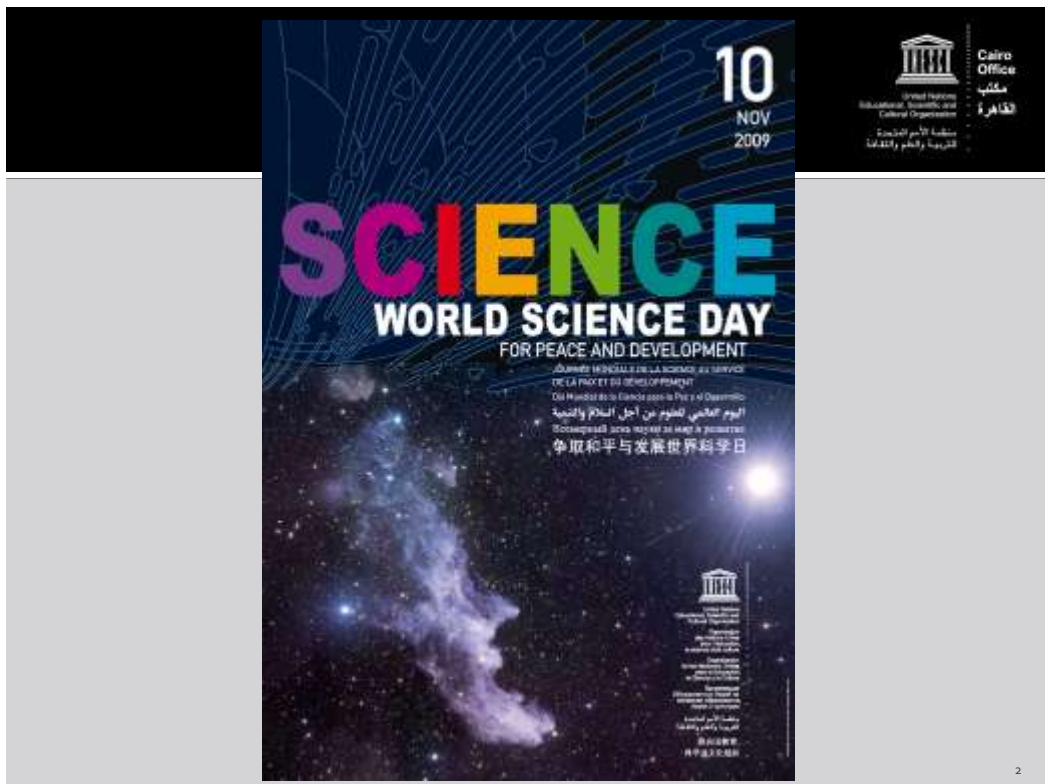


Reflection, Panorama, Thoughts and Recommendations

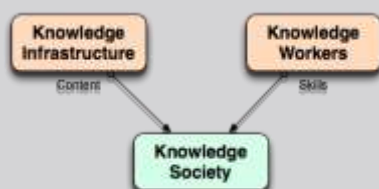
Impact of Science, Technology & Innovation (STI) on Socio-Economic Development in Arab States

Tarek Shawki
Director
Regional UNESCO Bureau for Science & Technology in Arab States



Thoughts ...

“The ability to create and maintain knowledge infrastructure, develop knowledge workers and enhance their productivity will be the key factors in deciding the prosperity of the knowledge society.”



Abdul Kalam, President of India

3

Incunabula

Incunabula is the Latin for "swaddling clothes" or "cradle"^[1] and can refer to "the earliest stages or first traces in the development of anything."^[2] In printing, an *incunabulum* is a book, or even a single sheet of text,^[3] that was printed — not handwritten — before the year 1501 in Europe.



A page from a rare Blackletter Bible (1497) printed in Strasbourg by Johann Grüninger. The coloured chapter initials were hand written after the page was printed.

There are two types of *incunabula* in printing: the *Block book* printed from a single carved or sculpted wooden block for each page, by the same process as the *woodcut* in art (these may be called *xylographic*), and the *typographic*, made with individual pieces of cast metal *movable type* on a *printing press*, in the technology made famous by *Johann Gutenberg*. Many authors reserve the term *incunabula* for the typographic ones only.

