



Guidelines for Formulating National Strategies on Smart Learning

Advanced Draft

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Preamble

INTRODUCTION

This Guide aims to serve as practical tool to ease the process of the implementation of Smart Learning initiatives. It is aimed towards the national governments who are looking to establish strategies and policies for wider uptake of smart learning.

This guide was developed in implementation of the ITU Arab Regional Initiative on Smart Learning adopted in WTDC 2014. Moreover the partners who developed these guidelines are ITU, Alecso, Intel and Millinium@edu.

The Guide for Formulating National Strategies for Smart Learning

This Guide for formulating national strategies for smart learning reflects the increased awareness and advances taking place in Arab region to embrace smart learning, and the need for a systematic approach to make smart learning implementation process more efficient and more responsive to people's needs and expectations.

This Guide aims to provide a framework and methodology for the development of national strategy for smart learning, action plan and monitoring framework. It is expected to be used by the Ministries of Education and Ministries of ICT for various countries in Arab region that are developing infrastructure and policies for smart learning, whatever their current level of information and communication technology.

Although this Guide provides a holistic view of how various countries can approach towards formulating their national strategies for smart learning, individual countries and their ministries can tailor various components of this Guide to suit their own existing national policies, resources and requirements, and to the expectation of their citizens. They can choose, refine and develop the components that need more focus within their own context, and create their own unique national strategies for smart learning.

The successful formulation of national strategies for smart learning, however, requires a team experienced in strategic planning, analysis and communication process. One of the team's early priorities should be deciding at what point to bring stakeholders into the process. This is important in managing the process itself, because the team will have to work closely and continuously with the many stakeholders, not just from the ministries involved. Earlier involvement will ensure multiple views are identified and assimilated in the process as early as possible, leading to less duplication and repetition of tasks, and reduced wastage of efforts. A critical benefit of this approach is that it brings the sense of ownership among various stakeholders, which improves the success of the implementations at later stage significantly.

Like all strategies and plans, the outcomes of this Guide are not static and represent a point-in-time understanding of what a country needs to achieve in order to address its particular goals and challenges. Changes in country's strategic context and advancements in information and communication technology infrastructure and use will require a dynamic approach to updating the national strategies for smart learning and the associated action plan so that they remain relevant. This requires understanding the key triggers for

refreshing the strategies and action plan, including specific events that change a nation's strategic content for smart learning, with a view to regular revision cycles to ensure the strategies remain aligned with the progress of country's stakeholders in ICT.

Ongoing engagement with essential education and ICT related stakeholders must also be maintained. Success in implementing a national strategy for smart learning that remains relevant over time is heavily dependent on having the continued support and guidance of stakeholders, and keeping pace with grassroots developments and adoption of trends by early adaptors and wider population alike.

Continued communication is also vital. Stakeholders should be regularly informed on the progress of the national strategy development. This ensures transparency, which is essential to maintaining stakeholder support and momentum for further activity and investment in smart learning. It is critical that formal channels are established for obtaining feedback from stakeholders and appropriate whistleblower mechanisms are developed so as to enable trust within wider community.

GUIDE EXECUTIVE DESCRIPTION

The Guide for formulating national strategies for smart learning is divided into eight modules:

Module 1 provides an overview of the strategy development and managing its development. This module is offered within the context of the Qingdao Declaration and the Incheon Declaration for Education, and focuses on the Goal 4 (Four) of the proposed Sustainable Development Goals (SDGs) which is related to education. The ITU Broadband Commission Report and the ITU SDGs/Technology Matrix provide background for this module. This Module covers also Education Frameworks, both institutional and from the private sector.

Module 2 focuses on how to prepare for smart learning strategy development and strategic planning. It provides guidelines for creating an enabling environment among all concerned stakeholders, with activities such as awareness campaign, visits to learning ministries and institutions as well as ICT companies and institutions, formulation of national working teams, collection of related policies, strategies, statistics, research, and so on. It also covers issues related to internal and external auditing within national context and trends analysis in education and ICT areas, strengths and weaknesses, opportunities and threats, and identification of priorities for the strategy.

Module 3 looks at formulation of vision, mission and aims/goals. Based on external and internal auditing, and the identified international and national trends and priorities, this module provides guidelines for developing vision (role of smart learning in developing the country's human resources), mission (role of education and ICT institutions/bodies), and aims/goals/objectives.

Module 4 provides guidelines for developing scenarios and modeling. It discusses how to identify all of those scenarios that can enable the countries to achieve various strategy aims. This module also outlines the process of selecting the most appropriate and cost-effective scenario.

Module 5 deals with the guidelines for selection and formulation of strategies related to professional development of staff, infrastructure for smart learning, assessment of smart learning outcomes, organization of smart learning and Leadership, connectedness, and content and curricula.

Module 6 provides guidelines for documenting the smart learning strategy. It focuses on the strategy document (the product of the strategy development process).

Module 7 looks at developing the action plan. It provides guidelines for how to translate the aims and goals into action plan, with the help of examples and format. Following goals are covered in this module:

Goal 1: Creation of the Management Structure and Coordination between Stakeholders

Goal 2: Definition of the Information System

Goal 3: Identification of Operational Challenges

Goal 4: Definition of Project Scope (regions, grades, etc.)

Goal 5: Piloting solutions for the project

Goal 6: Implementation Models

Goal 6: Project Financing - the role of regional development banks

Module 8 provides guidelines for monitoring the implementation of national strategies for smart learning and evaluation. It focuses on the basics of assessment of progress and the need for information systems, the monitoring and evaluation framework, and how to support governance of implementation and reporting (internal and external as well as measuring the impact).

Each of these eight modules describes the activities required, along with practical advice informed by real-world experience. Countries can undertake the entire set of activities, or those specific to their contexts and constraints. How the Guide is used, and the end result, will depend on these factors and on each country's priorities and vision.

Countries can focus on a range of structured activities that lead to the progressive development of the national strategies for smart learning. These include:

- involving the key education and ICT stakeholders in creating national strategies for smart learning, the action plan and its subsequent implementation.
- establishing governance mechanisms to provide improved visibility, coordination and control of smart learning activities that are occurring across the country's educational sector.
- establishing the strategic context for smart learning to provide the foundation for the national strategies for smart learning and action plan, and to enable the government to make informed decisions on whether to pursue opportunities that present themselves from the education and ICT sectors and other stakeholders.
- forming an understanding of the current education environment and ICT infrastructure in terms of the programmes, projects and smart learning components that already exist.
- the Guide also identifies the short-, medium- and long-term goals for countries, recognizing the importance of demonstrating outcomes and benefits throughout the process of national strategy implementation, and to build and maintain momentum and support for smart learning; and thereby improve the education effectiveness of their populations.

Finally, while it is aimed at a specialized, professional readership, the Guide's approach keeps the general public firmly in mind, recognizing that it is the public who will be the ultimate beneficiaries of smart learning in their country.

DRAFT

1. MODULE 1 Overview of the strategy development and managing its development.

“Knowledge is considered as one of the key pillars of a nation’s development and advancement, and critical to the society’s progress and prosperity. It is an incentive for intellectual and social mobilisation as well. The current era is called the “knowledge era”. If every era had its own wealth, this era’s wealth would be knowledge. The knowledge society is the society of the digital revolution, which has contributed to the change of relationships in the developed societies and perceptions about of the outside world. Information and knowledge have contributed to enhanced standards of living, defined artistic tastes and values, and helped speed up development and industrial progress. Knowledge accumulation also plays a major role in sustaining economic growth.” Third Arab Knowledge Report¹ – Foreword (Pages C and D)

**Sheikh Ahmed bin Mohammed bin Rashid Al Maktoum
Chairman of the Board
Mohammed bin Rashid Al Maktoum Foundation**

As the Knowledge Society and Economy is maturing around the world, it requires an education system which is capable to prepare the human beings to understand its main concepts, the operational structures of a network approach of the human activity and be able to use the technologies which are the tools of the 21st century.

Although new learning processes are emerging, our education systems still keep their structural and systemic functions grounded in century-old pedagogies , which have not kept the pace with the needs and demands of our societies. This is an important reason why we need to develop “smart learning” programs and initiatives which act as a transformational process in present education systems.

The aspirational osmosis between Knowledge Economy and Society is the main clue.

¹ http://www.arabstates.undp.org/content/rbas/en/home/library/huma_development/arab-knowledge-report-20140.html

Although this Guide covers a wide number of aspects, it aims to be an easy tool for use. It also attempts to include practical approaches to make its implementation possible and allows its adaptation to any specific situation.

1.1 INTRODUCTION

1.1.1 METHODOLOGY

The **Guidelines for Formulating National Strategies on Smart Learning** are presented in **Six Approaches**, as follows:

- **First – Critical analysis of existing policy documents, relevant reports and indicators**

The main policy documents are introduced in Module 1 but they will be referred in rest of this Guide as and when appropriate.

- **Second – Presentation of tools to implement Smart Learning Initiatives**

The Tools are described in Module 7 and they aim to work as a guide to develop a a real program or initiative on Smart Learning with hight impact.

- **Third – Presentation of Case Studies**

Identification of some relevant Case Studies for Smart Learning Initiatives, which will be presented along this guide.

- **Fourth – Recommendations**

Each chapter of the Guide will include a set of recommendations, to be developed by the experts.

- **Fifth – Visits**

A number of visits to best practices implementations will be suggested whenever appropriate.

- **Sixth – Forum**

The Guide will be presented in the Forum as a draft document, open for discussion and evolution, in order to reach a final version and additional, more specific, documents,

1.1.2 5 Layers of Smart Learning

One of the main challenges of a **Smart Learning Initiative** is to put in a **comprehensive strategy: Data; Information; Knowledge; Learning and Wisdom**, constituting a **Framework** to develop a strategy for each of these five components.

This **Framework**, based in **five layers**, aims to structure the implementation of technologies in education with a comprehensive approach and for that purpose, assumes a specific meaning for each of the five layers in this context.

Although the **Framework** is presented sequentially in this document, some of the decisions are interrelated. For example, the Data to be collected depends on the Information Systems which are planned to be built and, in the same way, the design of the Information Systems depends on the data which is possible to collect in a certain context.

One important aspect to be considered is the high impact a **Smart Learning Initiative** may have in the society where it is developed. Considering the large majority of the population has a link to education, because they have children in the school or they are teachers, or have any other activity related with education and knowledge, all the policies defined for the five layers will have a transformative capacity in the society, working as a driver, when all sectors try to catch the technological revolution and prepare the new generation for a future with technology.

Understanding Data issues, such as their importance and privacy, experience the power of information management systems and their impact in everyday life as activity organizers, seeing knowledge and learning as a design evolving process and gain the wisdom to use all this tools for good and sustainable development is the main thread of this framework.

Without entering in deep theoretical concepts, it is important to establish a clear practical approach which holistically integrates technologies in the education system, in the five identified layers.

1.1.2.1. Layer 1 - Data – digitized world

Collecting Data from students, teachers, schools and all other entities involved in the education system, such as assessment results, presences, content usage, infrastructure and its usage, and a multitude of aspects of the education and learning ecosystem, assuring Data security and safety as well as respecting privacy, is the basic task to create a Smart Learning Initiative.

The enormous potential of information and communication technologies to collect realtime data at a deep level and with appropriate tools may support learning and education in a more effective way and help to improve education systems.

All data, existent or to be collected, should be digitized to create a data base which is the raw material of the knowledge economy and society, as well as the raw material of a Smart Learning Initiative.

All Data must be:

- Collected;
- Digitized;
- Coded;
- Transmitted.

Although it is very important to contextualize Education Data in a broader context as demographic, economic, technological and social indicators, among many others, in what concerns this Document there are two focus areas of Data in a Smart Learning Initiative: a) Education Data and b) Data of ICT usage in Education.

ICT, when used, can improve a lot Data collection and availability, in all aspects of education, and it can be used to measure its own impact.

Big Data

Today the possibility to go beyond traditional indicators of education and collect more detailed data on the student activity and outcomes will allow, in the future, having more accurate information and a better planned approach on curricula, infrastructure or any other element of the education system.

Today students, teachers and all education actors use at a large scale, or will use in near future, computer devices, allowing to collect a lot of important data which can be an outstanding source to create a detailed picture of the education and learning system. Internet of things (IoT) and wearables will add very soon an

enormous amount of data. One crucial characteristic of this data is the fact that is possible to be collected and used in real time.

The fact that students visualize digital content and electronic platforms, allows to track their needs and give feedback to support their learning. For example, recommend in real time, or on a daily basis, content and exercises which improve their learning process.

Legal Frame

Legal Frame has to be considered, such as privacy laws, security and safety legal frameworks.

1.1.2.2. Layer 2 - Information – map the data

Based on the available Data it is possible to produce Information to allow any person, organization or system to benefit from it. This is the second challenge, which implies openness and flexibility to access the Data.

Deciding how the data must be mapped, presented and transmitted and which technology must be used, are decisions to be made accordingly to each specific **Smart Learning Initiative**.

It is necessary to develop and make available information management systems which can be used by administrators, teachers and students as well as planners, policy and decision makers, who can use the available data to improve their performance.

The implementation of an Information system which can support education at all levels and provide specific Reporting to each of the levels, students, teachers, principals and all decision makers, in a comprehensive manner, is the challenge of this Layer.

Providing information for students on school schedule, evaluation and available resources, helping teachers to organize their work and their classes, allowing the real time tracking of IT operations or aggregating information for decision makers at all levels, such as school principals, responsables for regional and national education structures, are some examples of the potential which can be mapped, provided and transmitted.

Open Data

It is important to define an **Open Data Policy** which allows having a controlled access to the public information and encouraging the development of a local technological ecosystem and clustering providing new solutions adequate to a specific reality and also supporting the creation of national economic value and jobs.

1.1.2.3. Layer 3 - Knowledge – using information system

Using data and information to produce knowledge, and learn how to produce knowledge is the driver of any **Smart Learning Initiative**. The schools and the teachers assume new roles in such environments to give meaning and context to the data and information which is available to any student with access to a connected device.

There are two types of knowledge that are produced:

- Tacit: Know-How (on-the-job training for teachers and administrators)
- Explicit: Coded Knowledge, mapped and integrated in the learning activities.

The organization of the education systems plays here a very important role. It is necessary to understand how to use Data and Information to impact the overall system and how to use the outcome of the different practices, good and not so good, in a way that allows to profit from all the knowledge the education system produces and is able to be shared among all stakeholders and the community.

Platforms as **ERP - Education resource planning** and **CRM – Citizen Relation Management for Education** can translate in practical terms tacit knowledge into explicit one.

1.1.2.4. Layer 4 - Learning – content and learning models

Based on Information and knowledge and in the development of the previous layers, it is possible to create a content distribution approach linked with the teachers and students available infrastructure.

In what concerns content distribution, questions like internet access at home and its quality, device type, operating system, and the access quality in general by the students and teachers, are key to its design and definition of the distribution model.

The design of the curriculum and the learning models to be promoted has to be consistent with the Data, Information System and Knowledge.

The content, to be effective and clearly impact the education results has to be linked to the curricula and integrated with the learning/teaching process as much as possible. To ensure a convenient level of integration

it is important that teachers know the digital content or are able to discuss it, in or out of the classroom, in the case it is the student who brings and presents the content.

Content and Learning Management Systems integrated with test and evaluation management systems may support the learning process and help teachers and students.

Content models are not all born equal. The WEB approach or the APP strategy are different, just to highlight two of the most trendy ones.

The WEB content is the classical approach. The link of WEB content to curricula and learning management platforms is well known to IT departments and publishers. A clear policy from the technical and content point of view is documented in many case studies and must be defined when a Smart Learning Initiative is developed.

The APP strategy is more linked to mobile devices, such as tablets and phones or phablets, and has different approach than the WEB. Decisions like Subject APP or Session APP are on the table. Some publishers already present one APP for each session of a specific subject, for example if in one country in a specific school year there are 62 math lessons, there will be 62 APPs.

The main challenge for education content policy and decision makers is to define criteria and standards of interoperability among the different providers, as well as the integration with their Data and Information Systems.

1.1.2.5. **Layer 5 - Wisdom – smart learning for smarter societies**

Wisdom is the ability to think and act using knowledge learned and, in this case, the capacity to create the conditions for sustainable development, which one of the best examples in this chapter is described in “21st Century Literacies” approach (see section 1.3.1).

Considering the structural role of education in a society, a **Smart Learning Initiative** must consider the relation of the education with the development process of the community in which the Initiative is integrated.

Technological supported education systems may be open to the community and interact with other social entities, companies as well as other public institutions.

For example, energy or water companies can provide knowledge on new technologies and more efficient usage models for the consumer showing also new employment and entrepreneurship perspectives at a large scale, using all the available tools with a minimum cost and integrated with the curricula. These energy and water literacies are an accelerator to have better citizens and professionals to participate in a knowledge driven economy and society.

Another important example may be the e-government and e-administration policy and plans to make the country more efficient and competitive. Providing students with access to internet in the school and support

by teachers, will help their families, especially those with lower education or economical levels, to access public services.

1.2 Policies and main Reports

1.2.1 Smart Learning - ICT Education Projects Implementation Context :

“According to the concept of the knowledge society, investment in education plays a pivotal role in the development of human resources and the expansion of youth opportunities and abilities to contribute to the historical quantum leap.

In this context, knowledge workers become the basis for the development of economic wealth, while the main activities producing wealth no longer reside in the use of raw materials, capital or labour, but rather in the added value “being produced through innovation, creativity and the application of knowledge at work. The value of goods is determined in the knowledge that lies in the final product”.

Arab Knowledge Report¹ (pages 29/30)

The present Guide aims to be used as a possible framework to any national government in the Arab Region to develop strategies for the implementation of **Smart Learning Initiatives and programs**.

The purpose of this Guide is also to be a map for many already existent reference documents and tools which are essential for the design and implementation of **Smart Learning Initiatives**.

1.2.2 Incheon Declaration for Education - Education 2030: Towards inclusive and equitable quality education and lifelong learning for all

The Incheon Declaration² represents the agreed vision for Education and its role in the society until 2030, where sustainable development and ICT are at the core of any educational program, in particular in a **Smart Learning Initiative**, as can be observed in the Declaration references below:

“5. Our vision is to transform lives through education, recognizing the important role of education as a main driver of development and in achieving the other proposed SDGs. We commit with a sense of urgency to a single, renewed education agenda that is holistic, ambitious and aspirational, leaving no one behind. This new vision is fully captured by the proposed SDG 4 *“Ensure inclusive and equitable quality education and promote life-long learning opportunities for all”* and its corresponding targets.”

