

**SUB-THEME 3: INNOVATIVE APPROACHES TO EDUCATION AND TRAINING FOR SUSTAINABLE DEVELOPMENT**

**GUEST SPEAKER**



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Prof. Kombo holds a PhD in Sociology of Education, and currently the Acting Dean, School of Education, Kenyatta University. Some of the significant researches he has done include the Impact of Nairobi-Thika Super Highway on Ruiru Town in Kenya and Cactus Pilot Project on Health Promotion in Selected Primary Schools in Nairobi, Kenya. His areas of interest include Education, Research and Community Development. His speech is on Innovative Theories and Models of Competency Based Education for Sustainable Development.

**Linking Competency-Based Education to Research and Innovation for Sustainable Development**

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**Machakos University**

**-1<sup>st</sup> Annual  
International  
conference**

Title: Linking competence based  
education to research and innovation for  
sustainable development in Africa

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Dean, School of Education  
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## Where did we go wrong as a country and continent?

Good policy documents and various commissions for reviewing and reforming our education systems and economy

How can we move away from the quagmire ? Hence no development worth talking about.

Who is to blame for lacuna ?

### 7 Aspirations of Agenda 2063



Higher education is a key pillar for pursuing Agenda 2063

For any meaningful and sustainable socio-economic growth to be realized and sustained, tertiary education must be centrally placed in the development agenda

## What was the main objective of Agenda 2063 ?

To bring about sustainable development in the African countries.  
however,

Is it possible to attain the stated agenda?  
pertinent question

1. Are the academicians able to set the agenda for development away from the politicians?. Or do we rely on politicians?
2. Who is to blame for the Dwindling Funds to education system?
3. Are the universities responsive enough to the needs of the client and market? The market dictates the manpower  
Is our education system accommodative enough? Is it competence based? Even if it was, the prevailing circumstances may not allow for flexibility

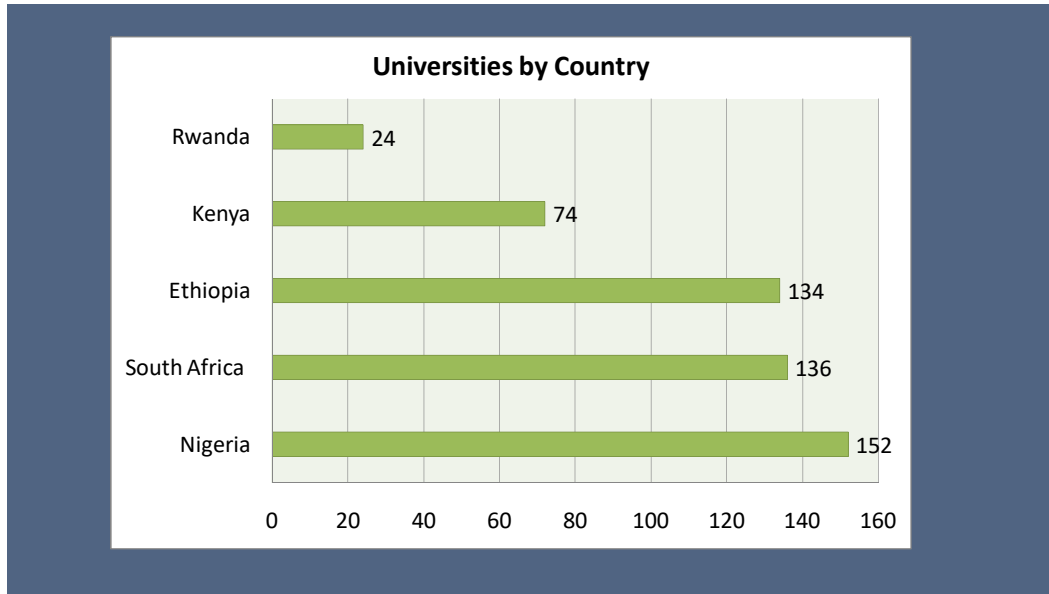
## Strong drive for increasing the number institutions of higher education in Africa.

Countries/People know the importance of education. In this regard, Numbers of universities began to go up in the hope that the concerned country & continent would realize sustainable development.

Example:

Kenya is standing at 74 universities and we are still expecting some more. This is based on the fact that the University Act 2012 allowed university/ies to be opened in each county.

Expansion has also been witnessed in other parts of Africa



## Questions :

Are these countries getting value for their money from the universities since its an investment ?

Have these universities revolutionized the thinking and the economy for sustainable development ?