Recent Noble Prizes

The Nobel Peace Prize 2006

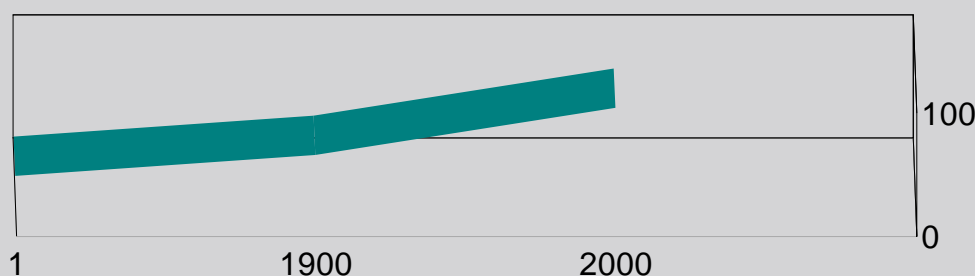
"for their efforts to create economic and social development from below"

Muhammad Yunus
1/2 of the prize
Bangladesh
Founder of Grameen Bank

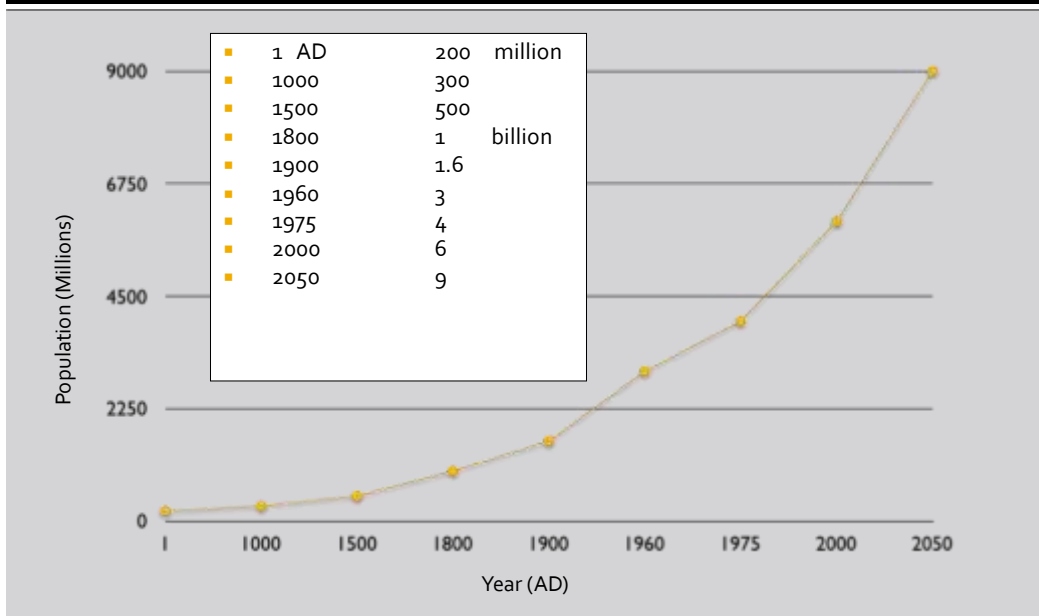
Grameen Bank
1/2 of the prize
Dhaka, Bangladesh
Founded in 1976

Life Expectancy at Birth

- 1AD, in Roman Empire **25 years**
- 1900 in Europe, Japan, US **40-45 years**
- 2000 in Japan and elsewhere **80 years**



Evolution of Human Population



Medical Sciences and Practice

- 14th Century: Plague in Europe
- Late 18th Century: Small pox vaccination by Edward Jenner
- Late 19th Century and early 20th Century:
 - Identification of many bacteria by Pasteur, Koch and many others
- 1928: Penicillin by Fleming
- Mid-20th Century:
 - Streptomycin, polio vaccine,
 - Organ transplantation, cardiac catheterization;
 - DNA structure, in vitro fertilization, CT, MRA, etc.
- 2000: Decoding human genome; molecular and genetic analysis, and recombinant technology, innovative new drugs, genetic diagnosis, gene therapy, stem cell research.