“9. Quality education fosters creativity and knowledge, and ensures the acquisition of the foundational skills of literacy and numeracy as well as analytical, problem-solving and other high-level cognitive, interpersonal and social skills. It also develops the skills, values and attitudes that enable citizens to lead healthy and fulfilled lives, make informed decisions, and respond to local and global challenges through education for sustainable development (ESD) and global citizenship education (GCED). In this regard, we strongly support the implementation of the Global Action Programme on ESD launched at the UNESCO World Conference on ESD in Aichi-Nagoya in 2014. We also stress the importance of human rights education and training in order to achieve the post-2015 sustainable development agenda.”

“10. We are also committed to strengthening science, technology and innovation. Information and communication technologies (ICTs) must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision.”

“13. We call for strong global and regional collaboration, cooperation, coordination and monitoring of the implementation of the education agenda based on data collection, analysis and reporting at the country level, within the framework of regional entities, mechanisms and strategies.”

1.2.3 The Qingdao Declaration - Seize digital opportunities, lead education transformation

² <https://en.unesco.org/world-education-forum-2015/incheon-declaration>

Following the **Incheon Declaration** where a world vision for Education was established, the **Qingdao Declaration**³ sets the role of ICT in the new education framework and main aims for **Smart Learning Initiatives**, as can be seen in the following references:

“2. We reaffirm the new vision of Education 2030 articulated in the Declaration adopted at the World Education Forum 2015 in Incheon, Republic of Korea, with access, equity and inclusion, quality and learning outcomes – within a lifelong learning perspective – as the key pillars. We are convinced that equitable and inclusive access to quality education for all across life is an imperative for building sustainable and inclusive knowledge societies, and as a key means of implementation to achieve all of the SDGs.

3. Inspired by a humanistic vision of education based on human rights and social justice, we further affirm that the remarkable advances in ICT and the rapid expansion of internet connectivity have made today’s world increasingly interconnected, and rendered knowledge and familiarity with ICT essential for every girl and boy, woman and man.

4. To achieve the goal of inclusive and equitable quality education and lifelong learning by 2030, ICT – including mobile learning – must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more efficient service provision.

5. Technology offers unprecedented opportunities to reduce the long-existing learning divide. The application of ICT is essential if we are to deliver on our commitment in the Incheon Declaration to non-discrimination in education, gender equality and women’s empowerment for sustainable development. We commit to ensure that all girls and boys have access to connected digital devices and a relevant and responsive digital learning environment by 2030, irrespective of their disabilities, social or economic status, or geographic location. In striving to achieve universal access to basic education and skills development, we recommend that all education stakeholders recognize enrolment in quality-assured online courses as an alternative or complementary mode to face-to-face programmes of study.

6. We stress the value of ICT-based solutions in ensuring that, in the wake of a conflict or natural disaster resulting in the destruction of schools or universities or in the impossibility of normal operations, the right to education is enforced. We therefore invite governments, international organizations, non-governmental organizations and technology providers to cooperate in designing and implementing, quickly and efficiently and whenever they are needed, the most suitable solutions.”

The UNESCO Qingdao Declaration is an advancement in the strategic and political framework of “smart learning” Initiatives and programmes offering a real reference to develop policies sustained by global and institutional trends under UNESCO.

³ <http://www.unesco.org/new/en/education/resources/in-focus-articles/qingdao-declaration#>

1.2.4 Education in the context of the Proposed Sustainable Development Goals (SDGs), namely Goal 4.

The Sustainable Development Goals⁴, agreed at United Nations (Resolution A/RES/70/1) to be the development agenda until 2030 includes Goal 4, which focuses on Education and should work as one of the main references. The Targets 4.7 and 4.b, listed below, aim to highlight the inclusion of sustainable development and ICT in education.

Following this path, this Guide aims to allow for the strategies that focus on the design of smart learning initiatives which will be integrated with the Sustainable Development Goals.

Various relevant sections of the Sustainable Development Goals are as follows:

“Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes

4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education

4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university

4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations

4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy

4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable

⁴ <https://sustainabledevelopment.un.org/post2015/transformingourworld>

lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development

4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all

4.b By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries

4.c By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States"

17 ways education influences the new 17 global goals⁵

As a structural area of the society, Education has a role in all the development goals and processes. This awareness is described below accordingly with the United Nations Sustainable Development Agenda (SDGs) and will be further referenced in this Guide.

The creation of an education system that is able to prepare the young generations for sustainable development is the basis of new literacies, as the literacy of water, energy or climate among many others will be a required competence for working and living in an information and knowledge society of 21st century.

Education is challenged by the need to integrate 21st century skills, such as communication, collaboration, critical thinking, creativity and the new literacies of sustainable development, where ICT is an appropriate tool to shift the paradigm.

Smart Learning Initiatives are essential to contextualize ICT in Education, as part of Sustainable Development Processes. This will reinforce the quality of Education which is the most powerful tool to achieve the Sustainable Development Goals.

Below are some examples of the role of Education in all the Sustainable Development Goals, developed by the **Global Partnership for Education**:

" ...

⁵ <http://www.globalpartnership.org/blog/17-ways-education-influences-new-17-global-goals>

#1 No Poverty

End poverty in all its forms everywhere

Education is one of the most effective ways to reduce poverty. According to UNESCO⁶, 171 million people could be lifted out of poverty - a 12% drop in global poverty - if all students in low-income countries left school with basic reading skills.

UNESCO also found⁷ that one extra year of schooling increases an individual's earnings by up to 10%, and each additional year of schooling raises average annual gross domestic product by 0.37%.

#2 No Hunger

End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

There is strong evidence that a mother's education improves her children's nutrition, especially as she seeks higher levels of schooling.

The most recent UNESCO research⁸ in 2013 shows that there are approximately 47 million children in low-income countries who are stunted as a result of malnutrition in early childhood. If all mothers in those countries had a primary education, 1.7 million children would be saved from stunting. If those mothers had a secondary education, 12.2 million children would be saved from stunting.

#3 Good Health

Ensure healthy lives and promote well-being for all at all ages.

Better educated people are much less vulnerable to health risks. In particular, when mothers are educated, even at the most primary level, they are more likely to be well informed about various diseases and take steps to prevent them. UNESCO reports⁹ that each extra year of a mother's schooling reduces the probability of infant mortality by as much as 10% and that a child whose mother can read is 50% more likely to live past age five. A study¹⁰ in the journal Lancet also showed that four million child deaths have been prevented over the past four decades thanks to the global increase in women's education.

⁶ <http://unesdoc.unesco.org/images/0019/001902/190214e.pdf>

⁷ Idem

⁸ <http://unesdoc.unesco.org/images/0022/002231/223115E.pdf>

⁹ <http://unesdoc.unesco.org/images/0019/001902/190214e.pdf>

¹⁰ [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(10\)61257-3/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(10)61257-3/abstract)

#4. Quality Education

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Education builds on itself, creating greater capacity to educate others and nurture a culture that values learning.

Education equips learners of all ages with the skills and values needed to be responsible global citizens, such as respect for human rights, gender equality, and environmental sustainability. Investing in and strengthening a country's education sector is key to the development of any country and its people. Without investment in quality education, progress on all other development indicators will stagnate.

#5. Gender Equality

Achieve gender equality and empower all women and girls.

Education enables girls and women to reach their full potential - in parity with men and boys - in their homes, communities, workplaces and institutions of influence.

One additional school year can increase a woman's earnings by up to 20%, according to World Bank studies¹¹, and Plan International¹² has shown that some countries lose more than \$1 billion a year by failing to educate girls at the same level as boys. It is also known that as the gap between the number of girls and boys narrows, so, too, do gender disparities in wages and employment.

#6 Clean Water and Sanitation

Ensure availability and sustainable management of water and sanitation for all.

As communities become better educated about the links between their sanitation and health they see substantial improvements in sanitation. And, as societies become more economically prosperous, it stands to reason that they will be better able to create modern water and sanitation facilities and systems.

In many societies, girls can spend as many as 15 hours per week fetching water for their families, leaving no time for school, UNESCO reports¹³. Similarly, without access to safe sanitation, there are many more sick children who will miss school. In Ethiopia, for example, 6.8 million people gained access to improved sanitation from 1990 to 2006. This was partly the result of having educated communities about the links between sanitation and health, and of implementing new, affordable technologies.

¹¹ http://siteresources.worldbank.org/EDUCATION/Resources/278200-1099079877269/547664-1099079934475/547667-1135281504040/Returns_Investment_Edu.pdf

¹² <https://plan-international.org/publications?lang=fr>

¹³ <http://unesdoc.unesco.org/images/0019/001902/190214e.pdf>

#7 Clean Energy

Ensure access to affordable, reliable, sustainable and modern energy for all.

Like education, clean and accessible energy is an essential building block of a country's social, economic and environmental development.

Experience suggests that educated citizens will likely be more inclined to recognize and adopt new practices and technologies that will help them and their communities prosper. More so, with education, those citizens will be positioned to build and maintain energy infrastructures that will sustain their countries for a long time to come.

#8 Good Jobs and Economic Growth

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Education is one of the strongest drivers of economic progress and prosperity. Studies¹⁴ have shown that each additional year of schooling raises average annual gross domestic product (GDP) growth by 0.37%.

The Education for All Global Monitoring Report¹⁵ showed that, in 1965, adults in East Asia and the Pacific had, on average, spent 2.7 more years in school than those in sub-Saharan Africa. Over a 45-year period, average annual growth in income per capita was 3.4% in East Asia and the Pacific, but 0.8% in sub-Saharan Africa. The difference in education levels explains about half of the difference in growth.

#9 Infrastructure

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

With education, countries have greater capacity to assemble and maintain the physical building blocks of progress, health and security.

As a country's inhabitants become better educated, they are more likely to acquire their own critical technical skills and creative problem solving necessary to build and sustain roads and bridges, ICT systems, ports and airports, health and financial systems, governance practices and the many other structures that enable life in a country to improve and flourish. Well-planned and operating infrastructure itself enables more children to get the educational opportunities they need. Better

¹⁴ <http://unesdoc.unesco.org/images/0019/001902/190214e.pdf>

¹⁵ <http://unesdoc.unesco.org/images/0022/002231/223115E.pdf>

infrastructure makes it possible for children - particularly in remote areas that have few developed roads or other reliable means of transportation - to get to school conveniently and quickly.

#10 Inequalities

Reduce inequality within and among countries.

As more children, from across the demographic, geographic and cultural spectrum become educated, we are likely to see an improvement in a country's income inequality.

One study¹⁶ showed that a 0.1% improvement in a country's education equality can, over forty years, raise its per capita income by 23% higher.

Research⁸ demonstrated that with more education equality, Vietnam's economic performance improved and, in 2005, its GDP surpassed Pakistan's, where education equality levels are half those of Vietnam's.

And, with better education, people from traditionally disadvantaged communities are better positioned to advocate for their own rights and needs, gain entry into higher echelons of economic, social and civic life, and help narrow gaps of inequality across their societies.

#11 Sustainable cities and communities

Make cities and human settlements inclusive, safe, resilient and sustainable.

With education, people are more likely than not to understand, support and craft creative solutions that ensure the basic ingredients of sustainable cities and communities are in place.

Good urban planning, efficient energy use, good water and sanitation management, social inclusion and other elements of well-working communities require people with knowledge and skills that are only available through quality education. At the heart of a World Bank Sustainable Cities Initiative¹⁷, for example, are awareness-building programs, development and implementation of local diagnostic tools, the creation of policy reforms and other tasks that require not just primary but advanced education.

#12 Responsible Consumption

Ensure sustainable consumption and production patterns.

Education raises the odds that people will use energy and water more efficiently and recycle household waste, according to UNESCO.

¹⁶ <http://en.unesco.org/gem-report/sites/gem-report/files/223115E.pdf>

¹⁷ <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/0,,contentMDK:23050220~pagePK:146736~piPK:146830~theSitePK:258599,00.html>

A study⁸ of Ethiopia showed that, six years of education improve by 20% the chance that a farmer will address climate change by adopting techniques such as soil conservation, variation in planting dates and changes in crop varieties.

Another study showed¹⁸ that for each additional year of education that a head of household received, a society is between 4% and 21.5% less likely on an annual basis to cut old-growth forest per household. Also, in developing countries, research points out that there is an improvement in awareness of energy-efficient technologies with increasing education.

#13, 14 and 15

Protect the Planet - Take urgent action to combat climate change and its impacts.

Life below water - Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Life on land - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

With higher levels of education, people across many different societies show greater concern about the well-being of the environment.

In 29 countries, 25% of people with less than a secondary education expressed concern for the environment compared to 37% of people with secondary education and 46% of people with tertiary education, research shows⁸.

Also, environmental education programs have been responsible for important advances in many national and regional efforts to fight climate change and protect aquatic life and terrestrial ecosystems. But that kind of education can only reach its full potential where a critical mass of a country's or region's inhabitants have foundational learning skills that come with primary and secondary education.

#16 Peace and justice

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Education is an essential precursor to peace, tolerance and a healthy civil society.

¹⁸ <http://www.iccs.org.uk/wp-content/thesis/phd-howe,caroline09.pdf>

Studies⁸ have shown that people with secondary educations are more likely than those with only primary education to show tolerance for people who speak another language (a 21% difference in Latin America and 34% among Arab States), immigrants (26% and 16%, respectively), homosexuals (32 and 1%), people of a different religion (39% and 14%), people with HIV (45% and 12%) and people of a different race (47% and 28%).

We also know¹⁹ that literate people are more likely to participate in the democratic process and exercise their civil rights, and that, if the enrollment rate for secondary schooling is 10 percentage points higher than the average, the risk of war is reduced by about three percentage points.

#17 Partnerships for the goals

Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Partnerships are proven to be a most effective way to achieve strong development outcomes.

The Global Partnership for Education is a prominent example of how working in a collaborative partnership can enhance progress in education and in the other development sectors. The partnership model of the Global Partnership for Education mobilizes and aligns donor financing behind national education plans that are based on needs assessments and evidence-based policy making.

It coordinates the work of all internal and external actors that play a role in that process. When the most important players work together, we see greater efficiencies and impacts with the available resources. And we see real progress in countries that are hungry to bring quality education to their children and move ever closer to the global goal of education for all.

As the U.N. High-Level Panel of Eminent Persons on the post-2015 Development Agenda declared in 2013, "The Global Partnership for Education is getting quality education to marginalized children, coordinating education's many players, offering aid without wasteful replication and following local leadership. GPE is single-sector [education] but shows how collaboration can bring better results. Similar models might prove useful in other areas."

1.2.5 The ITU Broadband Commission Report and the ITU SDGs/Technology Matrix - EDUCATION

¹⁹ <http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/pdf/NotesLiteracy-Peace.pdf>

Alongside with the Education perspective in important documents of public policy, it is our focus to do the same analysis in those documents, such as the ITU Broadband Commission Report on Education²⁰ and the World Summit on the Information Society WSIS – SDG matrix²¹.

In the WSIS –SDG matrix we can find action lines where Smart Learning Initiatives fit or where should be taken into consideration when a national initiative is planned.

In some action lines of the matrix like e-business or e-agriculture specially, it must be analyzed in each context the role learning and education can play to accelerate the introduction of new practices and the inclusion of the skilled human resources in the value chain.

Below are some relevant sections focused on Education and its context, from the WSIS-SDG matrix.

“ ...

C3. Access to information and Knowledge²²

ICTs allow people, anywhere in the world, to access information and knowledge almost instantaneously. Individuals, organizations and communities should benefit from access to knowledge and information.

1. Develop policy guidelines for the development and promotion of public domain information as an important international instrument promoting public access to information.
2. Governments are encouraged to provide adequate access through various communication resources, notably the Internet, to public official information. Establishing legislation on access to information and the preservation of public data, notably in the area of the new technologies, is encouraged.
3. Promote research and development to facilitate accessibility of ICTs for all, including disadvantaged, marginalized and vulnerable groups.
4. Governments, and other stakeholders, should establish sustainable multi-purpose community public access points, providing affordable or free-of-charge access for their citizens to the various communication resources, notably the Internet. These access points should, to the extent possible, have sufficient capacity to provide assistance to users, in libraries, educational institutions, public administrations, post offices or other public places, with special emphasis on rural and underserved areas, while respecting intellectual property rights (IPRs) and encouraging the use of information and sharing of knowledge.

²⁰ http://www.broadbandcommission.org/Documents/publications/BD_bbcomm-education_2013.pdf

²¹ http://www.itu.int/net4/wsis/sdg/Content/wsis-sdg_matrix_document.pdf

²² <http://groups.itu.int/stocktaking/About/WSISActionLines/C3.KnowledgeAccess.aspx>

5. Encourage research and promote awareness among all stakeholders of the possibilities offered by different software models, and the means of their creation, including proprietary, open-source and free software, in order to increase competition, freedom of choice and affordability, and to enable all stakeholders to evaluate which solution best meets their requirements.
6. Governments should actively promote the use of ICTs as a fundamental working tool by their citizens and local authorities. In this respect, the international community and other stakeholders should support capacity building for local authorities in the widespread use of ICTs as a means of improving local governance.
7. Encourage research on the Information Society, including on innovative forms of networking, adaptation of ICT infrastructure, tools and applications that facilitate accessibility of ICTs for all, and disadvantaged groups in particular.
8. Support the creation and development of a digital public library and archive services, adapted to the Information Society, including reviewing national library strategies and legislation, developing a global understanding of the need for "hybrid libraries", and fostering worldwide cooperation between libraries.
9. Encourage initiatives to facilitate access, including free and affordable access to open access journals and books, and open archives for scientific information.
10. Support research and development of the design of useful instruments for all stakeholders to foster increased awareness, assessment, and evaluation of different software models and licences, so as to ensure an optimal choice of appropriate software that will best contribute to achieving development goals within local conditions.

C7: ICT Applications:²³

i. eGovernment

SDG 9.c: Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020 (connection).

Expansion of e-government services can be a driver of demand for ICT, and provider of affordable access, directly, for example in the form of shared public kiosks, or indirectly through intermediary service providers.

SDG 16.6: Develop effective, accountable and transparent institutions at all levels (direct link)

ICT is a key driver and enabler of enhanced efficiency, effectiveness and transparency in public service delivery.

ii. eBusiness

²³ <http://groups.itu.int/stocktaking/About/WSISActionLines/C7.ICTApplications.aspx>

SDG 5.b: enhance the use of enabling technologies, in particular ICT, to promote women's empowerment

Empowering women's entrepreneurship through ICTs

SDG 8.3: Promote development oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage formalization and growth of micro-, small- and medium-sized enterprises including through access to financial services.

Facilitating the growth of the ICT production sector can offer opportunities for decent job creation, entrepreneurship, creativity and innovation, and encourage formalization and growth of micro-, small- and medium-sized enterprises.