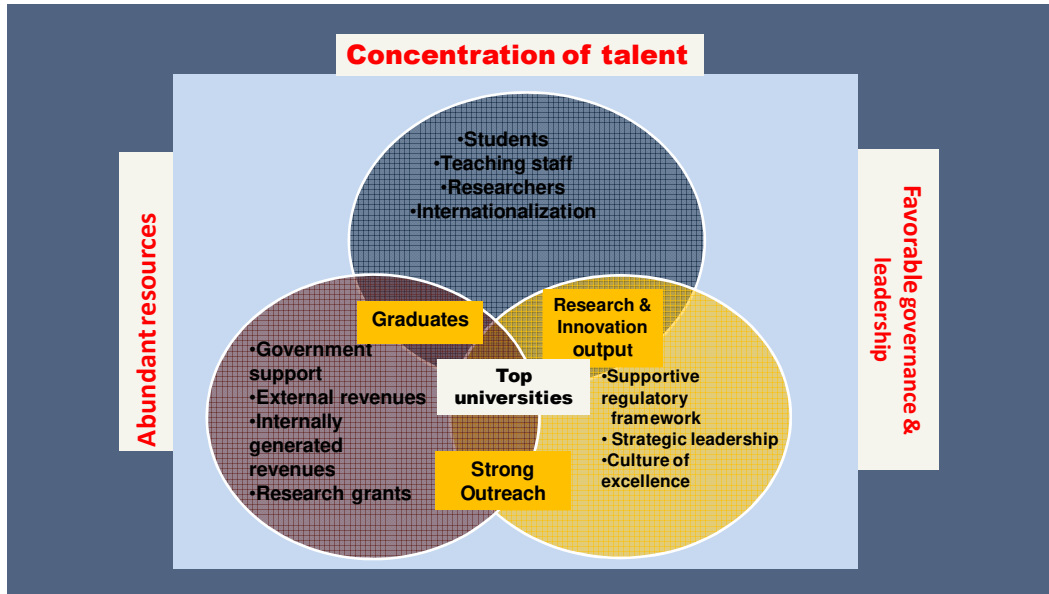


African Universities today  
have clear mission of  
strengthening  
research, teaching &  
learning and community  
outreach to drive  
sustainable development

## Role of universities

- 1. Teaching & Learning
  - Expected to develop human capital relevant to 2016 agenda.
- 2. Research & innovations
  - to generate new knowledge & innovations for sustainable development
- 3. To create opportunities for interactive and sharing of research-based knowledge, information, technologies & innovations.

To undertake these strategic roles universities ought to possess the following attributes.



## Challenges related to the mission of universities in Africa as we think of CBE

Role One: Teaching

Universities have been effective in training and producing manpower. BUT.

1. Is placement of students to programmes right?
  2. Do we have adequate infrastructure in the universities?
  3. Is the quality of training in the universities in tandem with the dictates of the market?
  4. Are the students exposed enough to the right knowledge, skills and content.
- Due to lack of job opportunities, the relevance of training is being questioned.
5. Are we expecting too much?

## Role Two: Research & innovation

Universities in Africa are undertaking research

BUT

Limited research funding

-2% of Kenya's GDP is set aside for research. This compares well with south Africa since the percentage is the same.

-however, research priorities are not being focused on priority area in the universities.----priorities are set by other players and not universities.

-universities are not also blameless since they fail to allocate adequate funds to research.

-Governments in Africa focus more on action research ...such as on food security ,water insecurity etc at the expense of others

## Innovations:

Its through research that countries could realize innovation and sustainable development.

Why is it that innovations and sustainable development are hardly attained despite of all the efforts .

Does the presence of qualified and experienced staff at the universities translate into development?

The answer lies on the type of education and the attitudes of staff thereof. Priorities are sometimes not right and hence a problem with the quality of output.



## The case in point is Kenya's vision 2030

It was well conceptualized but weak on values.

-our value systems are too weak to the extent that people rely on courts for arbitration .

Funding should be dictated by priorities and needs .

Minimal innovations are being produced at the universities due to lack of funds and priorities.

-the available funds are allocated to needy areas but not research.

## Role Three: Outreach

Transfer of knowledge generated to society has remained the weakest point of African universities.

-pursuit for knowledge for the sake of it is a luxury which can not be afforded.

-universities must produce return on investment

-there is need for paradigm shift to put emphasis on knowledge transferred than knowledge generated.

