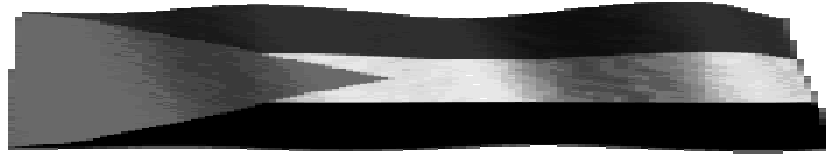




تحت إشراف
الجامعة العربية
العلمية والتقنية
بالتعاون مع
مركز الأبحاث
والتقنية
بجامعة القاهرة



Towards the Establishment of National and Regional
Science, Technology and Innovation Observatories in
ESCWA Member Countries

Beirut 11-12 November 2009

The Situation of the National System of Innovation in
Sudan

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The new landscape

- A growing number of a new generation of inventions associated primarily with new fields of science
- The end of 2004 witnessed the milestone of 1000,000 patents filing since the start of the Patent Cooperation Treaty(PCT)
- Consumers already are enjoying biotechnology products (foods, Environmental biotechnology, DNA fingerprinting.....)
- According to US(NSF), by the year 2015 the annual global market for nano-related goods and services will top \$1 trillion, making it one of the fastest growing industries in history of mankind

The barometer reads

- Fast change in science and technology, which will dramatically change & increase the individual and group performance and the support systems of civilization
- We need to take very serious and conscious steps to start the catching up with the developed world and be part of the integrated global system

National Innovation System

- A core conceptual framework for analysing technological change.
- Foundation of long term economic development.
- Crucial instrument to improving innovative performance.

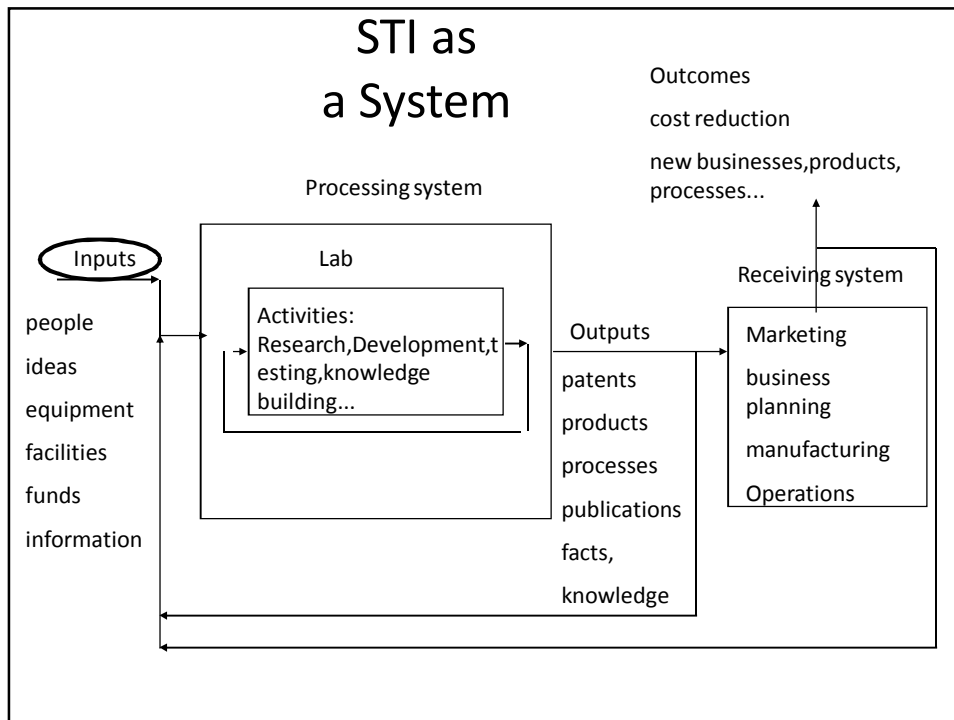
National Innovation system

- Many definitions. Most of which describe NIS in developed countries
- Little is known about innovation, entrepreneurs, dynamics and changes within the sectors and their relationships.
- In general the NIS perspective indicates a much broader and more interdisciplinary approach to economic growth.

National Innovation system

Definition:

- NIS is the interactive system of existing institutions, public and private (large or small), universities and government agencies, aiming at the production of Science and Technology within national borders.
- Interaction among these may be technical, commercial, legal, social and financial as much as the goal of the interaction may be development protection, financing or regulation of new S&T.