SDG 8.9: By 2030 devise and implement policies to promote sustainable tourism which creates jobs, promotes local culture and products

Enhance the use of ICTs among enterprises in the tourism sector to enable e-commerce/e-tourism. Improve access to e commerce markets for products and services and address challenges facing SMEs in developing countries.

SDG 8.10: Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all

Use of mobile and related ICT platforms can help to bring financial services to all

iii. eLearning

SDG 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Enhanced

Enhanced use of e-learning for education will be an important means to support the achievement of this goal, by offering affordable and flexible means to access education, and supporting more effective pedagogical innovations to improve the quality of education offered. Each of the elements under this goal is relevant for this action line.

iv. eEmployment

SDG 4.5: By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations

Early intervention programs in science and technology targeting young girls should increase the number of women in ICT careers.

SDG 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

New ways of organizing work and business could raise productivity, growth and well-being. In particular, investments in ICTs and human resources represent a sustainable-friendly approach.

vi. eEnvironment

SDG 9.4: By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

a. Foster cooperation between the ICT community, the environmental community, the meteorological community, and other relevant communities working on reducing energy consumption and greenhouse gas emissions, environment protection, towards safety of population and assets against increasing threat caused by climate change related impacts.

vii. eAgriculture

SDG 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

Appropriate and trusted content in local languages disseminated through the use of ICTs will benefit small-scale farmers to increase their agricultural productivity and incomes. ICTs can also play a role in increased access to financial services and access to market and market information.

Enhanced use of ICTs in rural enterprises can play an important role in increasing the productivity of small-scale food producers. Promote the use of ICT's in building local and international market places for the sale and distribution of food. Encourage the use of innovative payment solutions, such as remittances for e-commerce, mobile payments and digital currencies.

C8: Cultural diversity and identity, linguistic diversity and local content²⁴

SDG Int. 9: The natural and cultural diversity of the world was acknowledged, and it was recognized that all cultures and civilizations can contribute to sustainable development

Culture is both a driver and an enabler of human and sustainable development. It empowers people to take ownership of their own development, and stimulates the innovation and creativity which can drive inclusive and sustainable growth. ICTs are a platform to promote, share and expand cultural diversity.

²⁴ <http://groups.itu.int/stocktaking/About/WSISActionLines/C8.CulturalDiversity.aspx>

SDG 4.7: (...) promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

ICTs are important tools of learning, creation and communication for capacity building, dialogue and cultural expression that contribute to sustainable development

SFG 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage.

Cultural heritage is a living part of today's societies and ICTs help to preserve it. Policies promoting the exchange of culture and knowledge between societies are essential. ICTs help ensure continued access to cultural and natural heritage via archived digital information and multimedia content in digital repositories, and support archives, cultural collections and libraries as the memory of humankind.

1.2.6 Broadband: the key to bringing quality education for all

"Education is one of the most powerful uses to which broadband connectivity can be put", are the words of ITU Secretary-General Houlin Zhao²⁵. In fact, broadband can be the key to advancing the Education for All agenda²⁶, namely in what concerns content development and dissemination:

"...ICT integration enriches the process of educational content development and dissemination by making far more content and teaching models available to learners and educators. Open Educational Resources (OERs) hold significant potential to accelerate free access to knowledge and facilitate the adaptation of content to local needs and languages..." (page 10²⁷)

...

"...Broadband internet has accelerated access to high quality digital learning and teaching resources. Perhaps the most extraordinary advancement that broadband has enabled over the last ten years is the rise of Open Educational Resources, a term that was first adopted at UNESCO's 2002 Forum on the Impact of Open Courseware for Higher Education in Developing Countries. OERs are teaching, learning or research materials that are in the public domain or released with an intellectual property license that allows for free use, adaptation and redistribution. Open sharing and collaboration offer real potential for enhancing both learning and teaching, and for closing the knowledge divide between countries..."(page 26¹⁸)

"...In the twenty-first century, education cannot be separated from technology. Rapid advances in information and communication technology (ICT) and expanding connectivity to the internet have made today's world increasingly complex, interconnected and knowledge-driven. Access to quality education for all – which

²⁵ http://www.itu.int/net/pressoffice/press_releases/2015/03.aspx#.Vf6Ty9iFPmR

²⁶ <http://www.broadbandcommission.org/focus-area/Pages/educationscience.aspx>

²⁷ http://www.broadbandcommission.org/Documents/publications/BD_bbcomm-education_2013.pdf

includes access to ICT – is an imperative for building inclusive and participatory knowledge societies. However, disparities in access to technology and learning opportunities persist. Countries around the world are under pressure to bridge the digital, knowledge and gender divides by designing policies that enable access to the full potential of technology in a digital age.” (page 6¹⁸)

1.3 ICT@EDU Frameworks

The number of Frameworks for education which have been developed to help implement new models which enable smart learning and the full use of technology is growing. To present all of them is beyond the structure of this work and trying to create an integrated matrix is impossible. Considering these facts, the option is to identify and present a number of frameworks which are more used or which the structure looks appropriate to this work.

1.3.1 21st Century Literacies - Underpinning Sustainable Development

“reading the word-world”

“... reading the word, the phrase, the sentence, never entailed a break in reading the world. ... reading the word meant reading the word-world.”

“Literacy: Reading the Word and the World “ Loc 112 ²⁸

“Freire makes it impossible not to ask what is literacy and why we want others to be literate. He insists that we all answer for ourselves, from our own reading of the word and the world.”

“Literacy: Reading the Word and the World“ Loc 118 ²⁹

²⁸ Literacy: Reading the Word and the World by Paulo Freire and Donaldo Macedo, Kindle Edition

²⁹ idem

Education is facing many challenges in a changing and interconnected complex reality, but one thing is for sure, it needs to offer and opportunity to understand the world where we live and participate in the World Development Agenda in all its aspects.

In 2015, at a moment when the **United Nations Sustainable Development Agenda (SDGs)**³⁰ has been agreed with a horizon to 2030, Education must be able to offer **21st Century Literacies for All**, at least, to allow a critical understanding of the new **Agenda for Sustainable Development**.

Understanding the **17 Goals of the SDGs Agenda**, the vision it includes in each and all of them, the strategies defined in the document, the methodologies it shows, the technologies required for its implementation and all the aspects that its achievement implies, as well as the most important, opportunities of personal and community participation in the **Sustainable Development Agenda is the literacy of our time and the challenge of education, and provides a Framework for Education**.

The **SDGs Agenda “Transforming our world: the 2030 Agenda for Sustainable Development”** expresses three dimensions as follows: “We are committed to achieving sustainable development in its three dimensions – **economic, social and environmental** – in a balanced and integrated manner.” **SDGs §2.**³¹ Which are considered as the **3Es of Sustainable Development – E for Economic; E for Equity (social) and E for Environmental**, although a fourth **E for Education** is required to enable all the other in the knowledge society and economy as well as create the framework literacy of 21st century.

“**Sustainable development post-2015 begins with education**” a document published by UNESCO in 2014³² describes with clarity the role of education in the new **Development Agenda** as follows: “**Notwithstanding the centrality of education in treaties, covenants and agreements, the international community has yet to recognize the full potential of education as a catalyst for development.**” ... “**An important step can be seen in the outcome document of the Open Working Group on Sustainable Development Goals (released in July 2014)**³³, which reiterates that education is not only an end in itself but also a means to achieving a broad global development agenda. This policy paper provides a succinct, evidence-based overview of the numerous ways in which education can advance the proposed post-2015 sustainable development goals. It underscores the notion that sustainable development for all countries is only truly possible through comprehensive cross-sector efforts that begin with education.”

This recognition of the role of Education as a support and an enabler of sustainable development matches with the vision of literacy as a tool to understand the world, as well as the fact literacy, for the same reason, is related to the specific context.

Literacy is understood as related to the context and at the same time as the contextualizer of the reality for the human beings, is the enabler of the context dynamics itself: “Some scholars have suggested that a more useful

³⁰ <https://sustainabledevelopment.un.org>

³¹ <https://sustainabledevelopment.un.org/post2015/transformingourworld>

³² Sustainable development begins with education

<http://unesdoc.unesco.org/images/0023/002305/230508e.pdf>

³³ https://sustainabledevelopment.un.org/content/documents/4518SDGs_FINAL_Proposal%20of%20OWG_19%20July%20at%201320hrsver3.pdf

concept would be that of multiple literacies – that is, ways of ‘reading the world’ in specific contexts: technological, health, information, media, visual, scientific, and so on (see Street, 2003; Lankshear and Knobel, 2003; Cope and Kalantzis, 2000)”³⁴

During a “Global Meeting on ‘Literacy and Sustainable Societies’”ⁱ on 8th and 9th September 2015 on the occasion of International Literacy Day at UNESCO Headquarter, the relation between the Sustainable Development Agenda and literacy skills was clearly described:

“At the same time, progress in each area of sustainable development will contribute to the advancement of literate environments, creating sustained demands, opportunities and conducive settings for people to acquire, use and further develop their literacy skills.”

...

“We, therefore, reaffirm our engagement to literacy as the foundation of lifelong learning. The emerging ‘2030 vision of literacy’ is a continuum of proficiency levels and is part of a wider set of key competencies needed for sustainable development.”

...

“Encouraging innovative approaches to the teaching and learning of literacy: While building and scaling-up proven effective approaches is critical, new opportunities must be seized to improve curriculum frameworks and teaching and learning processes. The potential of information and communication technologies should be harnessed to make learning more accessible and relevant to learners and their communities, including by building conducive learning environments and providing appropriate learning resources.”

...

“Building robust lifelong learning systems and partnerships: The ‘2030 vision of literacy’ implies that literacy is integral to lifelong learning systems and related institutional and legislative frameworks. The immense task before us requires the pooling of resources for the development and coordination of joint programmes, and sustained inter-sectoral efforts of multiple stakeholders at global, regional, national and sub-national levels. This requires capacity development of stakeholders and the strengthening and widening of networks and partnerships for literacy.”

...

“Working together across sectors will generate demands for literacy, as progress in any area of sustainable development requires literacy skills and such progress creates new demands.”

This path was translated in the “Resolution adopted by the General Assembly on 18 December 2014; 69/141. Literacy for life: shaping future agendas”³⁵:

“Recognizing that literacy is a foundation for lifelong learning, a building block for achieving human rights and fundamental freedoms and a driver of sustainable development”

³⁴ Education for All Report 2006, Chapter 6 – Understandings of Literacy

³⁵ Global Meeting on ‘Literacy and Sustainable Societies’

...

“ ... innovative models of literacy delivery, including through information and communications technologies, and expanding the knowledge base and monitoring and evaluation, as well as advocating literacy on the global agenda and ensuring synergies between different actions, including through multi-stakeholder partnerships and networks;”

...

“Recognizes the continued need to give appropriate consideration to the issue of literacy in the discussions on the post2015 development agenda;”

To define a framework of action by taking into consideration the **“Education for All Report 2006, Chapter 6 – Understandings of Literacy”** ⁱⁱ we can follow four “understandings of literacy”:

- **literacy as an autonomous set of skills**

“The most common understanding of literacy is that it is a set of tangible skills – particularly the cognitive skills of reading and writing – that are independent of the context in which they are acquired and the background of the person who acquires them.”

...

A particular attention should be given to access information and knowledge which bring new literacies as “information literacy”

- **Skills enabling access to knowledge and information**

The word ‘literacy’ has begun to be used in a much broader, metaphorical sense, to refer to other skills and competencies, for example ‘information literacy’, ‘visual literacy’, ‘media literacy’ and ‘scientific literacy’. International organizations – notably the OECD through publications such as Literacy in the Information Age (2000) and Literacy Skills for the Knowledge Society (1997) – have given impetus to the use of such terms.”

- **literacy as applied, practised and situated**

“Acknowledging the limitations of a skills-based approach to literacy, some scholars have tried to focus on the application of these skills in ‘relevant’ ways. One of the first coordinated efforts to do so was through the development of the notion of ‘functional literacy’.”

- **literacy as a learning process**

“As individuals learn, they become literate. This idea is at the core of a third approach, which views literacy as an active and broad-based learning process, rather than as a product of a more limited and focused educational intervention.”

- **literacy as text**

“A fourth way of understanding literacy is to look at it in terms of the ‘subject matter’ (Bhola, 1994³⁶) and the nature of the texts that are produced and consumed by literate individuals. Texts vary by subject and genre (e.g. textbooks, technical/professional publications and fiction), by complexity of the language used and by ideological content (explicit or hidden).”

These “**four understandings of literacy**” may constitute a framework to look at the 17 SDGs and design a program of **21st Century Literacies for Sustainable Development**.

As a starting point it will be useful to look to the the Global Partnership for Education initiative “17 ways education influences the new 17 global goals”³⁷, as described in 1.2.4, and consider how the understanding of literacy applies to each of the Sustainable Development Goals and Targets.

1.3.2 Framework for 21st Century Learning

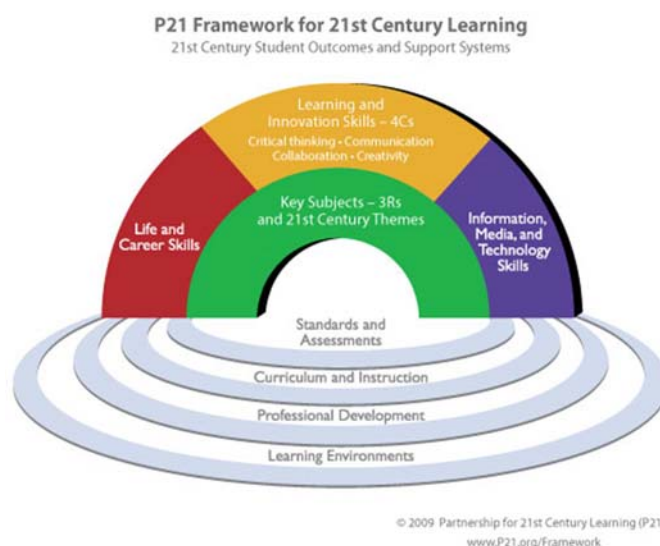
“P21's **Framework for 21st Century Learning**³⁸ was developed with input from teachers, education experts, and business leaders to define and illustrate the skills and knowledge students need to succeed in work, life and citizenship, as well as the support systems necessary for 21st century learning outcomes. It has been used by thousands of educators and hundreds of schools in the U.S. and abroad to put 21st century skills at the center of learning.

The P21 Framework represents both 21st century **student outcomes** (as represented by the arches of the rainbow) and **support systems** (as represented by the pools at the bottom).”

³⁶ A Source Book for Literacy Work: Perspective from the Grassroots, H. S. Bhola Jessica Kingsley Publishers, 01/01/1994

³⁷ <http://www.globalpartnership.org/blog/17-ways-education-influences-new-17-global-goals>

³⁸ <http://www.p21.org/about-us/p21-framework>



The P21 Framework is based on the skills, knowledge and expertise that students must master in order to succeed in work and life, presenting itself as a blend of content knowledge, specific skills, expertise and literacies. The Framework identifies the Key Subjects and 21st Century Themes, the Learning and Innovation Skills, the Information Media and Technology Skills and the Life and Career Skills, which provide the basis for this blend.

Key Subjects and 21st Century Themes

The Key subjects include English³⁹, reading or language arts, world languages, arts, mathematics, economics, science, geography, history, government and civics.

Schools must also promote an understanding of academic content at much higher levels by introducing the 21st century interdisciplinary themes into core subjects:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy
- Environmental Literacy

Learning and Innovation Skills

Learning and innovation skills are critical to prepare the students for the increasingly complex life and work environments in today's world. They include:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

³⁹ This Framework is of anglosaxonic origin, thus the English language. In other regions different languages may apply.

Information, Media and Technology Skills

The 21st Century citizens and workers must be able to exhibit a range of functional and critical thinking skills, and the ability to collaborate and make individual contributions such as:

- Information Literacy
- Media Literacy
- ICT (Information, Communications and Technology) Literacy

Life and Career Skills

The ability to navigate the complex life and work environments in the globally competitive information age requires students to develop adequate life and career skills, such as:

- Flexibility and Adaptability
- Initiative and Self-Direction
- Social and Cross-Cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

21st Century Support Systems

Further to the Knowledge and Skills mentioned above, the Partnership has identified five critical support systems to ensure student mastery of 21st century skills:

- 21st Century Standards
- Assessments of 21st Century Skills
- 21st Century Curriculum and Instruction
- 21st Century Professional Development
- 21st Century Learning Environments

1.3.3 ICT Competency Framework for Teachers (UNESCO ICT-CFT)

The ICT Competency Framework for Teachers⁴⁰ was developed by a cross-sectoral working group and based on consultations with experts in the field from all world regions. Moreover, this Framework is the result of the

⁴⁰ <http://www.unescobkk.org/education/ict/online-resources/databases/ict-in-education-database/item/article/unesco-ict-competency-framework-for-teachers-version-20/>

successful continued collaboration between UNESCO and its partners from private companies in the professional society, such as CISCO, INTEL, Microsoft, and ISTE.

This Framework is further detailed in Module 5, in subsection 5.2.

1.3.4 PRIVATE SECTOR FRAMEWORKS

2.3.4.1. INTEL FRAMEWORK

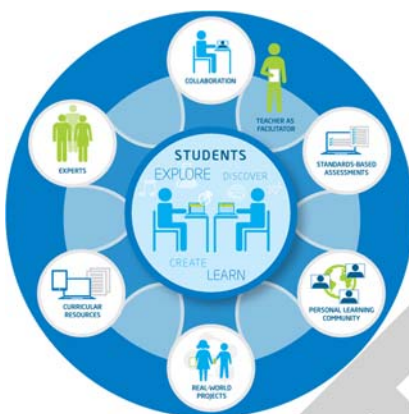
“Grounded in research, Intel® Education has developed a model for learning and teaching⁴¹ that includes all aspects of the process from providing leadership and policy development to adopting curriculum, choosing technology all while maintaining sustainable program funding and constantly evaluating program success.

Intel Education model provides insights, best practices and practical strategies to advance the schools’ vision of education transformation. By adopting and using this model schools can successfully effect deep, large-scale and long-term change to realize student success.”

In the transformed environment, teachers are still critically important, but they act as facilitators who guide students in their learning. Teachers can customize the learning experience for their students, helping each student achieve at the highest level. Technology is pervasive, and students and teachers use it throughout the school day and beyond.

Education in a transformed environment is academically rigorous, but follows a student-centered model that emphasizes investigation, independent learning and collaboration. Students can manage their time and take more control of their learning. They can access different media for learning in a way that fits their needs. They can master higher-level skills such as critical thinking, problem solving and collaborative learning.

