Distinguished delegates, ladies and gentlemen

In 2003, at the opening of the SASA conference, Honourable Minister Trevor Manuel presented four challenges to SASA members. Since then, many SASA presidents have stood in front of you, presenting ways of addressing each of these challenges. I would like to reflect on what has been presented thus far, my views on them and more importantly to discuss the importance for the statistical fraternity of South Africa, **to work together**, in order to accomplish the goals of SASA and address the challenges by the Minister.

The first challenge presented by the Minister was to restore trust in official statistics and this had been addressed in 2005 by Professor Sarah Radloff and in 2010 by Yoko Chhana. These centered around:

- Building a track record of a low incidence of errors and readiness to make corrections when this happens.
- How SASA could work with Stats SA in improving public understanding and appreciation of the work that Stats SA is doing.
- Creating awareness globally through initiatives, like the World Statistics day and publicity article publications, thereby highlighting the statistics that were applied in the research to the community.

A lot is currently being done towards addressing this challenge. At the SASA 2011 conference, as part of our programme, we will be presenting ways in which to attract students at open day and there is a plenary by Professor Jacky Galpin on ways in which we can assist Stats SA. We should each also help government in achieving some of its goals since as you are aware government is now implementing evidence-based governance and we can assist through planning, monitoring and evaluation of policies that are implemented. In doing so, we also create visibility of statistics through the media, and if we do this right, we create public trust. Visibility was also mentioned by Dr Khangelani Zuma in 2008 and adding to this, I would like to say that we can create visibility through our South African Statistical Journal (SASJ) and use the journal as a vehicle in South Africa to instil trust in the statistics that we produce. Indirectly related to visibility, Professor Francois van Graan in 2006 presented the state of SASJ and the fact that SASJ was no longer the ISI (Institute for Scientific Information) Thomson rated and had a low impact factor. At the SASA 2011 conference we are discussing these issues and have begun a process to get SASJ accredited with IBSS (International Bibliography of the Social Sciences). The process for ISI accreditation will follow. We are also discussing ways in which the impact factor of the journal can be improved as well as a new outlook for the journal. I must inform all members that SASJ still publishes high quality articles and this will not change. In 2008, Dr Khangelani Zuma also spoke about creating openness in what we do, and this also adds to restoring trust in statistics. This can be further enhanced through the Institute of Certificated and Chartered Statisticians of South Africa (ICCSSA) and as a professional body, it has the ability to instil trust into the statistics by ensuring that the statisticians carry out their job in a professional manner and be held responsible and accountable for disseminating information to the public and thereby creating visibility.

The second challenge by the Minister was related to the fact that there are too few South Africans who love statistics or have a passion for it. This challenge relates directly to building statistical capacity. In 2004, Professor Mbulaheni Nthangeni presented building capacity in official statistics with the help of SASA and the tertiary education institutions in SA. In 2005, Professor Sarah Radloff discussed the increasing “poverty of numeracy” and the factors contributing to this, which are trimming of education budgets, large class sizes, teaching quality, poor counselling to avoid difficult subjects, unattractive syllabuses which are too theoretically oriented. The introduction of Mathematical Literacy in schools was intended to solve some of these issues.

In 2008, Dr Khangelani Zuma pointed to the fact that South Africa requires a surplus of statisticians and we as statisticians should not act as technicians. In 2010, Yoko Chhana spoke about the initiatives SASA was undergoing by signing a memorandum of understanding (MoU)

between SASA and both Stats SA and SAS. These MoUs help develop statistical capacity through scholarships, bursaries and visibility. The SAS MoU will also help create an expert list sponsored by SAS. I would also like to add that the Institute of Applied Statistics is also awarding a number of statistical bursaries and creating visibility of statistics at schools by sending those who are awarded bursaries to various schools to promote statistics. Yoko Chhana also discussed the survey conducted in 2008 by Herrie van Rooy about the staffing situation of statistics departments at tertiary education institutions, the challenge of the age profile of statisticians employed at the university and the difficulty in retaining statisticians at the universities. This survey is to be repeated in 2011. Some of the suggestions given by Yoko Chhana were recruitment of statisticians from overseas universities, however the shortage of statisticians and the age profile consisting mainly of senior statisticians in academia who are close to retirement is a worldwide problem as per a recent article on the "Bleak outlook for academic statistics" published in the RSS News Vol 39 No 2 April 2011; partnerships with industry; scarce skills supplements and establishment of joint industry/academic posts. I will expound on these issues later today.

The third challenge presented by the minister was on the absence of sufficient discourse on methodology and outcomes. In 2007, Dr Immo Kleinschmidt spoke about working in applied research and evaluation of government initiatives by monitoring and evaluating policies and interventions. Dr Kleinschmidt also added that the process of, for example analysing noisy data, often spawned statistical methodology.