Medical Sciences in 20th Century - 1 Infectious Disease - Nobel Laureates



- 1901: Behring: Diphtheria
- 1902: Ross: Malaria
- 1905: Koch: Tuberculosis
- 1907: Laveran: Malaria
- 1908: Mechnikov, Ehrlich: Immunity
- 1928: Nicolle: Typhus
- 1945: Fleming, Chain, Florey: Penicillin
- 1952: Waksman: Streptomycin

Medical Sciences in 20th Century - 2 Principle of Life - Nobel Laureates



- 1910: Kossel: Proteins and Nucleic Acids
- 1930: Landsteiner: ABO Blood Type
- 1931: Warburg: Cell Respiration
- 1947: Cori and Cori: Glycogen metabolism
- 1953: Lipmann and Krebs: TCA Cycle and Intermediary Metabolism
- 1923, 1929, 1934, 1937, 1943, 1950: Vitamins and Hormones

20th Century



- Global wars.
- Science and technology and changes in the way of our life.
- Medical and life sciences and human population.
- Urbanization; life style, disease pattern, aging society.

Challenges of the 21st Century



- Rapidly Growing Human Population,
- Urbanization, aging, disease pattern,
- Energy and Climate Change,
- Environment and Natural Resources,
- Water, food, sanitation, pollution,
- North-South Disparity,
- Poverty, food and hunger (3Fs), and
- Human Security.

UN Millennium Development Goals (MDG's)



- Goal 1: Eradicate Extreme Poverty and Hunger
- Goal 2: Achieve Universal Primary Education
- Goal 3: Promote Gender Equality and Empower Women
- Goal 4: Reduce Child Mortality
- Goal 5: Improve Maternal Health
- Goal 6: Combat HIV/AIDS, Malaria and Other Diseases
- Goal 7: Ensure Environmental Sustainability
- Goal 8: Develop a Global Partnership for Development

On Innovation ...

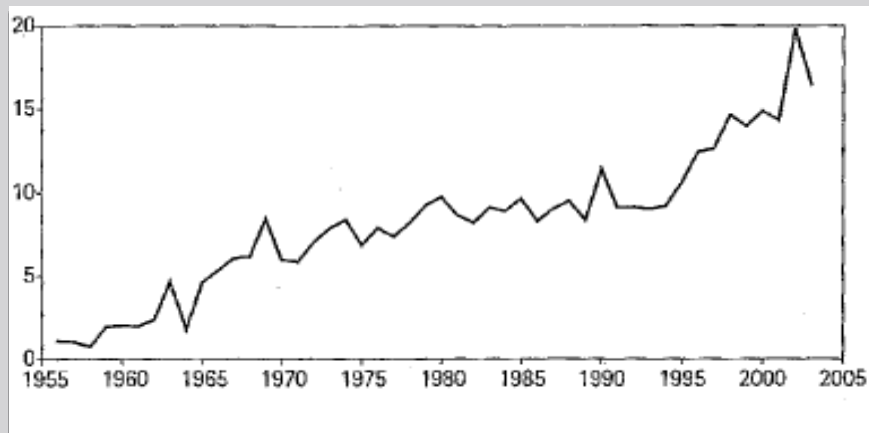


- Innovation is 'Change', thus does not go along with 'Stability'!!
- Innovation is to create social values:
 - Science, technology and engineering
 - Social system: regulations and deregulations
 - Entrepreneurship

Scholarly Articles with the term "Innovation" in the title [1955-2004]



Per 10,000 social science articles



Source: ISI Web of Knowledge, Social Science Citation Index (SSCI)

Innovation



- Innovation Power almost equals National Competitiveness
 - US Initiatives and Policies (e.g. Innovate America (2004))
 - European Initiatives and Policies (e.g. Lisbon Strategy (2000), Aho Report (2006))
 - Japan Initiatives (e.g. Innovation25)
- 'Innovation' is everywhere!
 - --'Innovation Mantra' per K. Kurokawa,
 - Science, April 13, 2007

- Three Major Reasons for Innovation 'Mantra':
 - Globalization: The world has become 'flat'; i.e. ICT Revolution,
 - Sustainable Development or Constraints for Growth, and
 - Disparity between those who have and those who have not.