⁴¹ <http://www.intel.com/content/www/us/en/education/education-transformation.html>



Transformation changes WHAT students learn and HOW they learn. Students use technology to analyze, learn, communicate and explore. They develop higher-order thinking skills, such as evaluation and problem solving, critical thinking, innovation and creativity, and the ability to work collaboratively and communicate effectively. They gain knowledge that prepares them to work and contribute to their economies and communities.

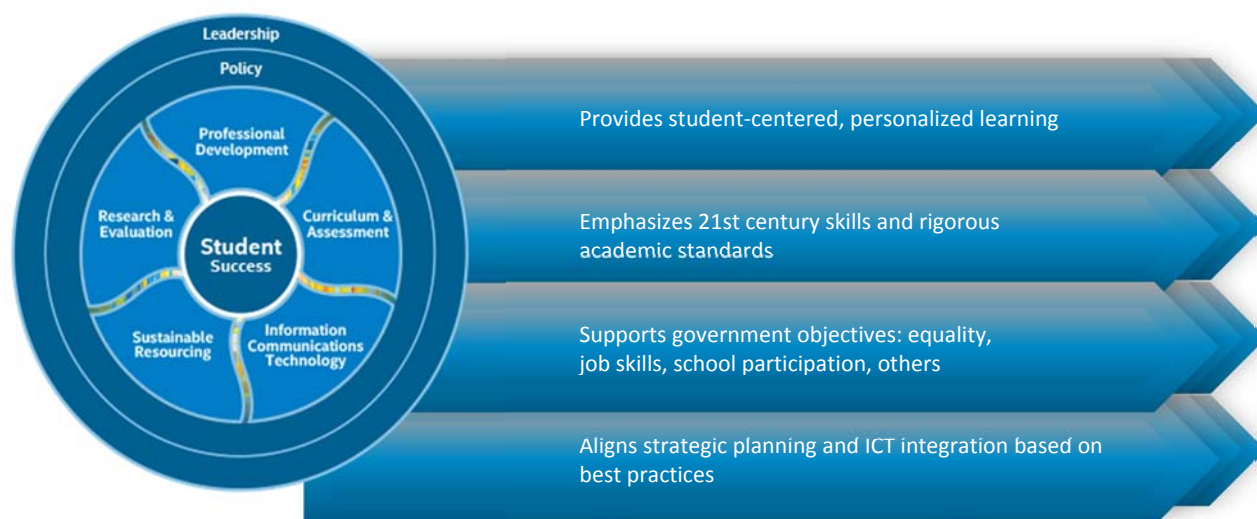
The transformed learning environment matches the needs of the 21st century knowledge-based global economy. It contrasts with the traditional, instructor-centric model of education that most of us grew up on. The traditional model grew out of factory-era thinking. It takes a one-size-fits-all approach. Instructors impart facts and knowledge, often in lectures. Students reiterate information back to the instructor in worksheets or tests. There might be technology in the classroom, but often it is the teacher who uses it; or students use it to gather facts.

Robust ICT—ideally, one tablet or other mobile device for each student and teacher, plus appropriate infrastructure—plays an important role here.

- Pervasive technology helps teachers deliver personalized learning experiences that challenge each student and enable all students to work to the highest level.

ICT also allows teachers and students to connect with resources, experts, and other schools and students. All of this greatly enriches the classroom and learning experiences.

Strategic, Comprehensive Research-Based Model for Transformation:



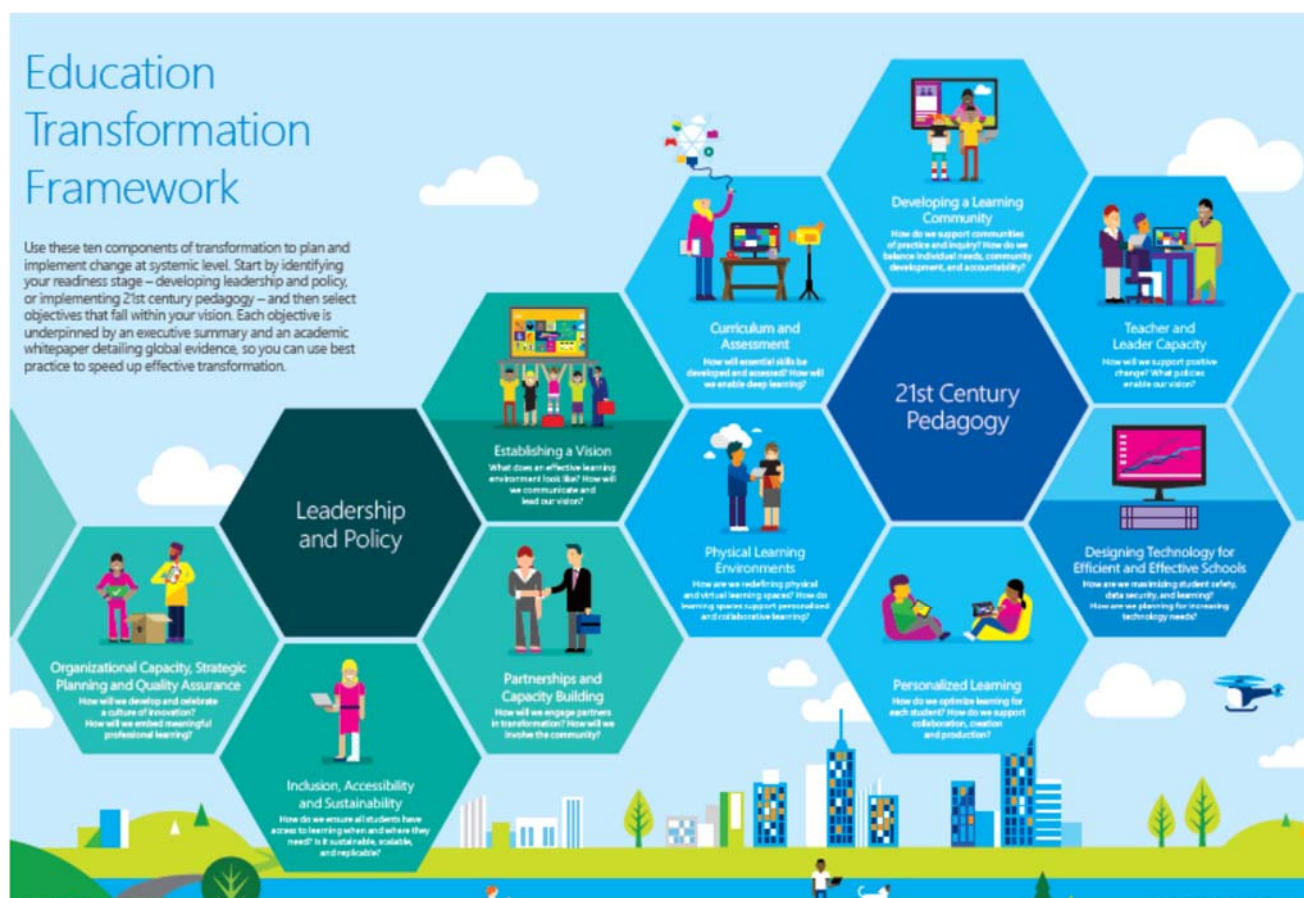
Transforming Education for the Next Generation

- Develop students that are next-generation citizens, innovators and entrepreneurs
- Use the transformation model as a comprehensive approach that is delivering results around the world
- Provide powerful, practical programs, technologies and resources to help you achieve your vision of student success

2.3.4.2. MICROSOFT FRAMEWORK

The Microsoft in Education Transformation Framework⁴² is a guide for educators and leaders engaged in holistic education transformation. The critical conversations needed for effective transformation of education systems are the focus of this paper series. Each expert author presents a global perspective on the topic through the current thinking and evidence from research and practice, as well as showcase examples. Specifically, the papers document the contributions of anytime anywhere approaches to K-12 learning and explore the potential of new technology for transforming learning outcomes for students and their communities.

⁴² http://download.microsoft.com/download/8/E/4/8E4D5383-058A-431E-9090-1F241AC23246/1_MS_EDU_TransformationPapers/MS_EDU_BonusCoreOverview.pdf



The Education Transformation Framework is made up of 10 components, which are the components of transformation needed to plan and implement change at systemic level. These components are designed to help Policy makers to develop the transformation of the Education system. Below, these 10 components are identified and summarized:

1. Establishing a vision

The first step is to define a clear vision. This focus area helps policy leaders with examples from successful systems, and best practice to develop a cycle that includes defining a vision, strategic planning, implementation, and reflections on progress.

2. Partnerships and capacity building for change

A public-private education partnership has the potential to be a significant catalyst for systemic change. In order to find the right partner and deliver the greatest possible alliance, work and success, both organizations must commit to mutual understanding and the power of education to transform lives, communities, institutions, and nations.

3. Organizational capacity, Strategic Planning and Quality Assurance

It is fundamental to develop a change strategy that includes professional development, feedback and support for teachers. Quality assurance is based on a carefully planned monitoring and evaluation system.

4. Inclusion, Accessibility and Sustainability

This component focuses on providing technology solutions that empower all students, including those with learning difficulties, physical disabilities or other learning impairments. Accessibility is a crucial consideration in transformation, and early planning for inclusive learning environments benefits students and schools.

5. Personalized Learning

After the right technology is in place, personalized learning is becoming practical and easy to implement throughout schools. This has the potential to overcome socio-economic, time and space limitations and maximize educational opportunities through motivated, engaging and relevant learning. Clear guidelines from UNESCO present a roadmap towards individualized education.

6. Teacher and Leader Capacity

Building teacher and leader capacity is vital to successful transformation.

In addition to equipping leaders with the skills and incentives to continually assess and apply new ways of working, top-performing schools place an intensive focus on training, mentoring and collaborative groups that promote discussions on student learning, and offer regular feedback and peer learning.

7. Curriculum and assessment

Responsive and creative use of technology is powerful in improving curriculum and assessment outcomes for students. With access to personalized, connected and collaborative learning, students in blended learning exceed students in traditional classroom environments. However, care must be taken to ensure technology meets the needs of the student and the strategies of the teacher.

8. Developing a learning community

Learning communities go through a series of stages as they grow and develop, however technology makes it easier to create and sustain a peer network and gives learning communities the ability to communicate and collaborate in a virtual hub that can provide help and support to its members.

9. Physical learning environments

Anytime, anywhere virtual learning spaces are redefining the 21st century school-community dynamic. From whole-of-school transformation to mobile and smart learning solutions, these technology-enabled environments cultivate innovative learning.

10. Designing Technology for Efficient and Effective Schools

Combining cloud solutions that manage infrastructure, services and learning allows schools to operate more effectively. Not only does the technology support the running of the school, it also maximizes the potential of all students.

Together with the Education Transformation Framework, the School Transformation Process helps schools or school systems reflect on, plan and undertake changes in education for 21st Century learning. This process consists of six phases which can be undertaken in any order or simultaneously.

These six phases are:

1. **Introspection:** Collaborate to define a vision, core values and goals.
2. **Inquiry:** Discover the possibilities for change.
3. **Inclusion:** Seek input and strategic partnerships to help shape the vision.
4. **Innovation:** How to bring about the vision
5. **Implementation:** Create and implement the plan for change.
6. **Insight:** Reflect and review to guide continuous improvement.

For each of these stages, the School Transformation Process provides guidelines, activities and considerations to help implement the process.

2. MODULE 2: Preparation for Smart Learning strategy development/strategic planning:

2.1 General Policy Considerations

Apart from considerations for policies related to specific issues, such as ICT or curriculum and assessment, policymakers should keep in mind other things that will maximize the impact of their policy decisions. There are a number of characteristics of effective policies and these characteristics should be incorporated into policy decisions.

2.1.1 Systemic reform

A system is composed of interconnected, mutually reinforcing components. A change in one component influences and is influenced by others. Effective policies acknowledge and address this systemic nature. Even when a policy is focused on only one part of the system, such as ICT or curriculum, it addresses all of the other parts.

2.1.2 Coherence

Related to this systemic nature, reform policies should be coherent. There are two types of coherence to consider and plan: horizontal and vertical. Horizontal coherence connects and aligns policies and programs across related administrative units within the Responsible Entity. That is, the ICT policy should align with and support the curriculum policy, the professional development policy, and other policies, and these policies should support the ICT policy. This type of alignment comes from the coordination with and involvement of other organizational units in the decision making process and policy implementation. The management of this can be effectively done by a cross-ministerial team, perhaps chaired by the leader of the Responsible Entity. This horizontal coordination can even extend across relevant ministries, such as education, ICT, youth and families, labor, and finance.

Vertical coherence connects and aligns policies and programs through the hierarchical levels, such as federal and state or provincial agencies. In many countries, there are intermediate agencies between the national government and the schools and classrooms where the policies are to be implemented. Often these intermediate levels have a certain amount, maybe a lot, of policy-making authority of their own. To reach the

schools and classrooms, national policymakers should involve regional policymakers in the decision process and coordinate programs and implementation with regional efforts.

2.1.3 Action-oriented

Effective policies are action-oriented. They do not just articulate a vision or a set of values or goals but specify actions, programs, and projects to achieve these goals. Conversely, the programs and projects must be specifically linked to the policy visions and values on which they are based. Local administrators and teachers who are engaged in new programs and projects must understand how they are contributing to the goals and visions defined by policies.

2.1.4 Local participation

While national policies define visions and goals and initiate programs for implementation, education reform can benefit from structuring policies to allow for considerable local participation and innovation. Programs can be structured to create opportunities and build mechanisms for teachers and principals to design program variations and projects that contribute to policy goals but also address local needs and conditions. At the same time, local implementation must be held accountable for contributing to the national goals.

2.1.5 Innovation and scale

The ultimate challenge for any policy is to have its effects spread widely throughout the education system. An important characteristic of transformational policy is it has a path or trajectory by which initial changes will diffuse throughout the system. Oft-used strategies start by seeding “innovative” or “lighthouse” schools or by creating special funding that is given to schools or districts that volunteer for participation in new, policy-supported approaches. Transformative policy specifies mechanisms by which such innovations, once proven, can be shared with and adopted by other schools.

2.1.6 Financial support

Money is always a critical factor in implementing effective policies. High-sounding intentions are usually free of cost but it takes money to set up the programs and purchase equipment and resources that will make the policy work.

Australia set aside A\$ 2.4 billion to promote and provide ICT and broadband connections for secondary schools with its Digital Education Revolution. Portugal, with its eSchool program, developed a Public private Partnership, where the investment was split between the State, Telecom Operators and Beneficiary Families. It

is tempting to pass along some of these costs to schools, teachers, and students or their parents. This is an possible strategy, on occasion. High-quality education has personal benefits people value and will pay for, if they are able. On the other hand, high-quality education benefits the public, as well—it improves the economy and society, generally. These are in many ways even more important than the personal benefits. In this regard, investment in educational improvement is a wise one from a policymaker’s perspective and can result in huge returns on the economy and society. Financing of educational change should not preclude those least able to pay for it.

2.2 Creating an enabling environment

The successful integration of smart learning into education depends on the creation of an enabling environment for ICT among all stakeholders. All key stakeholders (students, teachers, parents, governments, private sector etc.) should have a common vision for smart learning.

The management structure of the Smart Learning Initiative will be further addressed in Module 7, Chapter 7.1, nevertheless it is important to state that the establishment of a national committee will help for coordination and development of a plan. National committee could be composed from the Chief of State level (Kingdom, Presidency, Prime Ministry Offices) Ministries of Educations ICT, Finance, Development, Telecom Regulatory Authority and other relevant institutes. One person needs to lead national committee and national committee needs to have full support from the Chief of State.

National Committee could start by collecting existing relevant policies, strategies, implementation plans, strengths-weakness and barriers to examine existing situation. Challenges can prevent effective execution of smart learning program (absence of clarity, lack of implementation strategy and/or monitoring procedures, etc.). It is also necessary to determine percent of schools connected with broadband, percent of schools donated with ICT technologies, percent of teachers, students using ICT in schools and outside, digitization level of training courses etc.

Committee should also focus on trends and successful smart learning applications in the world. Regional and global trend analysis is necessary to compare the existing situation and benefit from the best practices of other countries. It is also important to analyze and understand the strategy of most developed countries.

It is sometimes difficult to get people to think “outside the box”; the envisioning convener can help by providing some warm-up exercises which get participants’ to think creatively.

The situation analysis helps identify the best starting points to work toward policy goals, the strengths on which to build, and the weaknesses to address. The situation analysis is the basis for developing the long-term master plan and trajectory that moves toward the vision.

Analyze the socio-ecosystem. The outcome of the envisioning session is a clear vision and a concrete set of images that can serve as a set of measurable goals to attain in ten years or fifteen years. The “socio-ecosystem analysis” brings the process back to the current world. Analyze the situation as it is right now. What does the current situation in schools look like? What are the strengths of the system? What are the weaknesses? What are the local and global demands and local expectations? What are the challenges and impediments to change? The socioeconomic analysis may involve reading reports, visiting schools, and interviewing teachers, school leaders, and Ministry officials. Go beyond the specific focus of the policymaking and include the whole context, including global trends and world-class standards. Even if the policy is focused on a particular area, like ICT, consider the current state of all the components of the system: curriculum and assessment, teacher professional development, research and evaluation.

For example, when considering the ICT policy in Jordan, schools were visited, along with their computer labs and other classrooms. Teachers and principals were interviewed, as were officials from the Ministry’s ICT department and other departments of the Ministry --those in charge of teacher professional development, curriculum, assessment, and planning. People in the Ministry of ICT were also interviewed. The situation analysis helps identify the best starting points to work toward policy goals, the strengths on which to build, and the weaknesses to address. The situation analysis is the basis for developing the long-term master plan and trajectory that moves toward the vision.

After collecting these information and understanding existing situation and problems it is necessary to identify priorities and develop a strategic roadmap for smart learning aligned with the vision of country. For example; UAE Smart Learning is in line with UAE Vision 2021, education remains a top priority and developing human capital is considered to be a key enabler in the country’s efforts to establish a diversified knowledge-based economy. Program was established to further advance the United Arab Emirates’ already accomplished education system into the next phase of development through the application of world class teaching techniques and up to date technology.