## Core mandate of universities --Research :

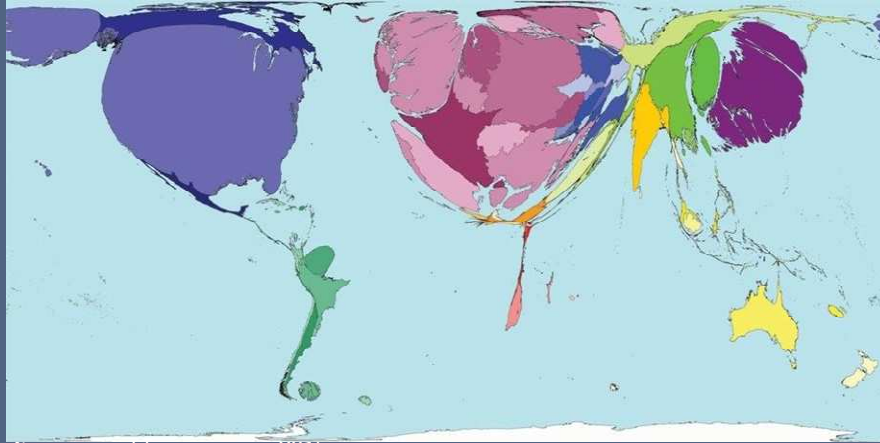
- Research strongly anchored in strategic plans of universities
- Core units have been established to support research and innovation
  - Division of Research, Innovation and Outreach
  - Directorates: RS,RDU,Chandaria BIC, Uni-Industry Linkages, IPR, COEP,ERC
- Aligning it to national and international goals in:
  - Kenya Vision 2030
  - National Commission for Science, Technology and Innovation (NACOSTI)
  - National Research Fund (NRF)
  - Sustainable Development Goals of the UN

## Globally .....

- The new global economic paradigm is knowledge intensive.
- Businesses strive for innovation in value creation in order to remain competitive.
- Innovation drives new product development and high tech value creation
- Innovation economics: recognizes knowledge, technology, entrepreneurship, and innovation are dependent
- Policy should spur higher productivity and greater innovation.
- Kenya and many LMICs perform poorly in this front.



## Map of countries by scientific output

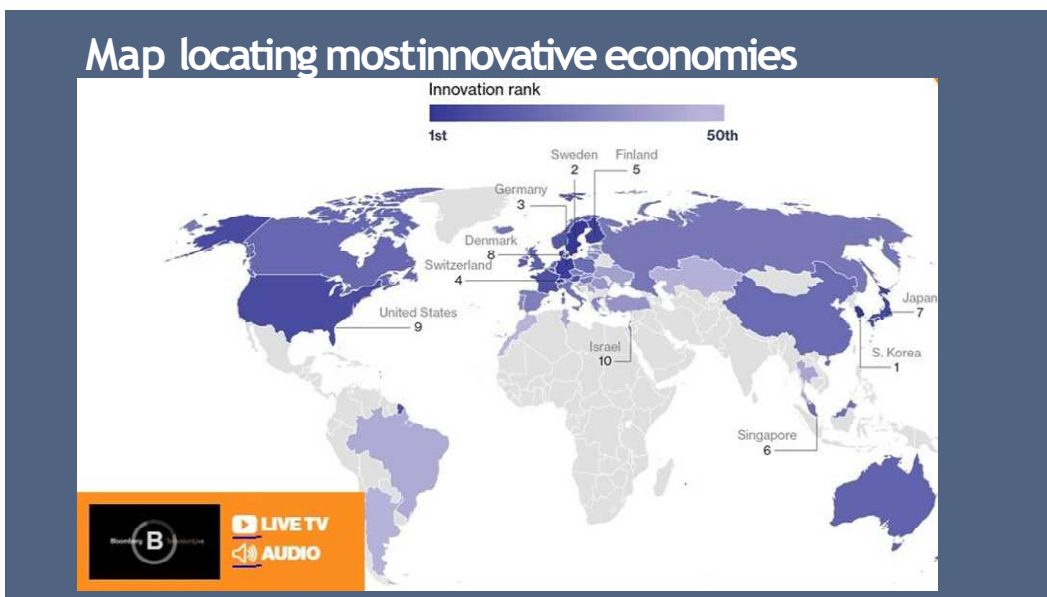


Source: worldmapper.org - 2015

## Global Innovation Index (GII)

- GI is an annual ranking of countries by their capacity for, and success in, innovation.
- Computed using average Innovation Input and output Indices
- Published by Cornell University, INSEAD, and the World Intellectual Property Organization, etc
- Based on both subjective and objective data from World Bank etc.
- Used by corporates and governments to gauge level of innovation.
- In 2017, all top 30 countries are high-income countries, except China