Actors of NIS

- Firms(Private or Public)
- Government Institutions
- Academia(Universities and Research Organizations)

Firms in Sudan

- a) Low technological capabilities. Most firms have grown without deepening their technological capabilities in the long run.
 - Their technological learning has been very slow and passive.
 - Only small minority of large firms have capability in R&D.
- b) In many cases, there are innovative activities, but not the products of formally organized R&D. Product and process Innovation are carried out in firms , but not formal R&D.

Firms (Cont.)

- c) Most firms, even large corporations, have a deep-rooted attitude of not develop their own indigenous technological capabilities.
 - off-the-shelf imported technology
 - Turn-key technology transfer from abroad
 - joint venture with foreign partners.
 - Many firm owners historically developed from a trading background, paying attention to quick return.

Major economical indicators of large productive establishments (value in SDG)

Major economical indicators	All manufacturing	Public	Private	Mixed-sector
Number of establishments	1654	89	1533	32
Number of employees	90605	22154	63920	4531
Number of persons engaged	97193	25589	67052	4552
Wages & salaries	35159055	6253336	22397960	6507759
Gross output	628761319	111630303	364052244	153078772
Cost of material & services	348091620	40280065	201277926	106533629
Gross fixed capital formation	31546905	8953879	19065392	3527634
Gross value added	280669699	71350238	162774318	46545134

Source: Comerehensive industrial Survey Project Reports-Ministry of Industry / Central Bureau of Statistics(2001)
* More than 10 Workers

Major economical indicators of small establishments group by type of ownership (value SDG)

indicators	Total manufacturing	Partnership	Private	cooperative
Number of establishments	22460	1995	19652	813
Number of employees	40899	4267	34686	1946
Number of persons engaged	65489	7006	56053	2430
Wages & salaries	6754725	780409	5642612	331704
Gross output	136668539	14271822	118085945	4310772
Cost of material & services	81927394	8466513	69758749	3702132
Gross fixed capital formation	1688431	4729	1683087	615
Gross value added	54741145	5805309	48327196	608640

Source: Comerehensive industrial Survey Project Reports-Ministry of Industry / Central Bureau of Statistics(2001)
* Less than 10 Workers

Government System

No coherent and articulated innovation policies.

- There is no explicit and coherent national innovation policy.
- Innovation although mentioned in National Strategies plans it is only a “buzz word” fashionably spoken among policy makers.

Government System

- a) Policies to promote Industrial technology development are not given high priority and virtually not incorporated in industrial, trade and investment policies.
 - Industrial policy, which is also fragmented, has not paid attention to the development of indigenous technology capability as an integral factor in the process of industrialization.
 - Investment policy, aims primarily at generating Products and employment . It is not used to upgrade local technological capability.
 - The Industrial Policy have been limited to so called “functional” intervention.
- b) Obvious imbalance between S&T organizations and economic organizations and ministries related to technology development.

Gross Domestic Product by kind of Economic Activity at Current Market Prices for the years 2004-2006(% distribution)

Kind of Economic Activity	2006*	2005	2004
Agriculture, Livestock, Forestry and Fishing	31.1	32.6	34.0
Petroleum	10.0	8.3	6.9
Mining & Quarrying	0.2	0.2	0.2
Manufacturing and Handicrafts	9.3	9.3	9.3
Electricity and Water	1.2	1.2	1.2
Building and Construction	4.3	4.1	3.8
Commerce, Restaurant and hotels	15.6	15.7	15.7
Transport and Communication	11.9	12.1	12.2
Finance, Insurance, Real-estate and business Services	7.5	7.6	7.7
Community, Social and Personal Services	1.2	1.3	1.3
Nominal Financial Institutions	-0.7	-0.7	-0.8
Government Services	5.6	5.6	5.6
Producers of private non-profit services to households	1.0	1.0	1.0
Import Duties	1.7	1.7	1.7
Grand Total G.D.P.	100.0	100.0	100.0

Source: Central Bureau of Statistics –National Accounts Adm.

* Estimates

Academia

- 1) R&D organizations
 - a) Focus on Research, not on building capabilities such as technology assimilation and adaptation, designing and engineering or help solve operational problems.
 - b) Poor funding of R&D.
 - c) Absence of specialisation in Research and Technology Organizations
 - The structural feature of most R&D institution exhibits high degree of multiplicity and limited specialization.
 - Several Institutions doing a number of similar duties.
 - Inability of government to abolish or reorganise existing institutions.

Academia(Cont.)