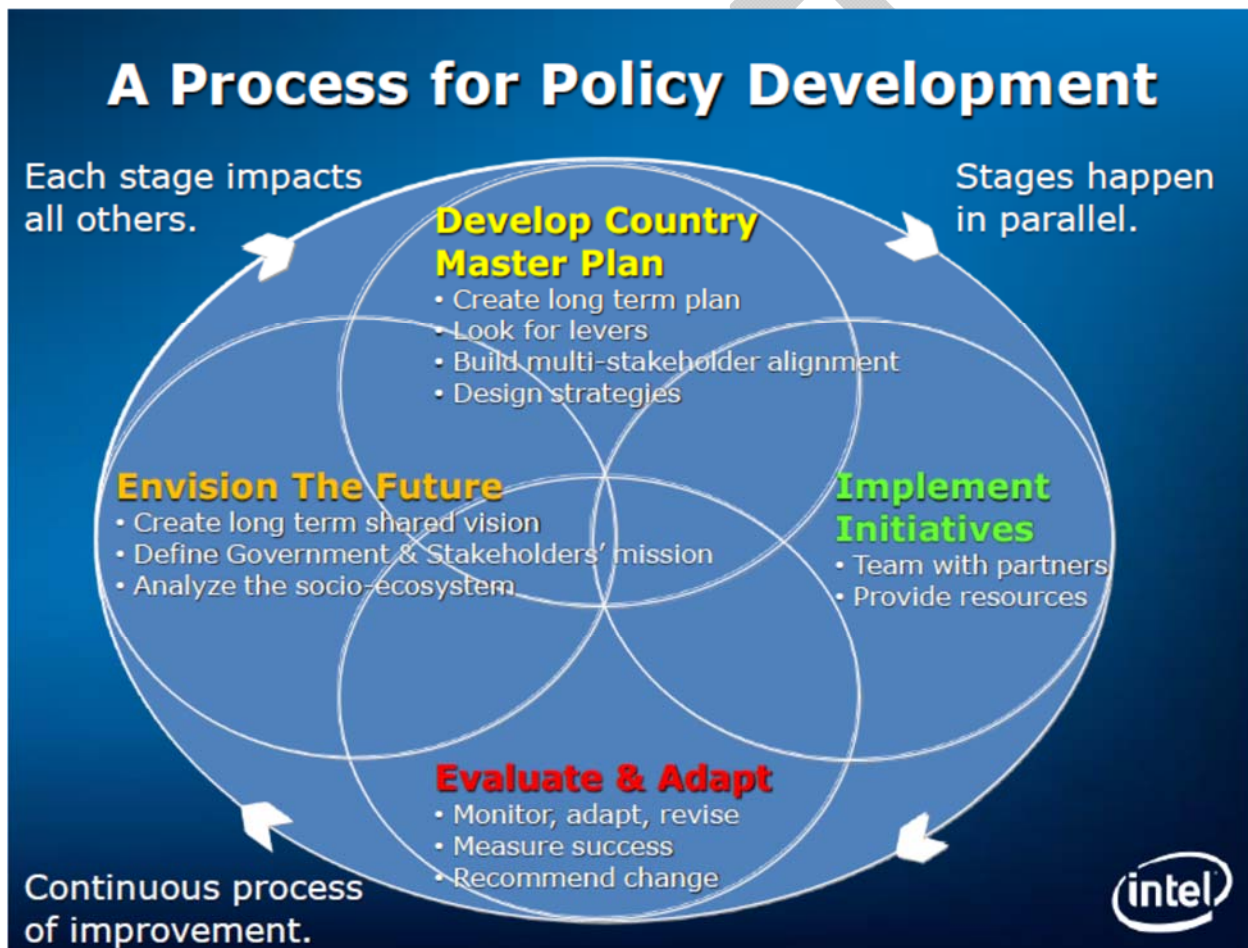
Public Awareness programs through different campaigns is critical for mobilizing the public’s interest and Institutions. Awareness Program Activities; Seminars-Workshops-Conferences, brochures, posters, videos, exhibitions, public awareness events, media, internet etc. All players should understand about the benefits and its importance for transformation into information society. Visits to relevant ministries, institutions and ICT companies by National Committee is also necessary. National committee needs to work very closely with ICT sector for the development of plan and implementation. ICT sector could also play a very important role for awareness programs. Awareness programs could also help to mobilize financial resources and partnership programs.

A smart learning pilot project in one of the schools is an effective method to create public awareness and get political support. Invitation of all players to the launch of pilot project with a media activity will help to increase the awareness.

Strategic Plan should include following:

- A National Committee for the development of strategic plan
- Vision
- Objectives and timeframes (what do you want to achieve)
- Roles and responsibilities (must be owned by all stakeholders)
- Funding strategy
- Defined set of smart learning outcomes and a roadmap to get there.
- Commitment for time and resources
- Must be based on the needs of students and teachers.

Following figure shows a process for policy development;



3. MODULE 3: Formulation of Vision, Mission and Aims/ Goals:

3.1 Vision

Education is a fundamental human right⁴³. It provides children, youth and adults with the power to reflect, make choices and enjoy a better life. It breaks the cycle of poverty and is a key ingredient in economic and social development.⁴⁴ The task of the policymaker is to turn the words above into reality. The intent should be to maximize the impact of policies on education systems. Policymakers need to articulate a vision, develop a master plan, implement initiatives, and evaluate and adapt these initiatives, relative to the vision.

The process and strategies used to formulate ICT policies can be used in formulating policies in other components of the education system, such as curriculum and assessment, teacher professional development, and research and evaluation.

Policymakers are in a unique position to influence the direction and scope of educational change. By generating a long-term, shared vision, developing a policy master plan, implementing initiatives, and evaluating and adapting efforts, education leaders can craft policies that make huge contributions not only to the education system but to a nation's economy and social welfare.

It is very important to prioritize Smart Learning and integrate in National ICT/Broadband, Development plans and country visions. Countries need to develop national visions for Smart Learning. Without a strong vision, strategic plans cannot be properly developed and deployed. Vision is also very important to motivate all players and people. Different countries are developing smart learning visions.

Countries should create a long-term shared vision. Sometimes the policy development process starts with someone — often the Chief of State — who articulates a high-level vision of what education should be like to ensure the country's future wellbeing. This happened in Portugal, Rwanda and UAE, among others. For example, in Portugal, Prime Minister Jose Socrates launched the Magellan Initiative, a project aimed at giving a laptop computer to every primary school student, as part of a larger vision, called "Plano Tecnológico", to develop a high tech economy in the country. In Rwanda, President Paul Kagame promoted ICT in education to support increased access to formal and informal basic education. UAE's Vice President and Prime Minister Sheikh Mohammed bin Rashid Al Maktoum, launched Smart Learning Program in 2012. The program aims to create a new learning environment in schools, through introducing "smart classes" in all schools. In Turkey,

⁴³ <http://www.un.org/en/universal-declaration-human-rights>

⁴⁴ http://www.unesco.org/education/efa/global_co/policy_group/EFA_brochure.pdf

President Erdogan launched Fatih which includes smart classrooms and tablet computers to all students-teachers.

If a vision has not been articulated, begin the policy making process by developing one, for it gives focus to all that follows. The vision should be long-term, not a year or five years but at least ten years into the future.

Work with multiple stakeholders to create such a vision. Envisioning meetings are a useful mechanism in which Ministry officials, school and teacher leaders, business leaders, parents, and even students participate. Even when a high-level person has articulated a vision, it is useful to convene such a meeting to generate buy-in and support. Envisioning meetings are like brainstorming sessions where people are asked to think outside the box and be as creative as possible.

To start, publish and promote the articulated vision, if there is one. As these visions are often stated in broad term, use an envisioning session to identify and generate detailed, graphic pictures of the future: what classrooms (if they continue to exist) will look like and what students and teachers will be doing, the everyday activities in which they are engaged, the facilities and resources they have, how they use them, as well as other aspects. All aspects of the system should be addressed: teacher professional development, curriculum and assessment, ICT, and research and evaluation.

Each person can define their own personal vision statement, or vision statements can be created by small groups of participants. In either case, share all visions with the whole group in a full session. Like a brainstorming session, criticism—especially that of “it can’t be done” sort—is prohibited. Once all of the statements are shared, the convener looks for commonalities. Similarities and distinctions are clarified by the participants. The goal is to align and achieve a shared vision or visions of what people want schools to be like in the future.

Define government and stakeholders’ missions. Many ministry departments are involved in educational transformation—the departments of curriculum, assessment, teacher training, and ICT are all important contributors. Other stakeholders can make important contributions, as well—private sector industries and businesses, parent and community groups, professional organizations and unions, NGOs, and donors. It is important to identify all the stakeholders and specify their missions. This will provide information needed to analyze the socio-ecosystem and identify potential partners for change.

3.2 Develop a National Master Plan

3.2.1 Create a long-term plan and trajectory

Before starting to identify short-term plans and programs, progress can best be defined by creating a long-term trajectory, perhaps in five year phases. Then identify short term plans and programs which define progress against the long term vision. This assures short-term plans will contribute to ultimate long-term goals. For example, in 1997 Singapore created a series of ICT master plans of five years. A trajectory started with an emphasis on equipping schools and classrooms, moved to embedding ICT into the curriculum, and then shifted to collaborative learning pedagogy and teacher communities of practice.

3.2.2 Look for levers

A complex system is composed of a constellation of interlocking, mutually reinforcing components that make the system robust. This interconnection makes it very difficult to change the system because a change in one component has implications for all of the others, and the status quo in those components creates resistance that is a major barrier to change. Education change, particularly education transformation, means changing many things, sometimes the whole system. Yet everything cannot change at once. The challenge then is where to start. The answer is often opportunistic and always depends on the situation.

The situation analysis provides a picture of the strengths of the system, as well as its weaknesses. One approach to education change is to build on strengths—those components that are closest to the target goals. Building on strengths can provide a lever to make changes in all other parts of the system. The introduction of a new component, such as ICT, can also be used to launch change in other components. However, it is important to keep in mind that merely introducing new technology will not bring change by itself. It is best to link new technology with other changes.

3.2.3 Build alignment

The key element in designing a policy strategy is to use the levers identified to realign the other components and move toward your goals and vision. Identified levers are the start, and over the upcoming years, bring about changes in other components to create a new constellation of mutually reinforcing components. Consequently, design a way to, over time, bring all of the stakeholders and components into an alignment that works toward the defined goals and vision.

3.2.4 Design strategies and initiatives

With a trajectory set, the levers identified, and a plan for aligning the components over time, you have the basic structure for designing a short-term, five-year strategy. Begin filling in this strategy by setting specific measurable goals for each target component at the end of five years; for example, 100% of the teachers will be trained in the use of blended learning to integrate ICT into their teaching, 90% of the teachers will use blended learning in at least one of their lessons or classes each week and 70% will use it two or more times a week. With the final and intermediate goals in mind, identify actions, programs, or initiatives that will achieve these goals for each of the targeted areas of change.

In Jordan, it was proposed that in the first year of the plan, the Ministry of Education adopt the UNESCO ICT Competencies for Teachers⁴⁵ to identify or develop training materials targeted at these competencies. With the goal to provide all primary school children with networked laptops in Uruguay, Plan Ceibal set out four stages in which all students in one target rural school received laptops, followed by all students in the province in which that town was located, followed by all students in the country outside of the primary metropolitan area of the capital, followed by all students in the capital¹⁶. In parallel, schools were set up with wireless hotspots, teachers were trained in the use of the computers in their teaching, and digital contents and activities were developed.

3.3 Implement Initiatives

3.3.1 Team with partners

Strategy implementation is a challenging task. It requires significant resources, as described below, but also a management structure. Management must be responsible for making sure the plan is implemented. Early in the implementation, a team should be identified that spans across the relevant departments to assure various efforts within the Ministry are coordinated.

In Jordan, a Development Coordination Unit was set up in the Ministry that drew on each of the directorates or divisions within the Ministry to oversee the implementation of various programs related to the Education Reform for the Knowledge Economy, including the ICT Plan. In Singapore, the Educational Technology Division worked with other Divisions within the Ministry, such as the Curriculum Planning and Development Division and the Training and Development Division, to implement their master plan. In addition, the Ministry of Education worked closely with the Infocomm Development Authority, the government agency responsible for the national ICT grid and for developing a competitive ICT industry in Singapore.

Cooperation among ministries, such as the Ministry of Education, the Ministry of ICT, the Ministry of Higher Education, or the Ministry of Labor, can dramatically increase the support for, scope, and impact of policies and their implementation. In Chile, a National Digital Strategy was developed through the cooperation of the Ministries of Economy, Education, Finance, Transportation and Telecommunications, and the General Secretariat Minister of the Presidency. Finland's Ubiquitous Information Society Plan was developed under the aegis of the Ministry of Transport and Communications with participation from the Ministries of Education, Employment and the Economy, Social Affairs and Health, Justice, Finance, Defense, and the Interior. In Portugal, the Magellan Initiative was a collaboration between the Ministry of Public Works, Transportation, and Communication and the Ministry of Education.

Private-public partnerships can also play an important role. In addition to contractual arrangements with the private sector, some companies may be able to contribute resources or programs that would fit policy vision,

⁴⁵ <http://unesdoc.unesco.org/images/0021/002134/213475e.pdf>

goals, and strategies. The private sector made direct contributions to ICT programs in Portugal, Estonia, Hong Kong, Singapore, and South Korea, among other countries. The World Economic Forum worked with private sector companies to support major education reform initiatives in Jordan, Egypt, Palestine, India, and Rwanda.

Donors and NGOs can be part of the mix, as well. World Bank funding supported education efforts in Jordan and Namibia, among many other countries. Having the vision, goals, and strategies in place, allows the Ministry to focus and coordinate diverse contributions that might otherwise go in divergent directions.

3.3.2 Provide resources

Successful implementation is highly dependent on the allocation and management of adequate resources. These include personnel and materials and, in the case of ICT policy, hardware, software, networks, maintenance, and technical assistance. Detailed resource specifications, including budget, should be developed as soon as the strategy is finalized. These resources should be mobilized according to the strategy schedule. Financial resources are, of course, an important component of this.

Singapore invested \$1.2 billion in their ICT master plans between 1997 and 2002. Spending on education improvement increased in 2009, despite a significant economic downturn. On the other hand, implementation of ICT plans in Rwanda and Namibia have been limited by budgetary constraints. The financial resources that exist must be converted to specific spending priorities, such as the purchase of equipment, the training of teachers, and the purchase of digital content. Denmark, Finland, France, Hong Kong, and the Netherlands are among the countries that have invested in the development and distribution of educational digital content. South Korea plans to replace paper-based textbooks with digital content.

3.4 Evaluate and Adapt

3.4.1 Monitor, adapt, and revise

Monitoring, adapting, and revising are essential steps to policy success. A mechanism should be set up that would allow managers and participants to monitor the implementation of strategies and initiatives and progress toward goals. This will enable managers and participants to identify problems and shortcomings, adapt to changing conditions, and make revisions in strategies and initiatives.

3.4.2 Measure success

Early in the policymaking process, the goals should be expressed in measurable terms. Indicators should be identified that will be used to measure implementation progress and anticipated outcomes at various points in time. Some monitoring data (such as attendance, grades, equipment purchase and distribution) can be collected as part of the Ministry's regular information management system. For other information, instruments

will need to be designed—interview protocols, surveys, observation protocols, etc. A schedule for data collection should be set, along with review events, throughout the period of the policy. The management team should use this information to make modifications and adjustments in the strategy, based on the results. A final-year evaluation can identify and document success, address problems, and set up the requirements for the subsequent phase of the long-term strategy.

3.4.3 Recommend change

Continuous monitoring and periodic evaluation will provide managers with the information needed to make changes to their subsequent master plan. Singapore has periodic reviews scheduled throughout its master plans and, in the final year of a five-year plan, a summative review that involves an international review panel is charged with examining the findings across the years of the project. Based on these reviews, the international review panel makes recommendations for the next master plan.

3.5 Policy Issues, Constraints, Challenges, Opportunities and Recommendations

While process is important, substance is essential. To be transformational, education policies must address the entire system: Curriculum and assessment, professional development, ICT, and research and evaluation. This section identifies and discusses the key policy issues that confront education leaders as they engage in the policy making process.

3.5.1 Policies related to curriculum and assessment

Traditionally, curriculum policies have focused on the “scope and sequence” of the topics or materials “covered” by teachers and textbooks. Often, these policies would specify the topics in great detail and provide a schedule of dates by which each would be introduced, to ensure that all of the topics are covered. Curriculum inspectors or supervisors would visit schools to ensure these schedules are uniformly followed throughout the country. Assessments, often using multiple choice tests, would focus on the students’ recall of the material covered.

Contemporary curriculum policies are much more concerned with standards and student outcomes: that is, the skills and capabilities students must have at different stages of progress. Increasingly, these curriculum standards focus on the key concepts of the subject domains, those that serve to organize and connect the facts

within the subject. These standards also focus on the students' ability to apply these concepts to solve complex, real world problems.

In many countries, the curriculum is starting to include cross-domain, "21st century skills", such as creativity, critical thinking, problem solving, learning to learn, communication, collaboration, and information and ICT literacy. More and more, these skills are articulated as regional or global standards in multinational forums, such as the European Commission, the OECD, the IEA, and UNESCO.

Reform policies can serve to greatly improve the nation's curriculum standards and assessments and dramatically increase the skills and competencies of students and, ultimately, the capacity of the labor force and society, more generally. Policies can articulate the importance of these changes, create frameworks that can be developed by curriculum leaders, and provide resources to promote implementation.

3.5.2 Policies related to professional development

Traditionally, teacher professional development has been limited to a few courses or intensive workshops offered during school breaks. These may be supplemented by an occasional after-school workshop focused on a new technique or a recently introduced policy. The assumption has been that the bulk of what teachers need to know was acquired in their own college years and they needed only an occasional update.

Contemporary policies view professional development as a career-long process. Professional development services are provided in an ongoing basis. Teachers are proactively engaged in this process; they identify their own professional development goals and the means towards accomplishing them. Teachers are forming professional communities of co-learners, sharing new knowledge and skills and the products of their work. In some cases, teachers generate this new knowledge as they engage in action-research projects that employ and evaluate a new technique that they may have developed individually or collectively.

ICT is increasingly used to support each of these professional development activities by providing teachers with self-assessment and monitoring tools, learning resources, and community building and sharing environments.

ICT skills are becoming an increasingly important part of teachers' own development, for administrative purposes, and for their use in the classroom. Accordingly, ICT skills have become an important component of professional development curricula.

Important too are new pedagogical techniques that take advantage of the new capabilities of ICT and better teach and assess the new 21st century skills that students need.

The UNESCO ICT Competency Standards for Teachers weave together ICT skills with other important teacher competencies in curriculum, pedagogy, and assessment and are an excellent resource for policymakers.

3.5.3 Policies related to ICT

The introduction of new technologies is often an opportunity to review current policies and introduce new ones. ICT can be a lever used to initiate changes in other parts of the system, such as pedagogy, curriculum, and assessment. In the US State of Maine, a one-laptop-per-student program, the Learning Technology Initiative, was used as a lever to change pedagogy and curriculum content. A series of ICT master plans in Singapore have been used to support a range of changes in the education that align the system with the country's economic development goals. So while ICT strategies should include matters of hardware, courseware, networking, and information systems, these resources should be configured and used to support other policy changes.