Global Innovation Index 2016/17 Rankings			Global Innovation Index 2016/17 Rankings		
2017 Rank	Country	2016 Rank	2017 Rank	Country	2016 Rank
1	<a href="#">Switzerland</a>	1	16	<a href="#">Hong Kong, China</a>	14
2	<a href="#">Sweden</a>	2	17	<a href="#">Israel</a>	21
3	<a href="#">Netherlands</a>	9	18	<a href="#">Canada</a>	15
4	<a href="#">United States</a>	4	19	<a href="#">Norway</a>	22
5	<a href="#">United Kingdom</a>	3	20	<a href="#">Austria</a>	20
6	<a href="#">Denmark</a>	8	21	<a href="#">New Zealand</a>	17
7	<a href="#">Singapore</a>	6	22	<a href="#">Chile</a>	25
8	<a href="#">Finland</a>	5	23	<a href="#">Australia</a>	19
9	<a href="#">Germany</a>	10	24	<a href="#">Czech Republic</a>	27
10	<a href="#">Ireland</a>	7	25	<a href="#">Estonia</a>	24
11	<a href="#">South Korea</a>	11	26	<a href="#">Malta</a>	26
12	<a href="#">Luxembourg</a>	12	27	<a href="#">Belgium</a>	23
13	<a href="#">Iceland</a>	13	28	<a href="#">Spain</a>	28
14	<a href="#">Japan</a>	16	29	<a href="#">Italy</a>	29
15	<a href="#">France</a>	18	30	<a href="#">Cyprus</a>	>30



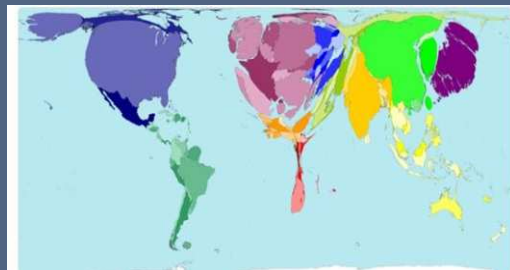
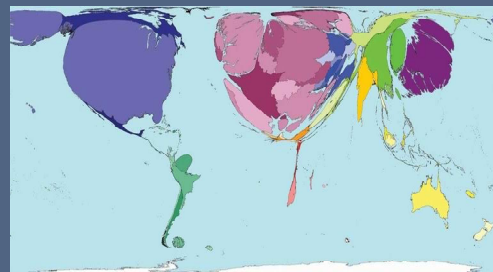
## Innovation generates wealth: Map of the world weighted by wealth - 2015



Note the similarities between:

1. Size by scientific output

2. Size by wealth



## Innovation capacity and Fortune 500 firms density

- The Fortune 500 ranks companies according to their annual revenues.
- US firms dominate = 134 entries
- China = 103
- Japan = 52
- UK = 26
  
- 63% of firms in 4 countries only.

## The worlds biggest companies in 2016



## Who/ where are the most reputable companies?

[www.reputationinstitute.com/global-reptrack-100](http://www.reputationinstitute.com/global-reptrack-100) : 2017 data

Rank	Home	2017	Pulse Score
1	Switzerland	 <b>ROLEX</b>	80.38
2	Denmark	 <b>LEGO</b>	79.46
3	United States	 <b>The Walt Disney Company</b>	79.19
4	Japan	 <b>Canon</b>	78.28
5	United States	 <b>Google</b>	78.22
6	Germany	 <b>BOSCH</b>	78.12
7	Japan	 <b>SONY</b>	77.74
8	United States	 <b>intel</b>	77.74
9	The United Kingdom	 <b>Rolls-Royce</b>	77.66
10	Germany	 <b>adidas</b>	77.27

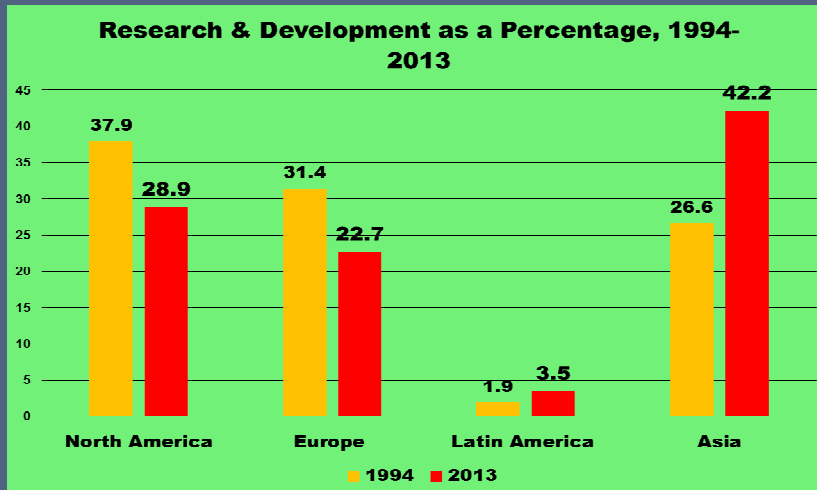
source: Reputation Institute's 2017 Global RepTrak® 100