Constraints for Growth or Challenges of the 21st Century

- Growing human population.
- Climate change/climate crisis:
 - Environment deterioration, pollution
 - Water, food and other natural resources
- Perception by the general public of wide North-South disparity:
 - Sense of inequity, frustration, violence, identity, etc.
- Is Our Society Sustainable?

Key Words in a Globalized Work



- Personalization
- Collaboration/Partnerships/Social Responsibility
- Innovation
- The Economist Intelligence Unit, 2007
- INSEAD, 2007 (Innovation Index Report)
- 'International' vs 'Global'?
- 'Human resource' vs 'Human capital'?
- 'Civil society' and 'social entrepreneurship'?

Technological Revolution and Techno-Economic Paradigm (C. Freeman and C. Perez)



| Era | Technology Revolution | Location/Time |
|--------|--|---------------------------------|
| First | ■ Industrial Revolution | UK, 1769-1830 |
| Second | ■ Age of Iron and Railway | UK, 1829-1873 |
| Third | ■ Age of Steel, Electricity, and Heavy Engineering | UK & US > Europe, 1875-1918 |
| Fourth | ■ Age of Oil, Automobiles and Mass Production | US > Europe, 1908-1974 |
| Fifth | ■ Age of Information and Telecommunication | US > Europe & Asia, 1971-20++?? |

Fourth Era: Age of Oil, Automobiles and Mass Production (1908-1974)



- Mass production, mass markets, consumerism
- Economies of scales (product and market volume)/horizontal integration
- Standardization of products
- Energy intensity (mostly oil-based)
- Synthetic materials
- Functional specialization/hierarchical pyramids
- Centralization/ metropolitan centers-suburbanization
- National powers, Int'l agreements and confrontation:
 - Linear Innovation, Supply-side dictates
 - National, Bi-lateral, International
 - Human resource development

Technological Revolution and Techno-Economic Paradigm (C. Freeman and C. Perez)



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Innovators and Innovations



- Computers - connected!
- Internet: www (92); Netscape, Yahoo, Amazon (all 94); Windows95; Linux, Google (97) ----Wireless, mobile, modular
- Email
- Mobile phone
- iPod to iPhone ...
- Playstation to Wii ...
 - Entrepreneurship
 - Demand-driven innovation

Age of Information and Telecommunication (1971-20++)



- Information-intensity (microelectronics-based ICT)
- Decentralized and integration / network structures
- Knowledge as capital / intangible value added
- Heterogeneity, diversity, adaptability
- Segmentation of markets / proliferation of niches/ branding
- Economies of scope and specialization combined with scale
- Globalization/ interaction between the global and the local
- Inward and outward cooperation/ power of clusters
- Instant contact and actions/ instant global communications

Innovation in Globalized World



- Invest in Human 'Capital' vs Human 'Resource',
- Nurture Entrepreneurship,
- Out-of-the-box thinking: Heterogeneity, Diversity, Adaptability,
- Focus on the Strength and Core competence,
- Recognize the Weakness and Collaborate,
- Speed is the Essence of the Game,
- Think locally, Act globally.

Review: Key Words in a Globalized Work



- Personalization
- Collaboration
- Innovation
 - The Economist Intelligence Unit, 2007
 - INSEAD, 2007
- 'International' vs 'Global'
- 'Human resource' vs 'Human capital'
- 'Civil society' and 'social entrepreneurship'
- 'Think locally', 'act globally'
- Wikinomics

Review: Constraints for Growth or Challenges of the 21st Century



- Growing human population.
- Climate change/climate crisis:
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- Perception by the general public of wide North-South disparity:
 - Sense of inequity, frustration, violence, identity, etc.
- Is Our Society Sustainable?

International actions/collaborations



- UN agencies:
 - UNESCO
 - WHO
- WB, IMF, Global funds
- G8 Summits
- Science Community –ICSU, IAC, IAMP
- Foundations
- NGO, Civil society and social entrepreneurship
- Many collaborations, partnerships and media.