Strategies derived from the ICT policy should provide the amount and capabilities of computers, printers, multimedia equipment, interactive boards, labware, among others. to meet the instructional objectives envisioned by the policy. Often, this means easy access to broadband-connected computers for all teachers and students. The software applications, courseware, and digital tools and resources should support the intended pedagogy and curriculum. The network should be of the capacity to support the intended instructional and administrative uses of ICT and how these responsibilities are distributed throughout the system. Finally, the policy should also include provisions for technical support and maintenance.

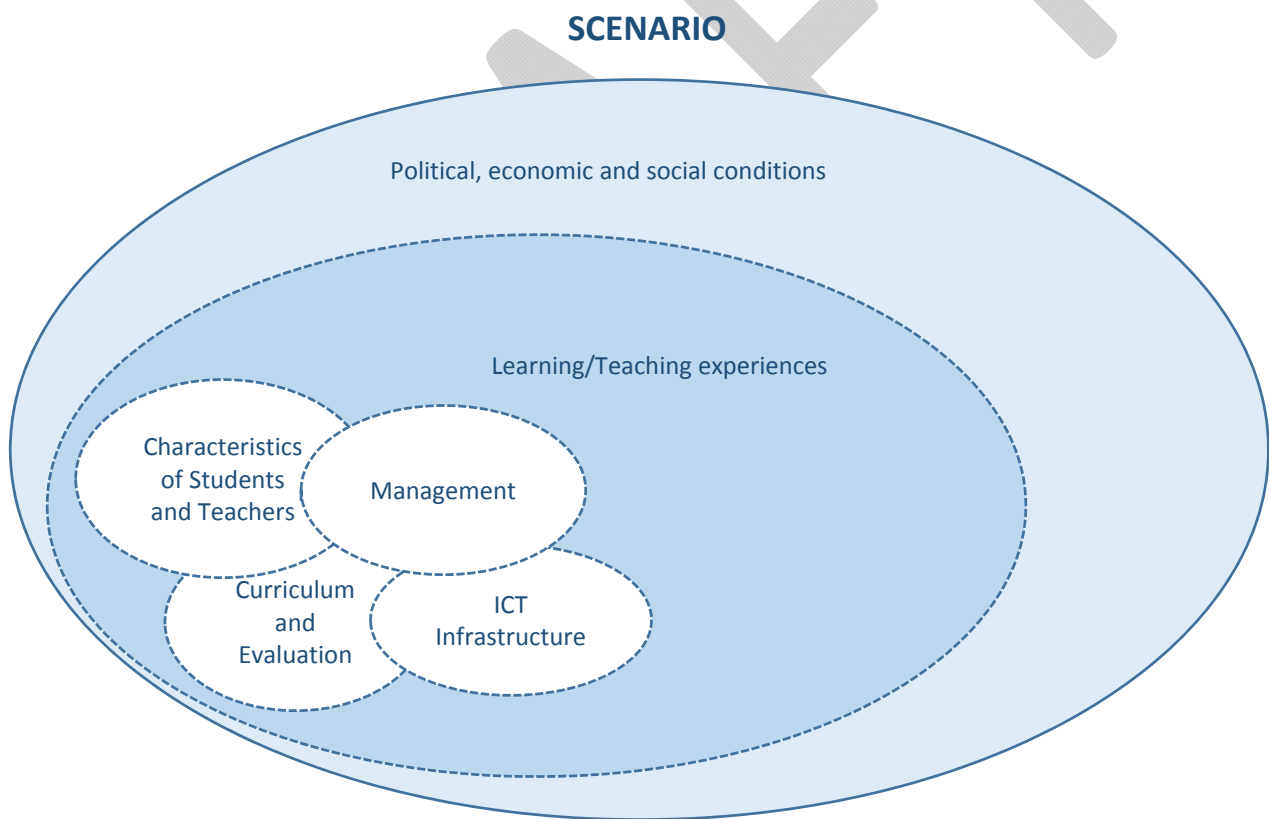
3.5.4 Policies related to evaluation and research

Effective policies depend on data, research, and evaluation in two ways: 1) Research results on effective teaching and learning informs effective policy and practice. 2) Continuous revision and improvement depend on an effective information management system. Policies and programs should include a monitoring and evaluation component that schedules milestones and data collection points so as to provide policymakers and administrators with ongoing information on the implementation, progress, and outcomes of policies.

4. MODULE 4: Developing Scenarios and Modeling

4.1 What is a scenario?

A scenario refers all the circumstances that constitute an educational phenomenon, this includes characteristics of students and teachers, ICT infrastructure, curriculum and evaluation, how these issues together determines the learning/teaching experiences, and how works in a political, economic and social framework.



The Characteristics of students and teachers provide information about the knowledge and skills of the students and it gives an overview of the professional profile and role of the teachers inside of the scenario.

The Management explains how the principals and the school community interact in terms of the achieve academic goals. This includes how the school manages technical resources and support.

ICT infrastructure is related to the technical resources in the school, the connectivity and the use of technology by teachers and students.

Curriculum and evaluation are very important because they are the reflection of the purposes of a nation in the educational field and they show the strategies to be used to achieve them and the evidence that will be collected.

The previous aspects determine Learning/Teaching experiences; if their connections are reviewed is possible to explain how the students access to content and the kind of resources used in the assessment.

All these elements together happen in environment that is influenced by political, economic and social dimensions. This statement lets us analyze the next big question.

4.2 Why the scenario matters?

When it's in mind to start the education transformation is clear that there is something that needs to be changed for best results, so goals are established in a local and global context, as the development of skills with students or teachers.

It is important to say that the establishment of a goal is not enough, it's still necessary to provide details about how these things will work together from this new structure, is necessary to answer questions like how teachers and students will interact?, how evaluation will happen?, how the actors will access to content? What are technical implications necessities to do this? How help desk will provide technical support? What kind of assessment is going to be used? and others.

With the answers of previous questions are getting a description of the scenario to build. At this point it is said that destination port has been provided, now it's necessary to identify a departure port that serves as benchmark to chart the path to walk to achieve the goal, what will be the implications, costs, challenges and even the benefits to deploy something new, it helps to select correct strategies and make decisions. It's time to plan! It's time to start to ask how can be built an appropriate scenario.

4.3 How could we build a scenario for smart learning?

Smart Learning is a strategy, a new and a different approach to observe education, which appears in today's society characterized by constant changes, interconnectivity, technological advancement and is located in the context of education to bring trend a transformation in the way of seeing, thinking and doing education. So Smart Learning triggers a paradigm shift and change to do things for the various areas that make up the educational phenomenon; for example, to the government who can't work and design in the same way the policies and strategic plans, so both new expectations should be directed to the MOEs align and contemplate as far as possible, the educational objectives included in the Millennium and Sustainable Development Goals, the trends that drive the economy and the labor sector, and visualize changes in the future: medium and long term.

A second area that is affected by this trend are the teachers, especially regarding the techniques and mechanisms of professionalization and development. They are key to the integration, implementation and impact of technology in school settings, because with their experience, knowledge and pedagogical skills, the benefits and changes may be more palpable and transcendental. A third sector are the students, who besides being the biggest beneficiaries of this transformation to Smart Learning, it's an opportunity for them to learn in a different way than their parents and grandparents did it. And now they represent a generation flooded constantly with information, they demand new skills and recognize technology as a prime ally.

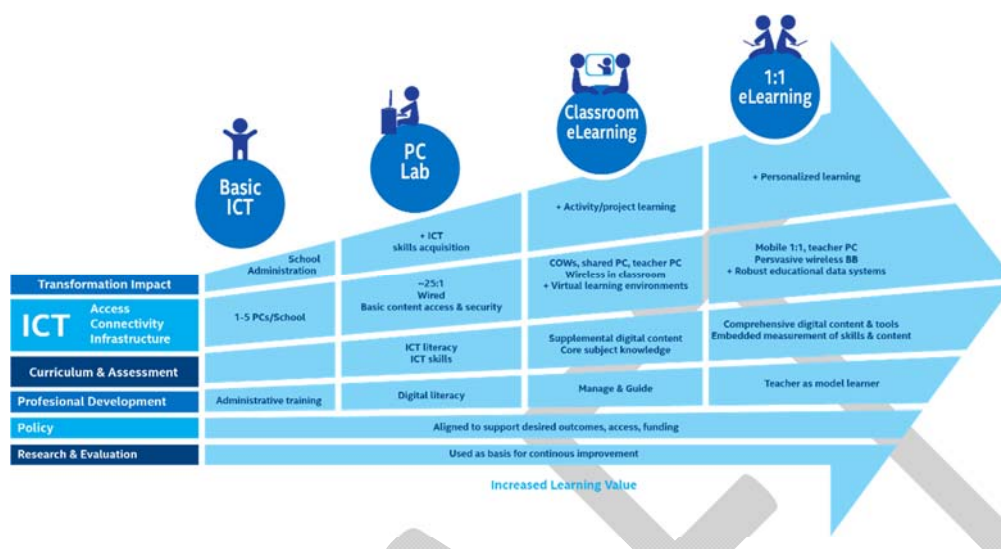
Finally a fourth group that is involved and also requires to seek this transformation: are companies working on technological innovations and communication, they should be ready to accelerate the demands of the education environment, but above all must be sensitive to their concerns, doubts and expectations. This companies can become a consultant and researcher to provide educational environments and alternatives to see what they can do with technology in their classrooms.

They have like aim to build "Smart" scenarios, whose goal is that students achieve significant learning necessary for the development of skills of the 21st century, enabling them to function in a context of recurrent changes and fast, making decisions for their lives and society, develop critical and systematic thinking to solve the various problems they are facing and in turn, the ability to adapt to changes and demands of their environment that will require creativity. Therefore, these claims seek to consolidate the Smart Learning as a tendency to learn about how to teach and how to learn in this age of technology, the cloud and interconnection.

In previous lines, were described the elements that are important to the existence of a scenario capable of harboring "Smart Learning", the combination of these variables and what each provides, allows the design of a new way of teaching were discovered. The summit of this process of "combination" is a work that is in the hands of those involved and that a transformation towards this trend, which can no longer be further perceived necessary.

The origin and concept of "Smart Learning" brought a series of models that they are looking to achieve the perfect combination between the pedagogical and the appropriate use of technology in educational environments. These Smart models have enabled schools, classrooms and educational actors to identify what is most relevant to their context and environment, it has even led to rethink the ways class and diversity of resources that have imparted to do.


Then some of these models have been developed at present and have emerged from deployments, their effects and technological innovations.



ICT models - Quick comparison

Model	Characteristics	Map
Basic ICT: School Station	<p>Primary usage is for administrative tasks. Students and teachers have limited access.</p> <p>The basic ICT configuration relies on just a few computers at school where usage is focused on School Administration Tasks and Professional Learning.</p> <p>Teachers and Students may have limited access to computers in the Media Center / Library primarily for research purposes</p>	
PC Lab	<p>Computers are stationary. Focused primarily on Digital Literacy (ICT skills AND LIMITED INTEGRATION) OF Core Curricula activities.</p> <ul style="list-style-type: none"> ▪ Labs are stationary and can foster 1:1 or 1: many learning environments. 	

	<ul style="list-style-type: none"> Time spent using technology is limited to availability of Lab. The teachers may begin integrating technology into the core curriculum. Professional Learning focuses on Digital Literacy. Focus areas can include ICT skills development, online assessments, and limited Core Curriculum (math, language, science, etc). 	
Classroom eLearning (COW / Computers on Wheels)	<p>Devices are mobile and foster 1:1 learning environment. Teachers share access to devices and plan curriculum accordingly. Learning becomes more technology-enhanced but in short periods of time.</p> <ul style="list-style-type: none"> Also known as a Computers on Wheels model where the devices are on a charging cart and wheeled from room to room. An in classroom set of digital learning tools subject to availability to be used inside the classroom for all subjects. Focus areas can include STEM and online assessment. Teachers plan curriculum according to availability of devices. Professional Learning focuses on integration of technology into core curriculum and movement to a student-centered environment. In-class digital learning usage prepares students and teachers for a more comprehensive use of technology in a 1:1 environment. 	<p>The diagram illustrates the 'Computers on Wheels' (COW) model. At the center is a circular hub with a teacher and students. Surrounding this hub are several key components: a 'CHARGING CART' (labeled 'Mobile Device Charging Station'), a 'WHITEBOARD' (labeled 'Interactive Whiteboard'), a 'SERVER' (labeled 'Cloud-based storage and management'), and a 'SECURITY' (labeled 'Data security and privacy'). To the right, a 'TEACHER' section shows 'Teacher's device' and 'Teacher's login'. Below that, a 'STUDENTS' section shows 'Student's device' and 'Student's login'. Further down, a 'CLASSROOM' section shows 'Classroom technology' and 'Classroom login'. The diagram also includes a 'USAGES' section with 'Assessment', 'Project learning', and 'Classroom management'. A 'DEVICES' section at the top right shows 'Tablet', 'Laptop', and '2 in 1'.</p>

<p>1:1 eLearning Personalized Learning Anytime/anywhere/anyway and fully integrated with core curriculum subject matter.</p>	<p>The personal model facilitates Personalized Learning allowing computer usage in day-to-day activities. The one to one computer development improves the usage of a wide range of digital materials, use problem-based learning and students take control of their own learning through high quality educational software, comprehensive digital content and tools. Measurement of skills and content is embedded on the curriculum. Teacher becomes a model learner. Refresh cycle and security plans take place.</p> <p>Local Technical support is the optimum answer to help teachers and students resolve problems.</p>	
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Once these models are known, the question is how to know to choose the most appropriate and relevant for educational contexts? Since nowhere are the same conditions, you don't have access to the same resources nor the support are similar. Therefore, it is essential that decision makers, intrude and search information on the different models that exist, further to analyze its general educational and pedagogical situation, then select the model that best match of your needs, expectations and finally assess the impact that occurred. Then well, capitalizing on their experience and take new decisions on how to transcend the use of technologies meeting the demands of new generations and the skills of teachers.

4.4 How to make the best decision?

- Understand and analyze implying promote and implement Smart learning scenarios. Disseminate what this educational trend, how it makes a difference in education through the use of technology, their proposals and their variables.

- Locate and describe the educational context where you want to implement. For this can be made a question guide with technical and educational information to gather information regarding the situation where the educational context is to develop Smart environments:
 - Pedagogical goals to develop from the use of technology.
 - Status of use and familiarity of technology.
 - Expectations to achieve with the inclusion of technology in classrooms and schools.
 - Availability and affordability of human resources, technology and infrastructure.
- List the benefits and advantages that will result in the adoption of Smart environments to motivate learning achievement and education quality. For this, next questions can be used to help guide decision logic: what are the benefits? What challenges have to go for an environment of this nature? What questions or support is required and who can solve it?
- Bring to the table models that allow the development of Smart environments and scenarios. Taking as a starting point the educational context to be transformed, quickly find information about what is and involves each one of them, at the end devise that scenario with these characteristics and its impact. It is important to have visibility of all models and trends that exist not to fall into temptation or surface to imitate environments that may not fit the characteristics of the context. Therefore a comparison will be good to define the framework.
- Interaction with technology. Look for determining and managing the way in which the teacher and student interact with technology in a smart setting. That is, a perspective or pedagogical theory upon which the educational phenomenon takes place, be it an individual, collective, collaborative interaction, the teacher as the main user, students and key users, share devices, among others is assumed.
- Expert judgment. Mapping the resources and support needed to implement, requires the assistance of people with a certain level of experience and knowledge on the subject, ranging from technology providers, educational advice, research, experience in other schools, etc. This support would use some criteria that help to select smart learning scenarios:
 - Consistency with national vision objectives and transformation into information society.
 - Accessibility, Applicability and impact assessments.
 - Similarities and differences with successful smart learning programs (such as UAE's Smart Learning Program).
 - Smart learning capable type student internet devices versus low cost non-smart student internet devices.
 - Financial and personal resources are available
 - Stakeholder involvement-alignment-support (who are involved).
 - Sustainability of project.
 - How it will work in real life.
- Evaluate the decision. Decision making include the following variables, which may be present in the whole process of creating and deploying:
 - Budget: Aimed at creating a scenario that includes faculty development, student learning and building the right infrastructure, which assumes a solution or integrated project.
 - Coverage: Represented by the number of groups, schools, students, teachers who are looking to benefit from such implementation.

-Availability Resources: includes the current conditions of the infrastructure which is expected to set the stage, the skills possessed by employees or school personnel and that may be useful for creating the scenario, the time available and aim to transform the environment, among others.

With this management process can gather all the information that has been obtained and make the best choice that responds to the intentions and expectations; but mostly goes hand in hand with the development of 21st century skills and meaningful learning.

The idea of building an ideal scenario for learning Smart, is not easy to perform and can be chaotic and out of step with the interests to be taken. The process to create a scenario of this nature requires of those involved, government, investors, stakeholders, teachers, educational community and students, different tasks to be performed collaboratively and at a certain time. Therefore it is a management process of identifying needs, design a state passes without losing sight of the alternative to assess the effects to show that this trend had on the transformation of education.

4.5 Gather the Deployment

While already it discussed the process of building the scenario and how can base a logical decision to create the best scenario, it be relevant and accessible to their educational environments. It can be said that a final process involved in this concept of a Smart scenario is how the experience is capitalized, ie, once the scenario was designed, built and implemented, it requires an activity to recover of this practice. For what purpose? Evaluate and feedback to the process and the results in terms of learning, usefulness, use, times and all this information will serve as reference for future technology deployments.

This task can be seen as a process of summative and formative assessment, the idea is that the experience can be recovered through different ways, which aim here and invites decision makers, stakeholders, beneficiaries and any agent which was intruded to him that is able to reveal what happened. This through:

- Description of cases. Present the process of deployment and it will serve others as a starting point and reference for future implementations.
- Pedagogical testimonies. Know the voice and perception of teachers, students and educational staff in the transit of this experience with technology.
- Portfolios. Narrate the history and development of scenario in educational environments and can also include: educational activities, evaluations, awards, journals, etc.
- Articles and essays. Media that can be shared across sectors or the field of education, and also they can be published.

5. MODULE 5 Strategic selections and programmes' formulation

Module 5 puts forth the some of the most important strategic selections and formulation of the programme.

The training and professional development of the Education Agents is of paramount importance in a Smart Learning Program.