## Innovative economy metrics: ref. Bloomberg, 2017

2017 rank	2016 rank	YoY rank change	Economy	Total score	R&D intensity	Manufacturing value-added	High-tech Productivity	Tertiary density	Researcher efficiency	Patent concentration	Patent activity
1	1	0	S. Korea	89.00	1	1	32	4	2	4	1
2	3	+1	Sweden	83.98	5	11	15	7	18	5	6
3	2	-1	Germany	83.92	9	3	16	5	12	16	9
4	5	+1	Switzerland	83.64	8	6	2	11	16	14	4
5	7	+2	Finland	83.26	4	13	20	15	5	3	5
6	6	0	Singapore	83.22	14	5	12	17	1	6	12
7	4	-3	Japan	82.64	3	9	28	8	27	9	3
8	9	+1	Denmark	81.93	6	17	5	13	22	2	11
9	8	-1	U.S.	81.44	10	22	10	1	34	20	2
10	11	+1	Israel	81.23	2	30	30	3	20	1	18
11	10	-1	France	80.99	12	34	18	2	10	18	10
12	13	+1	Austria	80.46	7	7	11	23	6	10	17
13	16	+3	Belgium	77.18	11	21	9	10	19	19	25
14	14	0	Norway	76.89	19	36	3	12	25	8	15
15	18	+3	Netherlands	75.23	17	24	19	6	44	15	19
49	49	0	Argentina	44.62	46	28	44	-	47	41	48
50	48	-2	Morocco	43.99	42	43	48	33	48	47	49

## Innovative economy metrics

1. Tertiary efficiency :
  - ✓ Total enrolment in tertiary education, as %of post secondary cohort;
  - ✓ minimum share of labour force with tertiary degree;
  - ✓ annual new science and engineering graduates as %of total tertiary graduates and %of labour force.
2. R&D intensity: Research and development expenditure, as %GDP
3. Manufacturing value added: MVA, as %GDPand per capita
4. Productivity: GDPand GNI per employed person age 15+
5. High tech density: Number of domestically domiciled high tech public companies, e.g. aerospace, defense, biotechnology, hardware, software, etc
6. Researcher concentration: professionals, including postgraduate PhD students engagedin R&D per million population.
7. Patent activity: Resident patent filings, total patent grants and patent in force per million population.





- ❑ New trends have been emerging in research & development globally
- ❑ North America's share of research for instance declined from 37.9% in 1994 to 28.9% in 2013
- ❑ In Europe, it fell from 31.4% to 22.7%
- ❑ In Asia it rose from 26.6% in 1994 to 42.2% in 2013
- ❑ China more than doubled its publications from 9.9% in 2008 to 20.2% in 2014

### **Africa's Research Profile**

- ❑ In 2013, Africa accounted for only 1.3% of global Research and Development
- ❑ Africa contributes around 1% of the global knowledge, the lowest in the world
- ❑ The continent's gross domestic expenditure as a share of GDP was 0.5% compared to the world average of 1.7%
- ❑ It was 2.7% for North America, 1.8% for Europe, 1.6% for Asia and 0.7% for Latin America in the same period

❑ In 2013, Africa's share of world researchers was 2.3% compared to 42.8% for Asia, 31.0% for Europe and 18.5% for North America

❑ As for researchers per a million inhabitants, Africa had 169 compared to Asia with 786, Europe with 3,219 and 4,034 for North America

❑ Within the continent, South Africa, Nigeria and Egypt dominate on all three indicators and many countries are negligible in the production of knowledge

❑ The 2016 benchmarking report for the World Bank-initiated Partnership for Skills in Applied Sciences, Engineering and Technology (PASET) shows research output remains low in Sub-Saharan African universities

❑ This affects African institutions in global university rankings

## Global Innovation Index, 2017

Europe	GII	Asia	GII	Sub-saharan Africa	GII
Sitzerland	1	Singapore	7	South Africa	57
Sweden	2	China	14	Mauritius	64
UK	3	Japan	16	Kenya	80

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UK	3	Japan	16	Kenya	80

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#### **4) Innovation & change**

- Most universities in Africa are not adopting fast enough to the global and dynamic trends
- There is little innovation in most African universities

#### **Cautionary Tale: The Eastman Kodak Company**



Eastman Kodak invented the digital camera, held much of the intellectual capital (patents) for photography, and at one point owned 95% of the photography business in the world.

