allowing for accelerated depreciation of equipment used in R&D;
- Reducing the cost of world-class inputs by exempting imported R&D inputs from import duties;
- Establishing techno-parks, industrial zones or city-rejuvenation projects that can act as sites for innovation (supported by appropriate infrastructure, reduced red tape, an accommodating regime of taxes, rates and utility fees and investment in the skills required for the relevant industry);
- Using techno-parks as innovation hubs where innovators are supported in turning their ideas into marketable designs (including support in developing specifications, initial designs, developing prototypes, industrialisation and ultimately the marketing of products);
- The full implementation of Intellectual Property Laws – including the protection of patents, trademarks, designs and copyright;
- Separate legislation to protect indigenous knowledge (rather than the current attempts to accommodate protection for indigenous knowledge in existing intellectual property laws);
- Allowing intellectual property developed with the support of public funding to be fully owned by the developers of the knowledge with appropriate provisions allowing the state to use the results of publicly funded R&D.

Our economic policy also recommends the development of dedicated Jobs Zones (a form of Industrial Development Zones or Export Processing Zones) which offer an attractive suite of incentives and appropriate infrastructure for businesses focussed on turning ideas into products. Incentives for economic activities within these zones should prioritise innovation-driven businesses that can drive the effective beneficiation of South Africa's raw materials and add value in the productive process.

3.3.7. Strategic flagship projects

Flagship projects like the Square Kilometre Array and the African Resource Management Constellation Agreement are important tools to showcase South Africa's research and innovation capacity, to attract funding and to encourage international experts to consider the country as a research destination.

Flagship projects must, however, be integrated with the country's research priorities and (as proposed by the NDP) must build on our areas of comparative advantage – including our indigenous knowledge systems.

These projects can also be used to showcase the value of research and science and raise awareness within local communities.

4. Conclusion

South Africa's success as a nation will be determined by the country's ability to generate knowledge and ideas and to establish a post-school education environment that will equip students for meaningful economic participation. Our innovation system must provide the appropriate infrastructure, financial support and incentives to sustain every phase of the innovation process – from the original idea to the ultimate product.

Important groundwork has been laid in the Green Paper for Post-School Education and Training and the Ministerial Review on Science, Technology and Innovation, but important challenges lie ahead to implement excellence and demand-driven education and innovation systems. To grow the economy and expand economic opportunities we must face these challenges head-on.

The DA's proposals can strengthen our post-school education and innovation systems and make them effective drivers for growth and development.