2) Universities:

- Many graduates lack skills of effectively use modern tools and equipments, not to mention developing them.
- The No. Of PhD and Masters degree graduates in engineering per year is very low.
- The overall ranking of Sudanese universities have slipped as time passed.
- Universities have weak research culture and capabilities . Low publication rate of research results.

Perception of Science and Technology

(Extracted from some reports & views)

- People are both uniformed and uninterested in science.
- Young people are turning their backs on scientific careers citing poor salary prospect as main reason
- Citizens look at R&D as wasted money, there are no deliverables, only prestige for scientists
- Policy makers believe that S&T could improve the quality of life, but there are more pressing issues in the list of governments priorities.
- Supervisors and Postgraduate students are looking for high-level research (publishing) with no social relevance

Situation Diagnosis (our staring point)

In general terms, the S&T system has not grown well in the last two decades

Lack of historical prioritization and financing of S&T activities by the government

In many cases the link between R & D activities and the technological needs of end users is neglected

The existing production network displays low level of technological demand due in part to the high number of small companies which have scarce resources for developing systematic R&D activities

Significant shortage of scientific – technological infrastructures such as up to date lab. Science parks and intermediary organizations which aid the transfer of knowledge and the generation of new technology based companies

Situation Diagnosis: MOST

- **New & Developing Ministry**
- **Inadequate Financial Resources**
- **Scarce professional skills**
- **Rapidly evolving external environment**
- **Fire-fighting not fire prevention**

Situation Diagnosis: MOST positive steps

- Encouraging the establishment of technology incubators and science parks (Sudan Technology City Project)
- Ensuring adequate infrastructure for S & T development in particular scientific equipments & laboratories (Central Lab.)
- Promoting S & T education linked with development issues (Sudan Academy of Science)

Sudan Technology City Project

The Intention:

To set up a science park (an organization managed by specialized professionals) with the aim of:

- Stimulating and managing the flow of knowledge and technology amongst universities, R & D institutions, Companies and market
- Promoting the culture of innovation and the competitiveness of its associated businesses and knowledge based institutions
- Encouraging proper technology transfer through incubation and spin-off processes

MOST Central Laboratory

- **To overcome the shortage and sometimes the lack of sophisticated and expensive scientific equipments**
- **Equipped with some of the latest equipments, to serve all research institutions, in various areas of specialization**
- **engage in basic research and hands on training**

Sudan Academy of Sciences

- **Postgraduate university under MOST**
- **To train young talented students to become first class researchers, and at the same time use their energy and drive to execute applied research ideas and solving problems in different fields of S & T**
- **To overcome shortage in researchers**

Debates over S&T in Africa

A check-list (Ref. SciDev.net)

A number of key ideas have emerged from recent debates about Africa's needs for capacity in S&T

SUDAN is no exception

- Think globally (the power of communication technology is such that any new research-based initiative must be able to locate itself in a global content)
- Think locally (global perspective on research must not be allowed to overshadow local needs and capacities)
- Think regionally (many countries in Africa are too small and too poor to justify ambitious S&T policies. The solution is to engage in regional activities, which can range from training to identification of centers of excellence)

Cont.

- Be relevant (research is to be justified on basis of the social benefits it will ultimately bring)
- Be close to excellence (excellence and relevance must go hand-in-hand, not to be seen as mutually exclusive)
- Sustainability (the concept of sustainable development remains an essential one)
- Think holistically (joined up thinking when it comes to S&T and innovation for development)

The Challenges Ahead

Competition in the 21st Century

- Driving Forces:
 - Globalization of markets, technology and \$
 - Emergence of e-commerce & e-communication (increased pressure)
 - Innovation explosion and knowledge based competition
 - Changes in demand structure (consumer products)
 - Shortening of products life-cycle

The Challenges Ahead

Guiding Principles

- Commitment from the government
- Prioritization of future areas
- Excellence in Scientific Research
- Efficient Knowledge Transmission
- Private Sector Involvement
- Sustainable Universities and Research Institutions
- Increase public confidence
- Emphasis on infrastructure and human capital

The Challenges Ahead

Policies are becoming:

- Complex , Inter-related (quality of life , social gaps , globalization , environment,.....) =

Need for New Approaches and methods

The Aim ...

Four possible aims

- Direction setting
- Determining priorities
- Identification of emerging trends
- Consensus generation

Possible Actions

- National foresight exercise
- Regional or Sub-Regional foresight
- South-South cooperation – Collaborative Research
- Technology Transfer

Why Foresight ?

- Bringing people with different experiences together ,which encourages creative thinking
- Transparent decision- making
- Reducing future uncertainty
- Systematic vision and a step before planning (Policy Tool)