Ultimately, Eastman Kodak ceased to be a photography business, and failed, because it could not adapt to a new world.

Is This Something George Eastman Would Have Done? The Decline and Fall of Eastman Kodak Company. Paul Snyder. 2013.

## 5) Research Challenges in Africa

- Uptake low - a lot of research still on the shelves
- Important for National visions (Vision 2030), regional goals (Vision 2063 & international visions (SDGs 2030)
- Questions: is there a relationship between research visions & research being undertaken in our universities?
- Are we developing the next generation of researchers?
- Are we investing enough in research in our universities?
- Are the structures in the universities strong enough to support research?



- Most research is done for promotion, self actualization, income & not for policy
- There is little research support in universities.
- Lecturers are not competing for international research grants & little directly goes to universities
- Plagiarism – many students are involved in this & we need central policy for this



- ❑ Our marginal position in research and innovation reflected in international and local rankings/ standing;
- ❑ Low innovation, research and development outputs

## Challenges of innovation in the African universities.

1. Managements and lecturers are not comfortable with changes.  
.Lloyd Armstrong says that individuals are wary of changes that challenge old thinking and require new skills to succeed.  
-assumption is that with high concentration of highly qualified and skilled manpower ,innovations would come from the universities

However, many of the institutions are the opposite of the expectation.

A contradiction since the continent has many educated and experienced lecturers but minimal innovations?  
innovation has been painfully slow----- which in turn impacts negatively on the economic development of the continent.

## 2.Regulations in the institutions :

There are many and cumbersome regulations originating from the government .it comes in form of oversight roles

-it may undermine innovativeness and researches

-the plethora of regulations and the rate at which guidance memos are issued serve to force the institutions away from the culture of research innovations towards the culture of compliance.

-complying to regulations could be too costly and detrimental to innovation.

-the time,staff hours,reporting cost,audits,consultants needed to comply with all the regulations can cost insitutions millions of shillings.

- However ,regulations with moderation are not bad for the universities

## 3.Tradition of the universities in Africa.

Most of the lecturers are in their comfort zones since they are assured of their payment at the end of every month.

-many would also oppose innovations as a strategy of protecting their brand and reputation. They lack serious competitors.

4. The administrative structures of these institutions pose a serious challenge to innovations .

Most administrators may not be comfortable with the major changes....changes which could water down their chain of command. Such changes may not be accommodated.

It may affect their autonomy and chain of command and hence the fear and resistance .



## 5. Innovations require money for coming up with infrastructure :

New laboratories ,buildings ,classrooms ,equipments ,machines etc would be required.

### 6. Fundings.

Funding in all the universities has been decreasing due to competing interest and needs of other priority areas.

### 7. Accreditation:

This is a peer review process and it is necessary for quality control. However ,new programs for innovations may be subjected to long and tedious process of accreditation.

## 8. Government may pose an impediment

Policies put in place show that the institutions of higher learning are under management boards.

There are expectations ,regulations ,policies ,laws within their jurisdictions of each institution.

All these could lead to unnecessary bureaucracies as an impediment to innovations

Competing and shrinking sources of funding

### 9. Funding based on Performance

There is a move to link funding to quantification of performance.

However, many of the outcomes in higher learning are not easily quantifiable to the satisfaction of all and sundry.

## 10. Measurements tend to be traditional of looking at the output in terms of

Graduation rates,retation rates,job placement,student loan default  
-its difficult to quantify output from the instutions of higher learning.  
-this is an outdated method which fails to take cognizance of all the manifests.

11.Lack of clear path ways in our education systems coupled by serious culture of high demand for academic papers and not competencies /skills This is a paradox which needs to be addressed.

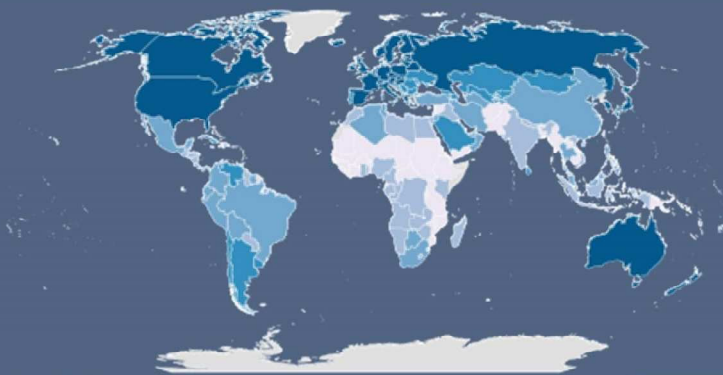
## University opportunities

### i) Research

- Identify & reward professors who undertake research to shape policy
- Universities should commission researches to address **the national vision?**
- Programmes at the universities to be adjusted in such a way that talents are discovered and natured
- Universities should employ people who will be funded to carry out research and innovate.