The fourth challenge by the Minister was to pace ourselves relative to our capacity. In 2008, Dr Khangelani Zuma explained SA's position with regards to this challenge but also added that we need to be aggressive in developing the skills base in SA especially among those previously disadvantaged.

Transformation was one issue that was not specifically mentioned by Minister Trevor Manuel. However, in 2005 Professor Sarah Radloff spoke about transformation and again in 2007 Dr Immo Kleinschmidt addressed the issue of transformation and said this should have been a fifth challenge by Minister Trevor Manuel. This is certainly something that SASA would still have to address.

This gives a summary of what has been discussed previously. It should be noted that the above were addressed over the last eight years by three presidents in academia, two in science councils and one in government. It is a great pity that the only president during this time who was in industry namely Dr Herrie van Rooy did not give a presidential address because of the ISI conference in 2009. It would have been nice to see the way industry views each of the above challenges. Hence, the focus of what I will present for the rest of my talk will highlight the importance of us working together.

Although many of us have received funding from NRF, not many of us have even applied for THRIP funding. This alone shows that we as statisticians have not infiltrated across the borders between tertiary education institutions, science councils, government departments and industry.

The main difference between the research that is done at tertiary education institutions, science councils, government departments and industries:

- At tertiary education institutions the focus has often been on basic research, which is also known as pure or fundamental research with the intention of expanding man's knowledge of fundamental principles, with no direct or immediate commercial benefits. This is often triggered by man's curiosity. Some researchers at the tertiary education institutions do applied research but this is the limit to the research done by most researchers at tertiary education institutions.
- At science councils the focus has often been on applied or directed research and leaning somewhat towards the development of new technologies, products or services. Applied research is designed to solve practical problems of the world and in doing so improve the

quality and condition of life of the people. Contract research is applied research which focuses on the outcome, namely implementation or manufacture.

- Industry focuses more on implementation of services and manufacturing of the new technologies or products, which has immediate impact on the economy and society.

The above, ranging from basic research to applied/directed research to the development of new products or services and finally to the manufacture of products or implementation of services is what is known as the full research and innovation value chain. It is very important, especially economically, to take the research through the full innovation chain and hence it is important for tertiary education institutions, science councils, government departments and industry to include into the design or plan to work together in order to achieve this. This allows our country to earn royalties and become more sustainable. To stop our research at the initial stages of the innovation chain, namely basic and applied research limits us in our main goal to improve the quality of life of the people in SA. Distinguished guests, ladies and gentlemen, the question for today is: Can we create our knowledge into viable industrial products? William Buxton in a discussion published on *Innovation vs Invention* said "*If you wanted the ideas to come to fruition, you had to spend as much time directing your innovation and creativity to fostering a culture of creativity and a receptiveness to innovation within the company, as you spend on the ideas themselves. If you do not, don't be surprised or disappointed if they come to naught.*"

In order to establish a network of organisations within South Africa that aspires towards the common goal of enhancing innovation, the National System of Innovation (NSI) was developed. The NSI allows open collaboration of research methods between the different organisations such as tertiary education institutions, science councils, government departments or organisations, and industry or stakeholders.

In order to collaborate openly and to act as one unified body, yet protect ones research and ideas, in November and December 2008, the presidency passed two acts, namely, the Technology Innovation Agency (TIA) Act and Intellectual Property Rights (IPR) from Publicly Financed Research and Development Act. These acts were passed mainly to protect intellectual property for South Africa and to enhance innovation. The IPR Act can protect the following: Patents, Technology, Software/IT, Trademarks, Databases and Internet Assets, while TIA will seek to mobilise Venture Capital (VC) through Public Private Partnerships (PPP), support the incubation phase of technology and build skills of scientists and engineers in innovation with the ultimate goal of sustaining the commercialisation process. At the heart of it all will be the Centres of Competence which will be the nerve centres of technology innovation. These centres will comprise representatives from all components of the technology value chain, from the materials providers and researchers (at tertiary education institutions, science councils and government departments) to the private sector.

As noted from the Portfolio Committee on Science and Technology (S&T): "*The fact that a number of SA institutions had been bought by foreign companies and had been commercialised overseas with no benefits accruing to South Africans was named as a major reason for introducing such new legislation. The new law provides for a completely revised enabling environment for IP development and management in South Africa*."

These bills were specifically aimed at regulating the operational implementation aspects of the Innovation Plan, which include:

- the Department of Science and Technology (DST) 10 Year Innovation Plan
- Organisation for Economic Co-operation and Development (OECD) 2006
- National Science & Technology Forum (NSTF) / National Advisory Council on Innovation (NACI) Growth and Innovation Study

We would all have to join forces and work together if we want to play a role in ensuring the innovation chasm is addressed and that the science-policy gap is overcome. This could also be addressed through the creation of Centres of Excellence and Centres of Competence.