Key Messages



- STI capacity building is not a diversion from poverty reduction and the MDGs; it is an essential tool for achieving the MDGs and reducing poverty.
 - Building STI capacity is therefore as essential for low-income countries as it is for middle-income or wealthy countries
- Building STI capacity for growth and poverty reduction is not about theoretical, abstract scientific research. **STI must stand for “solve, transform, and impact.”**

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Key Messages - 2



- The capacity to absorb and diffuse existing knowledge is at least as important as the capacity to produce new knowledge.
- Committed, capable national leadership with coherent STI capacity building policies is an absolute necessity.
- Basic literacy is essential, but it is not sufficient.
 - Developing countries will not have the capacity to address their social and economic problems if they focus only on basic literacy to the exclusion of secondary and tertiary education. Strengthening higher education, along with technical and vocational education, is essential for creating a globally competitive economy.

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Key Messages - 3



- The centrality of women to poverty reduction means that STI capacity building should target gender disparities in strategies to achieve the MDGs.
- STI capacity building is about much more than high tech.
 - On the contrary, developing countries may get more development “bang for the buck” by helping low-tech but knowledge-intensive sectors, such as horticulture and food processing, become more competitive and innovative than by trying to compete in a few high-tech niche products and industries.

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Key Messages - 4



- Regional initiatives are an important component of STI capacity building.
 - It may not be feasible or desirable to establish duplicate STI institutions in each and every country. This is especially true in regions that have large numbers of smaller countries with limited STI capacity. The trained manpower may simply not be available.
- Centers of excellence do not have to be only brick-and-mortar institutions.
 - Centers of excellence can be virtual institutions, encompassing ‘networks of scientists’ from different institutions in the same country or even from different countries.

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Key Messages - 5



- A good business climate must be paired with STI capabilities to develop an innovative, globally competitive economy.
 - Basic policies need to be in place to ensure reasonable macroeconomic stability, to promote a good business climate, and to reduce the cost of doing business. It makes little sense to build STI capacity if the legal, regulatory, financial, and economic conditions deter farmers, entrepreneurs, and investors from investing and innovating.

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Key Messages - 6



- Fostering entrepreneurship is a critical component of STI capacity building.
 - The ability to absorb and utilize new technology and the capacity to innovate must reside in private enterprises. Entrepreneurs are the ones who organize the production processes, link farmers and workers to global markets, and train them to meet the exacting production and quality control standards required by demanding international customers.

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Key Messages - 7



- STI capacity building should not be confined to S&T projects and programs or higher education projects and programs but must become an integral component of all investment activities.
- There is no single correct recipe for building STI capacity.
 - Different countries have developed various policies and programs for building STI capacity. But while the programs differ in technical details and specific tactics, successful programs tend to focus on a common set of core issues: promotion of entrepreneurship; adaptation and adoption of existing technology; both the supply and demand for S&T capacities; specific social and economic goals; and promotion of interactions among public institutions, academia, and the private sector.

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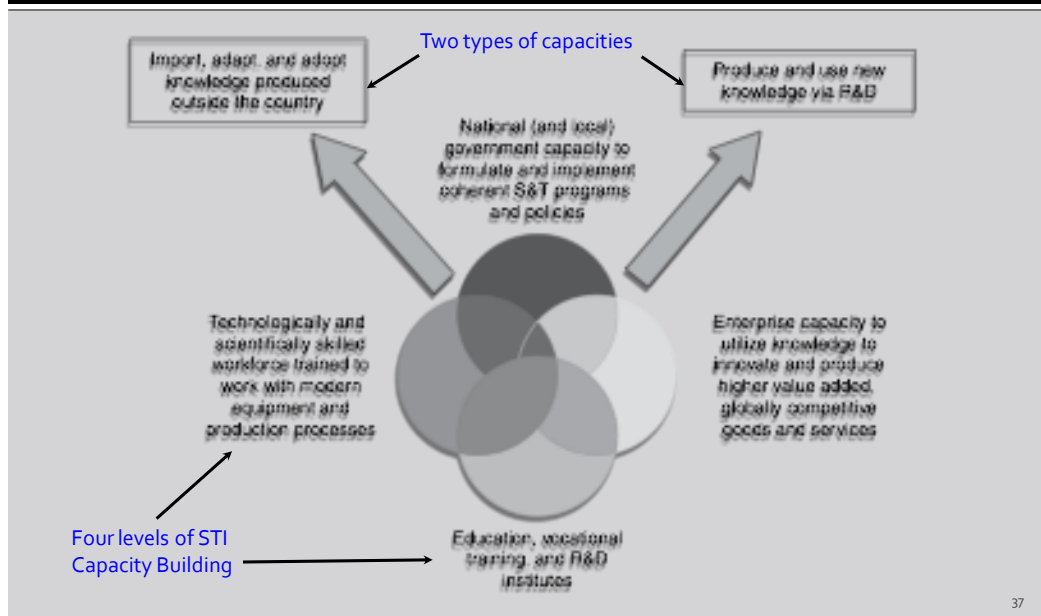
STI Capacity Building