# Opportunities and Proposals

## Education Index 2015



0 1,500 3,000 4,500 Miles

Frída L. Anhammar  
University of Illinois, 2017  
Sources: UN Development and Report 2016

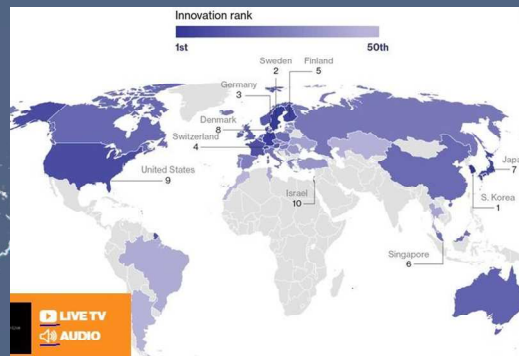
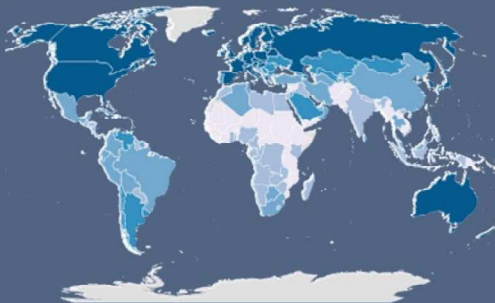
Legend:	
0.206 - 0.474	0.707 - 0.808
0.475 - 0.622	0.809 - 0.939
0.623 - 0.706	Data unavailable











[https://en.wikipedia.org/wiki/Education\\_Index](https://en.wikipedia.org/wiki/Education_Index)

Comparative analysis of the table indicates that Education is not Taken seriously in Africa.

## linkage between Education & innovation & development

Education Index 2015 Innovation ranking



Country	Education index													
	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013
 Afghanistan	0.076	0.103	0.121	0.175	0.226	0.297	0.309	0.321	0.332	0.344	0.357	0.365	0.365	0.365
 Albania	0.541	0.528	0.537	0.529	0.565	0.595	0.596	0.598	0.600	0.601	0.602	0.609	0.609	0.609
 Algeria	0.321	0.347	0.382	0.424	0.493	0.563	0.570	0.581	0.598	0.615	0.631	0.643	0.643	0.643
 Israel	0.675	0.706	0.714	0.764	0.820	0.848	0.846	0.849	0.844	0.847	0.848	0.851	0.854	0.854
 Italy	0.542	0.556	0.592	0.650	0.695	0.762	0.768	0.775	0.779	0.780	0.784	0.790	0.790	0.790
 Jamaica	0.483	0.496	0.527	0.564	0.588	0.648	0.652	0.656	0.660	0.664	0.668	0.668	0.668	0.668
 Japan	0.663	0.681	0.699	0.740	0.767	0.785	0.790	0.792	0.795	0.800	0.802	0.808	0.808	0.808
 Jordan	0.433	0.466	0.495	0.644	0.671	0.707	0.706	0.707	0.714	0.708	0.703	0.700	0.700	0.700
 Kazakhstan	0.534	0.581	0.606	0.633	0.683	0.755	0.759	0.758	0.759	0.755	0.754	0.759	0.762	0.762
 Kenya	0.348	0.369	0.392	0.414	0.431	0.467	0.472	0.491	0.502	0.512	0.515	0.515	0.515	0.515

Considers number of years a child is likely to spend in education/schooling

## Case study: South Korea

- Currently 13th largest economy globally and 3<sup>rd</sup> largest within Asia.
- One of the four 'Asian Tigers' alongside Hong Kong, Singapore and Taiwan.
- Investment in education and research at the heart of South Korea's growth.
- Tops in R&D intensity, value-added manufacturing and patent activity
- Is in top-five rankings in high-tech density, higher education and researcher concentration.
- In 2004 S. Korean government set a target of attracting 100,000 foreign students to its universities by 2012.
- By 2011, 85,000 international students from 171 different countries.
- Current target is 200,000 international students by 2020.