You should all be aware of SASA's new constitution and the formation of associated societies, for example, ICCSSA. ICCSSA has the potential to form a platform for statistics departments at tertiary education institutions to partner with industries and to form centres of excellence or centres of competence funded by industry. These centres can provide a multitude of solutions, for example, human capital development and statistics departments at tertiary education institutions to generate income to provide scarce skills supplements and thereby retain and even attract staff. Furthermore, through ICCSSA, statisticians can play a key role in the eight Millennium Development Goals (MDGs). From these MDGs, ten national priorities were identified and the government has derived twelve key outcome areas. These outcomes focus mainly on implementation of services which is the latter part of the research innovation chain and hence the need for tertiary education institutions to partner with science councils, government departments and industry.

Furthermore, as statisticians, we have an important role to play in monitoring, evaluating and assessing these twelve outcomes by providing adequate data and providing evidence as a basis for decision making; and it further supports our mission of SASA "*…to foster the study and knowledge of statistical theory and its application towards improving the quality of life of all South Africans*". Each of these outcomes has targets set by 2015 and it is our duty as South Africans to assist in achieving these targets. Often tertiary education institutions, science councils, government departments and industry working together have a better chance in achieving these targets.

In May 2010, Sam Palmisano addressed the transportation conference in the United States on "A Smarter Planet". In his speech he said that there are 4 billion mobile phone subscribers and 30 billion radio frequency identification tags produced globally and "*because of their increasing sophistication and low cost, these sensors and devices give us, for the first time ever, real-time instrumentation of a wide range of the world's systems – natural and man-made.*" People are currently applying technology in new ways to create a smart bay in Ireland, a smart power system in Malta, a smart telecommunications system in India and a smart food tracking system in Norway. There is an abundance of sensors and instruments recording observations and this information should be exploited. He added that the "*key to smarter systems lies not in the chip, or the sensor, or the mobile device. It's not the smart meter, or the smart power line. It's not even the software, per se.* ***It's the data***." He thus concludes that analytics is the key since it is able to use the data in real time to detect the patterns and spot the correlations. Hence we as statisticians should think of how to use this technology to address the eight MDGs and twelve key outcomes by real time monitoring of the system.

With regards to innovation and invention, what does SA have to show for itself? Internationally we have proven to have the skills to do basic and applied research, for example,

- Researchers like Professor Danie Krige for his pioneering work in the application of mathematical statistics to the valuation of new gold mines using a limited number of boreholes and of ore reserves for existing mines.
- In 1937, the University of the Witwatersrand established the Bernard Price Institute of Geophysical Research. A world-recognized authority on lightning detection and analysis, Dr. Basil Schonland was asked to develop an aircraft detection apparatus (later called radar) for the Defence Force. Using the institute's small but highly qualified staff, this was accomplished. Today, the Defence Peace Safety and Security unit in CSIR is still world renowned for the research on the radar and is bringing in royalties for South Africa and attracting international research funding.

Some of the other well known inventions include

- the CAT scan developed by South African physicist Allan Cormack,
- Sasol is the world's first and largest oil-from-coal refinery,
- the world's first heart transplant was performed by Dr Chris Barnard,
- the South African-made speed gun developed by Henri Johnson which accurately measures the speed and angles of speeding objects such as cricket and tennis balls,
- the swimming pool vacuum cleaner (known as the Kreepy Krauly) was invented by Ferdinand Chauvier,
- the Dolosse which are large, unusually shaped concrete blocks weighing up to 20 tons to break up wave action and protect harbour walls and coastal installations were designed by Eric Merrifield and first installed in East London harbour; and
- Pratley's famous glue invented by George Pratley is the only South African invention that has been to the moon. In 1969 the putty was used to hold bits of the Apollo XI mission's Eagle landing craft together.

We as South Africans should be proud of what we have accomplished but should continue to do so through our research and innovations.

Statistics, as a multidisciplinary science has a major role in the innovation chain and has the potential to address each of the challenges presented by the minister by restoring trust in statistics through image building and creating visibility of the discipline, by building statistical capacity, by addressing the absence of sufficient discourse on methodology and outcomes and by developing the necessary skills base in SA.

In conclusion I would like to quote

- Steve Jobs: "*Innovation distinguishes between a leader and a follower.*"
- Mark Twain: "*Twenty years from now you will be more disappointed by the things that you didn't do than by the ones you did do. So throw off the bowlines. Sail away from the safe harbor. Catch the trade winds in your sails. Explore. Dream. Discover.*"

Dr Pravesh Debba (President 2010/2011) *November 2011*