The **ICT-CFT** (UNESCO ICT Competency Framework for Teachers) is an important toolkit to develop the training program, and provides a matrix composed of three main approaches (ICT Literacy, Knowledge Deepening and Knowledge Creation), which, in conjunction with six aspects of a teacher's work— understanding ICT in education, curriculum assessment, pedagogy, ICT, organization and administration and teacher professional learning — creates a framework of 18 modules which is the basis for the Training Program.

One of the important conclusions of this Module is that the implementation of such a Training Program should be aligned with the countries vision in what concerns education and adapted to the current evolution state of the country in terms of ICT. Also, and in order to motivate and gain the Education Agents involvement, it should be designed in a way that promotes the professional development and career progression.

Another important selection is the infrastructure for Smart Learning. In fact, and further to the device selection, it is fundamental to understand the infrastructure as an holistic solution that fosters teacher and student interaction and promotes 21st century literacies.

5.1 Purpose

The purpose of this Module is to identify the main strategic decisions that need to be addressed in order to formulate the basis of the Smart Learning Strategies.

In this Module, the following points will be addressed:

- Professional development of Education Agents
- Infrastructure for smart learning;

In what concerns the definition of Education Agents, it includes teachers, ICT Coordinators, administrative and management personnel, both at the school and central level.

In this Module, a strong focus is put on the professional development of teachers, which should be done already in the context of the infrastructure present, in a holistic approach.

Nevertheless, the remaining Education Agents should also be considered in a training program, with specific focus on their needs, being them more at the technical level, for ICT Coordinators, or more at the administrative tools, at the School Administration and Central levels.

5.2 Professional Development of Education Agents

There are many potential issues that may hinder schools and teachers in their efforts to fully benefit from a Smart Learning Program opportunity.

A fundamental issue is whether teachers know how to use ICT effectively in their teaching. Clearly, the way ICT is used will depend on the subject being taught, the learning objectives and the nature of the students. Nonetheless, it is important to set out the basic principles which should guide the use of ICT in teaching.

Another fundamental issue is how to engage the teachers, and ensure that the professional development goes beyond the know-how acquired, and that it will potentiate their professional status and career progression.

5.2.1 Training Framework

The introduction of ICT in Education can promote the creation of engaging and fast-evolving learning environments, and, at the same time, makes the distinction between the formal and informal education less and less visible.

It requires that teachers evolve in what concerns their approach to the teaching and learning processes, as well as the student evaluation frameworks

More and more, the education process is focused on the skills and competencies students need to become active citizens and members of the workforce in a knowledge society, and less on the mere acquisition of knowledge, without a focus on what is required by the workplace that they will encounter.

The “UNESCO ICT Competency Framework for Teachers (ICT-CFT)”⁴⁶ is a Framework that provides a tool kit to develop the competencies, both technical and pedagogical, necessary to take advantage of the introduction of ICT in Education, and is a partnership between UNESCO and CISCO, INTEL, ISTE and Microsoft.

In this context, the ICT Competency Framework for Teachers is aimed at helping countries to develop comprehensive national teacher ICT competency policies and standards, and should be seen as an important component of an overall ICT in Education Master Plan.

⁴⁶ <http://unesdoc.unesco.org/images/0021/002134/213475e.pdf>

Three approaches of the Framework

“Economists identify three factors that lead to growth which is based on increased human capacity:

- **capital deepening** - the ability of the workforce to use equipment in a way that is more productive than before;
- **higher quality labour** - a more knowledgeable workforce that is able to add value to economic output;
- **technological innovation** - the ability of the workforce to create, distribute, share and use new knowledge.

These three productivity factors serve as the basis for three approaches that connect education policy with economic development.

- Increasing the extent to which new technology is used by students, citizens and the workforce by incorporating technology skills into the school curriculum — which might be termed the **Technology Literacy** approach.
- Increasing the ability of students, citizens, and the workforce to use knowledge to add value to society and the economy by applying it to solve complex, real-world problems — which could be called the **Knowledge Deepening** approach.
- Increasing the ability of students, citizens, and the workforce to innovate, produce new knowledge, and benefit from this new knowledge — the **Knowledge Creation** approach.

The **ICT-CFT** focuses on teachers in primary and secondary schools. However, these approaches generally apply to all levels of education: primary, secondary, vocational and tertiary education, as well as to on-the-job learning and continuing education.”

As mentioned above, although this Framework is focused on teachers, the introduction of ICT also has implications for different educational stakeholders: not just teachers but also students, principals, ICT coordinators, curriculum leaders, administrators, professional learning coaches and teacher-educators.

Along with these three approaches, there are six aspects that are dealt with in the Framework:

- Understanding ICT in Education;
- Curriculum and Assessment;
- Pedagogy
- ICT
- Organisation and Administration;
- Teacher Professional Learning.

By crossing the three approaches to teaching based on human capacity development— technology literacy, knowledge deepening, and knowledge creation—with the six aspects of a teacher’s work— understanding ICT

in education, curriculum assessment, pedagogy, ICT, organization and administration and teacher professional learning — a framework of 18 modules is created.

THE UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS			
	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING ICT IN EDUCATION	Policy awareness	Policy understanding	Policy innovation
CURRICULUM AND ASSESSMENT	Basic knowledge	Knowledge application	Knowledge society skills
PEDAGOGY	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
ORGANIZATION AND ADMINISTRATION	Standard classroom	Collaborative groups	Learning organizations
TEACHER PROFESSIONAL LEARNING	Digital literacy	Manage and guide	Teacher as model learner

“The use of new technologies in education implies new teacher roles, new pedagogies and new approaches to teacher education, therefore it must be addressed as a true Education Reform”⁴⁷

The policy goal of the **Technology Literacy** approach is to enable learners, citizens and the workforce to use ICT to support social development and improve economic productivity. Related educational goals include increasing school age population, making high-quality resources available to all, and improving basic literacy skills, including technology literacy.”

As an example of **Technology Literacy**, we can have the goal of the use of ICT resources to support the acquisition of subject matter and pedagogical knowledge. This can be achieved by discussing different ICT resources that participants can use to increase their subject matter and pedagogical knowledge and have participants identify a personal professional learning goal and create a plan for the use of various ICT tools to accomplish this goal, such as web browsers and communication technologies.

The aim of the **Knowledge Deepening** approach is to increase the ability of students, citizens, and the workforce to add value to society and to the economy by applying the knowledge gained in school subjects to solve complex, high priority problems encountered in real world situations of work, society and in life generally. Such problems might relate to the environment, food security, health, and conflict resolution.

As an example of **Knowledge Deepening**, we can have the goal of identifying or designing complex, real-world problems and structuring them in a way that incorporates key subject matter concepts and serves as the basis for student projects. This can be achieved by discussing characteristics of authentic world problems that

⁴⁷ Makrakis, V. 2005. “Training teachers for new roles in the new era: experiences from the United Arab Emirates ICT programme. Proceedings of the 3rd Pan-Hellenic Conference on Didactics of Informatics. (Korinthos, Greece.)

incorporate key concepts; examine examples of such problems; have participants generate examples, such as the need to improve crop productivity or to market a product.

The aim of the **Knowledge Creation** approach is to increase productivity by creating students, citizens, and a workforce that is continually engaged in, and benefits from, knowledge creation, innovation and life-long learning. Teachers can then be seen as model learners and knowledge producers who are constantly engaged in educational experimentation and innovation in collaboration with their colleagues and outside experts to produce new knowledge about learning and teaching practice.

As an example of **Knowledge Creation**, we can have the goal of helping students incorporate multimedia production, web production, publishing technologies and coding and app development into their projects in ways that support their ongoing knowledge production and communication with other audiences. This can be achieved by discussing characteristics of teacher activities that support students in the use of various production technologies in their own learning activities; have participants generate examples of such activities; have participants demonstrate examples of multimedia production, web production, publishing technologies to support student publishing in online professional learning communities, as well as coding and app development.

5.2.2 Implementation Aspects

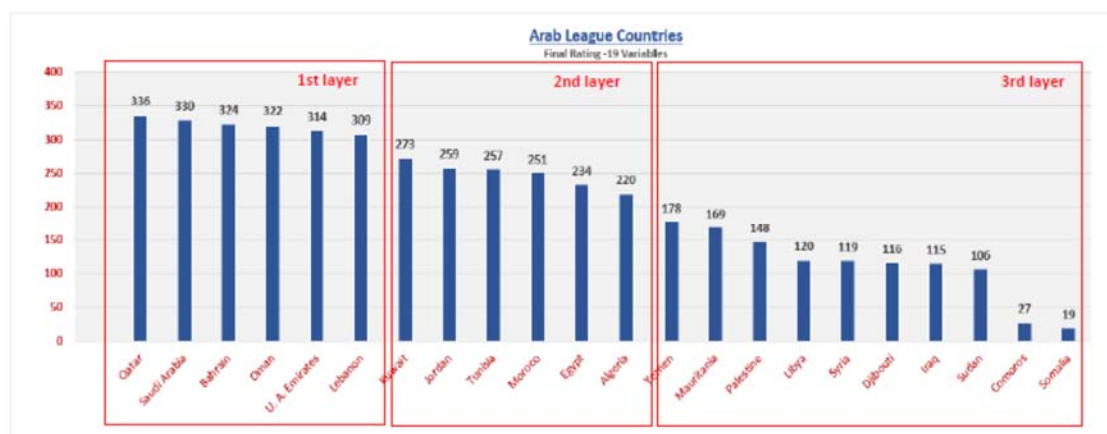
An important aspect of the **ICT-CFT** is that, it not only provides a framework for the training program, as described above, but is also provides useful guidelines regarding the Implementation aspects, namely in what concerns the need to adapt the framework to the way ICT is already integrated into society, economy and education system in each country, and also the possibility of adopting a modular approach, following different rationales in terms of the audiences addressed and the needs identified.

a. Country specific approaches

“The Framework suggests three different competency-based approaches. Countries with different growth strategies will find different parts of the framework useful. Countries with dissimilar social and economic conditions may share similar goals but take different paths to achieve these goals.”

In what concerns the stratification of countries, with a focus on the Arab countries, an independent assessment exercise has been performed, of which a summary of the main criteria and conclusions are presented below, as an example of a possible evaluation of the Arab countries, in what concerns the development of a Smart Learning Initiative. Other criteria can of course be used to ascertain the best approach to each country or group of countries.

The draft assessment study is presented as an Annex to these Guidelines.



The countries were evaluated following the criteria depicted below, and were grouped into three main layers. This segmentation is important, since it provides valuable inputs to the design of the Project and, specifically, to develop a training framework.

The criteria chosen, which are depicted below, should be seen as an exercise that requires further study and discussion, but provides clues as to how to perform the segmentation analysis.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
VARIABLES	Rating GDP per capita US\$	Rating GCR Index	Rating Tech. Readiness	Internet Access in Schools	Quality of EDU System	Quality of Primary Schools	ICT Develop. INDEX (IDI)	IDI Access	IDI Use	IDI Skills	HDI	Econ. Ind.	Children O.O.S	Adolescent O.O.S	% Enroll Primary	% Enroll Second.	% GDP Exp. EDU	Primary - Pupil / Teacher Ratio	Second - Pupil / Teacher Ratio

b. Modular Implementation

The **ICT-CFT** is meant to be used in a modular implementation. Teacher-education institutions and providers of professional learning do not need to address all the modules and competencies in any particular course or learning activity.

The important aspect is the different offerings can be designed based on specific modules, but always in line with the overall goals and rationale of the training program. This means that courses and professional learning activities should not consist of a small number of disconnected competencies. There should be a clear rationale for the modules selected.

There are two main rationales that can be used to develop the segmentation and specificities of the training program:

- **Rationale of Depth** - all of the modules for one approach are addressed. A rationale of depth could select the same module, for example Pedagogy, in each of the three approaches.
- **Rationale of Role** - select the modules which are particularly relevant for certain roles, such as technology coordinators, curriculum coordinators, or principals.

Other types of rationale and patterns are also possible.

5.2.3 Professional Progression

Teachers and other Education Professionals need to be engaged, and the Smart Learning Program needs to ensure that the professional development goes beyond the know-how acquired, and that it will potentiate their professional status and career progression.

In this context it is necessary to:

- Identify the teacher career structure and drivers for progression;
- Identify current teacher training structures and evaluate their involvement in the Smart Learning Program;
- Develop teacher evaluation and progression matrixes in accordance with the new needs and outcomes of the Smart Learning Initiative;
- Implement and communicate the evaluation matrixes so that Teachers are aware of the impact on their careers of the Smart Learning Initiative

Merely as an example, the following table depicts a possible teacher training framework, and the corresponding outputs in terms of evaluation and potential career progression.

Many teacher evaluation systems throughout the world are based on a credit approach. These credits allow to quantify several aspects such as pedagogical results, training actions taken and respective outcomes, seniority, among others. It is important that the ICT training framework for the teachers is aligned with its current evaluation system, so that the teachers understand that the Smart Learning Program is an integral part of their work.

In this example, which should be seen as mere qualitative example, the credit system is used to quantify the teachers involvement, from the participation in the training actions, which is the basis of the training and allows the teachers to receive credits, up to the award of best practices and results, which allows to gain more credits in order to motivate teachers to move from technology Literacy, to Knowledge Deepening and Knowledge Creation.

Credits gained can then be translated into career and income progression.

Teacher Training	Career Output
Initial Training – ICT “Technological Literacy”	0.5 Credits for each hour of training

Attendance of Seminars, Webinars: “Knowledge deepening”	1 Credit for each hour of Seminar, Webinar
Coaching – inside or outside the classroom “Knowledge Creation”	2 Credits for each hour of coaching
Regional Best Practices Sharing – best teachers are chosen to share their experience and results	50 Credits for each event
Case Studies – best experiences are chosen to develop Case Studies to be presented nationally and internationally	100 Credits for each Case Study

5.3 Infrastructure for smart learning;

Choosing the Infrastructure should include four approaches simultaneously:

- The holistic classroom solution, where the individual components which constitute the solution are identified and described, including hardware and software and services as support;
- The Project dimension and the economies of scale including the services and support ecosystem,
- International technological trends;
- Education strategic vision.

5.3.1 Classroom Solution

The Classroom solution should be addressed in a holistic way, defining an infrastructure for Smart Learning that will allow an integrated approach to the teaching and learning process.

The Classroom Solution will be defined on a case by case basis, depending on the existing local infrastructures, such as broadband connectivity and energy supply, but also on the Smart Learning Strategy defined and the budget allocated to the Project.

Nevertheless, typically this holistic infrastructure shall include, although not limited to:

Portable Computing Device

This individual component, either in a 1:1 smart learning strategy, or in a 1:n, if this is the starting point decided for the Project, plays a major role in the deployment, and its selection method is addressed in a separate study. It is important to state that 1:1 strategies can be effective in terms of introduction of ICT in Education and also digital inclusion projects, although budget or implementation constraints may induce a step by step approach, starting at 1:n and moving up to a 1:1 approach.

It allows learning in context, study and work, collaborate, communicate and create, at the school and home or any place like, library, friend's home, coffee shop amongst others;

Software Suite

Includes the operating system, productivity tools, functionality tools, and other applications to transform education and learning as promoting access and inclusion.

Depending on the device option, i.e. laptop/desktop versus tablet, these tools will differ, namely they may come as a software or as an APP. Either way, the goal will be the same, although with different learning approaches, which is to introduce on the device the productivity and functionality tools that support the teaching and learning process.

Labware (sensor based technology)

Designed to allow conducting scientific experiments in the school and outside, providing a unique opportunity to learn by doing science while promoting problem-solving skills;

While technology, in and of itself, does not create scientific understanding, the use of technology is an important tool for promoting inquiry investigations that yield quantitative data and can result in meaningful learning for students. Use of technology tools for data collection, analysis, and visualization as part of hands-on inquiry-based science instruction has been shown to deepen students' understanding of science concepts⁴⁸.

⁴⁸ Krajcik, J. S., & Mun, K. (2014). Promises and challenges of using learning technologies to promote student learning of science. In N. G. Lederman & S. K. Abell (Eds.), *Handbook of research on science education*, Vol. II (pp. 337-360). New York: Routledge.

Linn, M. C., & Hsi, S. (2000). Computers, teachers, peers: Science learning partners. London: Lawrence Erlbaum.

Rogers, L., & Finlayson, H. (2004). Developing successful pedagogy with information and communications technology: How are science teachers meeting the challenge? *Technology, Pedagogy and Education*, 13, 287–305.

Webb, M. (2008). Impact of IT on science education. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education* (pp. 133-148). Springer International Handbooks of Education, Volume 20. Springer.

Sensor-based investigations provide extensive opportunities for students to develop scientific literacy, familiarity with the practices of science, and scientific ways of thinking through hands-on experiences using tools similar to those used by scientists and engineers. Investigations are designed to help students explore a core science topic by designing and conducting their own investigation, using a process of scientific inquiry:

- Formulate questions for open-ended inquiry investigations
- Make decisions about how to carry out the investigation
- Conduct investigation and collect data
- Analyze, interpret, and evaluate data
- Collaborate as part of the investigation
- Draw conclusions and solve problems based on data, analysis, and reasoning
- Communicate findings and conclusions

The sensor-based technology tools used in these investigations facilitate quick, accurate data collection—freeing teachers and students to spend more time on activities that promote deeper thinking, such as analysis and interpretation or reformulation of the question to conduct the experiment from a different perspective. For example,

- pH sensors can be used to shift students from taking a single traditional titration, to quickly generating multiple titration curves. Consequently, students spend more time on curve analysis and interpretation.
- Using a carbon dioxide sensor to investigate photosynthesis enables students to directly measure a change in concentration of one of the reactants of the process. The sensor accomplishes in minutes what would take a 24-hour period using traditional methods.

Additionally, sensor-based technology expands the limited human capacity to enable a wider variety of potential investigations, further deepening learning.

- High-sensitivity light sensors can measure the flickering of fluorescent lights, which is too fast for human eyes to see.
- Force sensors capture forces in a collision in fractions of a second that cannot be seen with technology.
- Spectrometers allow for easy analysis of plant pigments and absorbance spectra, giving students firsthand experience with data they usually see only in a textbook.
- Motion sensors quickly and continuously measure position, velocity, and acceleration. This allows for real-time data collection, visualization, and instant analysis that students could not do with traditional equipment.

Learning how to use this technology, and how to analyze and interpret the data is only one component of the skill set required for teachers to teach science effectively. This technological knowledge is part of a larger system that includes pedagogical knowledge and science content knowledge of the teacher.

To align the pedagogical approach with the inquiry-based science investigations, the teacher's role must shift from the conventional lecture format to a role that facilitates and enables learning. The teacher's role changes to a facilitator, helping students create their own content-related questions, promoting student discourse in small groups and classroom discussions, managing multiple student projects, providing technical and content assistance related to students' work, and continually assessing and responding to students' work in progress.