## Samsung Academic Initiatives

- Spends 100 million USD in R&D activities with universities worldwide
- Seeks creatively-minded and challenge-oriented investigators
- Connects and collaborates with leading researchers and scientists
- Prepares for new challenges and explores wide-open possibilities for the future.
- Shares resources, leverages ideas and taps into others' expertise
- Creates vibrant innovation ecosystems, amplifies efforts, enhance speed and efficiency of innovation
- Pushes the boundaries of discovery to new horizons, towards the most promising breakthroughs.
- Ultimate goal is to generate more value for people and society!

## Case study: Singapore

10\_Creativity and Innovation in Singapore Economy\_7.pdf

1 / 4



In 1988, the SME Master Plan arguably marked the initial coordinated national attempt to upgrade Singapore businesses and promote domestic entrepreneurship. In 2003, the Ministerial Committee on Research and Development (MCRD) concluded that bold reforms were needed to transform Singapore into an R&D-driven innovative knowledge-based economy (Chia, 2005).

Did the initiatives succeed? Nearly a decade later in 2011, when Apple co-founder Steve Wozniak was invited as a motivational speaker to Singapore, he made the observation that a company like Apple could not emerge in societies like Singapore. He added, though many people were educated with well-paid jobs, "creative elements" in society seem to have disappeared and people are not taught to think for themselves (Mahtani and Holmes, 2011).

## Way forward

- To have and strengthen competence based education
- To rekindle and nurture Africa's innovativespirit in the continent.
- To provide quality education which in turn should to stimulate research, innovation, creativity, sustainable development etc.
- To deliver an optimal mix of knowledge, skills, attitude, etc.
- Safeguard balance between Social and Natural sciences.
- To provide relevant education, e.g. Coding - the new "foreign" languages!
- To align local innovation metrics to global standards.
- To harness the intelligence and creativity of the faculty members.
- To give faculty members a latitude to innovate.

- Link research to the development of priority areas e.g SDGs & Agenda 2063
- Promote international research and development cooperation based on continental interests and ownership.
- Expand competitive grants and awards and other support mechanisms to nurture young academics and accomplished researchers.
- The government to guide on the priority areas.

- Strengthen data collection, management, analysis and communication, the creation of education management information systems, regular information publications and support for education research and think-tanks.
- There is need for Government guidance on priority areas in research - Governments to allocate a high proportion of GDP to research but money going to individuals who submit good proposals

## To reduce all the bottlenecks in terms of regulations.

-to enhance autonomy for effective thinking.

Adapting a business model -modus oparadi changes.

Diminishing sources of finances calls institutions to adaptive survival tactics .

### **-Adapting a business model.**

Institutions to think and act more like businesses.

Reduce the operational cost, minimize tuition expenses ,operate efficiently,

To reflect on the viability of all the programs



## Commercializing education & research

University lecturers to Come out of the ivory towers and Adopt different models/ strategies depending on the areas of specialization.

-1.lecturers in the field of Education to “adopt a school strategy” This is where all the members in the school of education could offer their expertise in a model school.

lecturers in their areas of specialization could offer their expertise eg management,psychology,comtech etc

2.Department of agriculture to allow their lecturers to consult/ visit farmers in the counties and create a model county of excellence. impact

-add value to their products and increase productivity as a result of research

## Business school

Could offer their expertise in coming up with a model bank

Universities in this regard could be negotiating with the government for more research funds and not salaries.

such strategies could lead to economic development

researchers should at all times be encouraged to come up with innovations.

## Education to be revised as per the dictates of the market

Realign and bench mark it to the best systems in the world

Educators to think out of the ordinary and reach out to the government and communities.

Change the old mentality /attitude of being at the ivory tower and make an impact in the society.

## **ARMY WORM- Tiny insect terrorizing the whole country –Why are the researchers?**





2 | National News

**Food security** > Ministry says experts on the ground to confront menace

# Farmers stare at huge losses as armyworm marches on

Invasion by the pest has increased production costs for farmers, threatens yields for this year

BY NATION TEAM  
newsdesk@ke.nationmedia.com

Cereals growers in North Rift region, the country's grain basket, are staring at heavy losses due to the re-emergence of the Fall



Uasin Gishu Governor Jackson Mandago (centre) listens to agricultural experts during a farmers' field day at Elgeyo-borbor in Uasin Gishu County on Friday. The county is one of those hit by the Fall armyworm invasion.







## Conclusion: Contradiction between the theory and practice.

Theory shows that people know what is expected but they don't take action.

Practice is no action any thing.

Just criticizing without offering suggestions.

I have never seen university dons going on strike for research funds to be increased.

## **Conclusion**

### **Let us all focus on the CESA Mission**

***□ Reorienting Africa's education and training systems to meet the knowledge, competencies, skills, innovation & creativity required to nurture African core values & promote sustainable development at the national, sub-regional & continental levels***