- There appears to be an emerging consensus that STI capacity building is an essential tool for sustainable development and poverty reduction. But:
 - What precisely is meant by STI capacity building?
 - What capacities must be built?
 - How have countries built these capacities?
 - How should policy makers allocate scarce resources to different capacity building objectives and what specific capacities are the highest priorities for any given country at a given stage of development?

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Dimensions of STI Capacity Building



In Summary

- Building STI capacity is essential for poverty reduction and local economic development, but appropriate STI capacity must be built in the appropriate way if it is to achieve these laudable objectives.

An Example of ICT4ED Observatory Sort of!

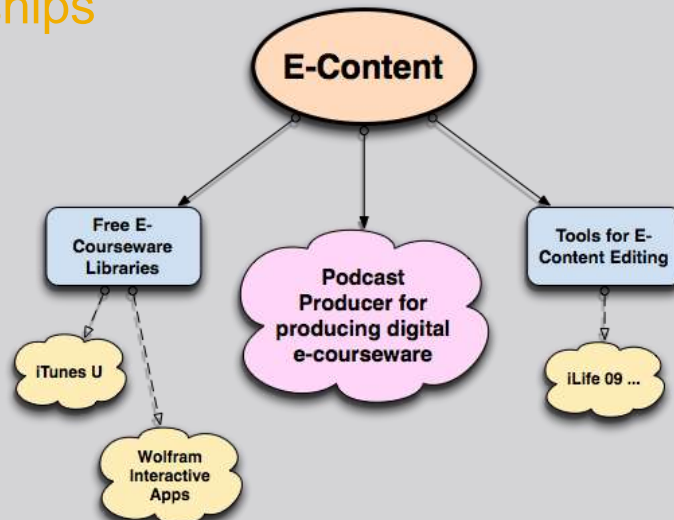


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UNESCO GCDL Initiative

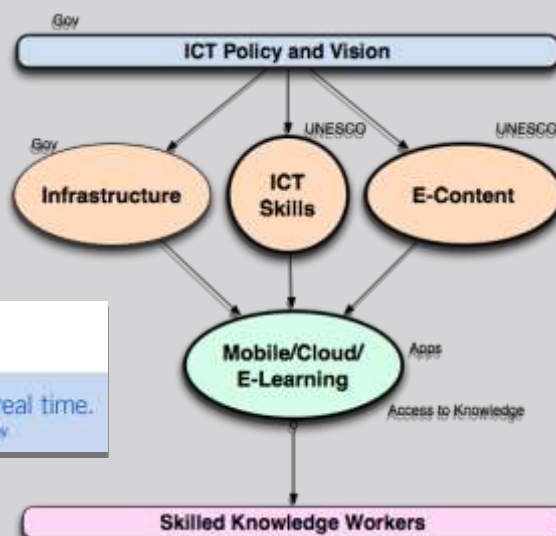


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- Develop Submission Guidelines,
- Authoring Distribution and global free access,
- Build a Multi-lingual Global Courseware Digital Library.



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UCO Vision ICT in ED/SC



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Final Remarks



Thank you for your patience and attention

UNESCO Cairo Office

cairo@unesco.org



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