The teacher's content knowledge refers to the level and depth of subject matter expertise. Content knowledge is intricately tied to both pedagogical and technological knowledge. A teacher with strong pedagogical knowledge uses effective teaching strategies, as well as developing an understanding about student learning. Teachers must have a good understanding of technology to use the technology for effective classroom instruction, communication, problem solving and decision making⁴⁹. These knowledge bases (including knowledge of student learning) work collaboratively "in knowing *where* [in the curriculum] to use technology, *what* technology to use, and *how* to teach with it"⁵⁰.

For teachers who seek to integrate technology such as data collection and analysis tools in their science classes, it is essential that they receive support from some form of professional learning can certainly be one avenue. But the learning can take place at a more grassroots level also, in which science teachers in one school form a professional learning community and support each other in developing the requisite skill sets. Whatever route is taken, it is important and necessary that teachers receive support and training, whether formal or informal.

As an example, and in what concerns scientific experiments related with renewable energies, the following set of sensors/equipments is available:

⁴⁹ Koehler, M., & Mishra, P. (2008). Introducing TPCK. In AACTE Committee on Innovation and Technology (Ed.), *Handbook of technological pedagogical content knowledge (TPCK) for educators*, (pp. 3-31). New York: Routledge.

⁵⁰ McCrory, R. (2008). Science, technology, and teaching: The topic-specific challenges of TPCK in science. In *Handbook of technological pedagogical content knowledge (TPCK) for educators* (pp. 193-206). New York: Routledge.



- 1 W Solar Cell
- Wind Turbine and sets of blades
- Reversible Fuel Cell Module
- Gas/Water Storage Module
- Accessories

These sensors can be used, for instance, for experiments such as:

Learning how a Solar Panel works:

- The effect of Shade
- The effect of Heat
- The effect of Tilt

Learning how a Wind Turbine works:

- The effect of Blade Quantity
- The effect of Blade Pitch
- The effect of Blade Length

In exercises related to water and environment, the set of sensors can be different:

- Chemistry Connector, allowing the connection of:
 - pH Sensor
 - Temperature sensor
 - Conductivity sensor
 - Pressure sensor
- Motion sensor

These sensors can be used to develop exercises, such as the ones below:

Air Pollution and Acid Rain

- Use a pH sensor to determine the effect air pollutants (CO₂, SO₂, and NO₂) have on the pH of water.

Heating Land and Water

- Use a temperature sensor to determine a property of materials that allows some to heat up faster than other materials and then draw conclusions about water's influence on a region's climate.

Acid Rain and Plant Growth

- Using the pH sensor and simulated rainwater from different sources, the students determine the effect of acid rain on the germination of bean seeds.

Interactive Whiteboard

It allows developing classroom interaction promoting collaboration, communication and critical-thinking in the classroom;

The Interactive Whiteboard allows the teacher to present the teaching materials in an interactive and appealing way, and to access additional content, on the internet or stored in the teacher device or the classroom server.

Together with the collaborative software, it represents a powerful tool to communicate with the students, since it will allow to shift between the content presented by the teacher and the content produced by the students, by displaying the student devices on the whiteboard, and allowing them to share their work with the teacher and other students.

Portable Projector

Enables learning activities, through high-end quality picture and mobility for promoting classroom interaction. The Interactive projector is can be both an alternative and a complementary solution to the Interactive Whiteboard, since it can turn any wall into an interactive surface. It has the advantages of reduced cost and portability, but it does not have the regular whiteboard function.

Teacher and Education Agent Device

Allows a comprehensive and collaborative classroom environment for a learning experience managed by the teacher, promoting learning and participation; It also provides tools for teachers to administer and manage learning, enabling the “Teacher as a model learner”

This tool allows several actions, such as:

- Monitor the activity of each student, allowing the teacher, for instance, to cut internet access to the student;
- Checking the battery status of each device;
- Show the student device on the Interactive Whiteboard;
- Develop quizzes, which can be made available to the students. The results can be treated automatically and allow the teacher to understand, at the end of each class, if the subjects discussed were understood by the students or if further work is needed;

School Server

Provides a local school “Cloud” with all the essential software, applications, and educational content, addressing the infrastructure challenges in emerging economies and rural areas, including low connectivity, IT skills constraints and training;

For instance, in areas with limited connectivity, this server allows to download content during the night, so that it can be available for teachers and students on the next school day.

Container Charger

Enables charging a number of **Portable Computing Devices** at the same time and when possible use renewal energies. Also provides a secure storage of the **Portable Computing Devices** when this is required due to security reasons.

This can be especially useful in schools where the power infrastructure is not updated, and there not may be enough plugs available.

There is a strong evolution in this area, namely in what concerns wireless charging. Once this feature becomes available in all devices, the container charger may be substitute by charging pads, either individual in each student desk, or multi-device pads, for the whole classroom.

Learning Management System

Includes comprehensive curricula, student tracking system, student evaluation and management. It also provides tools for teachers to administer and manage learning.

Typically an LMS will provide teachers with a comprehensive range of teaching tools and resources: lesson planning, student assessment system, collaborative areas, task management, communication tools and educational resources. Students learning experience is enhanced through easy-to-use technology embedded with engaging multimedia contents. The LMS enables an easy interaction between teachers and students, allowing them to promote collaborative learning practices with new technologies. Teachers may assess and follow students' progress, use different types of communication tools, create and manage work groups, share learning materials and assign tasks.

Educational Content

An integrated solution, including a service based on a collaboration model, between global and local partners, to provide a full solution covering all required subjects and school years. This **Component** is typically country-specific and requires the development of local partnerships with existing and accredited publishers.

In this context, local textbooks can be enriched with multimedia content and added to the LMS platform. Teachers can project the textbook in class, interacting with the pages with several tools, like text markup and notes, page zoom or search content within the textbook. Both teachers and students can have access to a great range of learning resources linked to the textbook, such as videos, animations, activities, learning games, interactive tests, etc.

5.3.2 Project Dimension and the ecosystem

Further to the components described above, the Holistic Classroom Solution should include a set of services that ensure its successful implementation and management.

These include:

Deployment

An integrated services solution related to the fieldwork of the integrators, which include Installation, On-site support, Pick-up and Return and Return management services, based on a collaboration model between global and local partners to provide a full solution covering all the aspects related with the implementation of the Project.

Maintenance and support play a crucial role in the success of the project, as well as in its economics. In fact, the notion of TCO (Total Cost of Ownership) is a fundamental tool that should be taken into account when budgeting and evaluating potential solutions, since the impact of defective or mal-functioning equipment is huge, both in terms of the teaching and learning process, and in the cost of the deployment. TCO is an evaluation of the cost of each equipment throughout its useful life span, and it includes not only the initial cost, but also all costs related to maintenance, downtime, etc.

The maintenance and support services will induce the creation of a local ecosystem of companies, that will need to develop the knowledge and skills necessary to perform the installation and maintenance tasks to the Smart Learning Project.

The creation of this Local Ecosystem implies a knowledge transfer process from the companies supplying the several components of the project, from hardware components, to software, services and training. This can have an immediate impact on the competitiveness of the country and job creation.

Warranties

Includes an assurance of the reliability of the **Holistic Classroom Solution**, and its **Components**, under conditions of ordinary use, during a specific period of time.

Further to these set of services, the Project dimension will have an important impact on the budget in terms of economies of scale. These economies of scale will be reflected in the cost per student of the Smart Learning Initiative in several ways:

- Individual components – The negotiating leverage will be greater when the number of components to be supplied increases, leading to higher discounts per component;
- Shared components – Components which are shared among students, at the school, regional or national level will lead to lower cost per student when the number of students increases. The development of digital content and curricula is also benefited by a larger deployment.

A nation-wide development strategy allows to profit from the economies of scale referred to above, although requiring a careful segmentation and scheduling of the deployment.

5.3.3 International technological and professional trends

Technology is always evolving, and Smart Learning Projects, which represent sizable investments over lengthy periods of time should take into account the technological trends and the potential for upgrade obsolete solutions implemented.

In this context, technological trend analysis should be performed while developing a Smart Learning Initiative, in order to avoid early obsolescence of the solutions implemented, as well as its adequacy, not only in terms of technological actuality but also as a function of the professional trends.

This later item is fundamental in this analysis, since the one of the main goals of the implementation of a Smart Learning Initiative is to create the conditions to prepare students for their future professional lives, which are also evolving constantly, as new competences and literacies are required in the professional world.

5.3.4 Education Strategic vision

Also, it is fundamental that any solution, being it in terms of technological infrastructure, content and platforms, training or new pedagogical models, is aligned with the vision defined for Education, in a sense that the Smart Learning Initiative is indeed an enabler of that vision, and technology is a path towards the implementation of that vision.

6. MODULE 6: Documenting the smart learning strategy

6.1 Purpose

This module focuses on documenting the strategy development process. It outlines the objectives of the strategies for smart learning (also referred as the purpose of the strategy), and the goals or deliverables which are necessary to achieve these objectives. The documentation of strategies should cover following components:

- Background: Why is this important?
- Objectives: How does this help the organization?
- Benefits: What will happen when we get there?
- Principles: How does this fit?
- Strategies: How do we make sure this works?
- Responsibilities: Judging the quality of our results
- Goals: Where are we now and where do we want to be?

Documentation of strategies for smart learning is the essential step towards creating the action plan. The action plan for implementing strategies for smart learning includes following components:

- A National Committee for the development of strategic plan
- Vision
- Objectives and timeframes (what do you want to achieve)
- Roles and responsibilities (must be owned by all stakeholders)
- Funding strategy
- Defined set of smart learning outcomes and a roadmap to get there.
- Commitment for time and resources
- Must be based on the needs of students and teachers.

In this context, strategies can be seen as a list of initiatives with associated timeframes and assigned resources. It is important to consider that strategies are not planning themselves. They involve identification of an integrated set of choices that collectively create sustainable advantage relative to the overall objectives and associated deliverables. These choices may include the aspirations, how one would approach to achieve those aspirations, how one would succeed, what capabilities need to be in place to ensure success, and what management systems need to be in place for that. Strategies cannot be executed without initiatives, investments, and budgeting.

Strategy inform what initiatives are realistic and are likely to produce the desired results. Strategy documentation therefore aims to make planning process easier. Once the strategy development process has been documented, there is more clarity and less ambiguity regarding which initiatives should and should not be pursued because the strategies enable identification of what is critical and what is not.

The purpose of documenting the development of strategies is to deliver an effective communication that attempts to get stakeholders and others thinking about the problem, and various potential solutions, in consistent manner. It helps to accomplish the task as effectively as possible, and in a minimum amount of time. It reflects what is needed, instead of any individual stakeholder's personal agenda.

Documenting strategy development also enables people to become involved without having any exceptional expertise in a particular task, since the purpose is not to have a ready answer at hand, as an expert might do, but to methodologically analyze and evaluate the various choices that contribute to the objectives and set out the process to achieve the associated goals or deliverables.

A critical step in documenting the strategy development is to collect as much data from different sources as possible to understand the context and obtain different perspectives. It is important to remain broad at this step. The idea is not to look for answers at this stage but to create a repository of all the different perspectives that exist. This not only provides an overview of what major patterns of opinion are out there but also helps in identifying lone voices that may represent minority fractions of the community. Early theories start to emerge as more data is collected, and various stakeholders and experts then need to be consulted to identify which of those are critical and which either should be left for later or not pursued at all. Iteration and refinement are key at this stage.

It is also important to remain focused on the development of strategies for smart learning. With a divergence of opinions, it is likely that issues related to broader fields of education and ICT start to surface. There is also a high likelihood of those items surfacing where certain decisions have already been made or investments already in place. While it is important to recognize those, it is equally or even more important that the strategy development is not completely swayed or constrained by those pre-existing conditions. For example, if smart boards were deployed in a certain region as part of a prior decision or due to some donation by a multinational company, that should not drive the strategy development process.

Another important aspect of documenting the strategy development is to consider short, medium and long term successes. Instead of creating only very high level strategies that may take years to materialize, a number of small, modest and tactical strategies will provide immediate benefits and will lead to bigger ones as the ideas prove themselves out.

An example of documenting strategy development is to focus on situation, available options, various recommendations, and the implications of each recommendation. Another example is to look for chronological needs, analyzing them in the context of near-term, medium-term and long-term basis. SWOT (strengths, weaknesses, opportunities, threats) analysis also provides a useful way to do needs analysis that can result in identification of critical strategies.

6.2 Establishing strategic context

National strategies for smart learning should emerge from the broader context of a country's goals for improving education through effective and efficient application of various ICT solutions. Governments using this Guide would already have a preliminary basis for undertaking a national strategy development process. This step of documenting that strategy development process aims to confirm that rationale and ensure that the broader context is adequately considered.

The strategic context includes:

- current and likely direction of current national educational system;
- structure and status of the educational system;
- national education strategies, goals and priorities;
- national ICT strategies, goals and priorities; and,
- national development priorities (both social and economic).

Elaborating the education and ICT goals and challenges will help in identifying specific areas where investing in smart learning has potential to add value for the education, the national development context (e.g. economic growth, innovation), and will demonstrate how smart learning will also support development or societal objectives. Together, these aspects constitute the strategic context for the national smart learning strategies.

6.3 Drafting initial strategies

Initial strategies for smart learning are drafted once the strategic context has been defined and smart learning trends, experience and best practice currently in existence have been reviewed. The initial strategies need to be 'unconstrained', which means, the limitations of the current educational and ICT environment are not considered at this stage. This approach enables governments to understand what an ideal national smart learning environment could provide for that country's unique context, and avoids a typical focus on the current state of the environment alone. It also enables a more comprehensive view of opportunities that could be pursued at a later date. Finally, it may indicate whether an incremental approach is sufficient to develop the national smart learning environment, or whether a larger scale change is a better way to go.

6.4 Describe the current state of educational technology implementations

This step focuses on understanding the national education and ICT environment, including challenges of access, cost and quality of services and its overall management.

Table 6.1 provides various examples of the national education and ICT environment dimensions that should be explored.

Dimension	Sample questions
Services	<ul style="list-style-type: none"> What types of ICT-based educational services are available to citizens in various parts of the country, including urban and rural areas? What ICT-based educational services cannot be delivered to certain population and what challenges or barriers are responsible for this?
Structure and roles	<ul style="list-style-type: none"> Which entities plan, manage and deliver educational services at national, state, regional and local level? Which entities are responsible for managing ICT infrastructure at national, state, regional and local level? What are the responsibilities of these entities and what are their relationships with each other? What gaps or challenges exist with the current educational system and ICT infrastructure?
Workforce	<ul style="list-style-type: none"> What is the size, education and distribution of the educational workforce? Where are workforce imbalances occurring, or expected to occur in the future? What impact these imbalances have on the ICT-based educational system, services and outcomes?
Funding	<ul style="list-style-type: none"> What is the current expenditure of the national ICT-based educational system? What model is used to fund the national ICT-based educational system? What changes in ICT-based educational spending and funding models are likely to occur? What are the funding and budget cycles for the educational system and ICT infrastructure, and which entities are involved?
Governance, policy	<ul style="list-style-type: none"> What governance and policy mechanisms exist at a national, state, regional and local level? What are the relationships and interactions between these mechanisms? How are regulation and performance monitoring of the ICT-based educational system undertaken?
Effectiveness and efficiency	<ul style="list-style-type: none"> What challenges affect the quality of ICT-based educational services? What challenges affect the effort, time and cost associated with delivering ICT-based educational services?
Accessibility	<ul style="list-style-type: none"> What challenges affect the ability of certain population segments to access ICT-based educational services?

This step should produce a summary of:

- the national ICT-based educational system and services;
- challenges in current implementation of ICT-based education, and any communicated priorities regarding them; and,

- potential challenges to the development of a national smart learning environment.

The data for this step should be derived from internal research and analysis, as well as survey and consultation with various stakeholders and other experts. Sources of data for internal research and analysis include national, state, regional and local education and ICT departments and agencies, as well as through Internet-based research. International agencies such as United Nations Educational, Scientific and Cultural Organization (UNESCO) and Organisation for Economic Co-operation and Development (OECD) also publish reports on country educational systems and ICT infrastructure deployments. Education and ICT stakeholders as well as other experts should be consulted as part of developing an understanding of the smart learning initiatives and associated challenges. Both broad and specialized perspectives should be sought. Consultation ensures that the necessary information is collected and provides stakeholders with the opportunity to outline their views on the potential role and contribution of smart learning.

6.5 Review existing strategies for smart learning

This step reviews work done to date and status on strategies related to smart learning. These could be in the area of smart learning (vision statements, goals, policy documents, government mandates or pledges), ICT-based educational environment, and other technology implementations related to education. The review should include education and ICT ministry documentation, including a review of resolutions, mandates, policy statements or commitments. Previous reports or other documentation can yield valuable insights and lessons for the current effort.

6.6 Documenting support of selected goals by smart learning

This step explores the relationship between flows of information related to smart learning, and the goals and challenges identified in the previous step. The focus is on determining how such information flows may need to change. It may also identify how the development of national smart learning strategies could support traditional educational system goals and challenges.

Information flows related to smart learning refer to electronic exchange of information within the education sector, supported by ICT solutions, and the provision of educational services through electronic channels. Exploring a strategic goal or challenge from this perspective helps determine how these flows may need to be

improved to enable a goal to be met or a challenge to be overcome. This is a critical step towards understanding what national smart learning strategies have to do to enable or support the national educational system.

Critical questions need to be asked at this stage in order to understand the implications of strategic goals and challenges for smart learning. Examples of such questions are as follows:

- What are the main information flow challenges that currently exist?
- How do these challenges act as a barrier to achieving a strategic goal or overcoming a strategic challenge?
- How will the flow of information in the educational sector need to change?
- What information, knowledge and tools would need to be made available to the teachers, principals, senior education administrators, policy makers, parents, children and local industry?

Documenting answers to these questions, through internal analysis will help in determining and describing how smart learning will support various educational goals for the country:

- the strategic goals and challenges for the national educational system and social and economic development;
- the implications of these goals and challenges;
- description of how sharing and access to information and other ICT-based educational services can address educational goals; and,
- description of how a national smart learning strategies may allow traditional educational sector goals and challenges to be addressed.

6.7 Documenting national strategies for smart learning

National strategies for smart learning will be guided by the initial drafts and will describe how smart learning intends to contribute to achieving a country's goals for improvement in education. It will reflect stakeholder input obtained so far, and be informed by research on global smart learning trends and practices.

Various activities involved in documenting national strategies for smart learning are as follows:

- Agree the time horizon for the implementation of smart learning.
- Define desired smart learning outcomes based on country's educational goals and challenges.
- Describe the rationale for each outcome sought; link outcomes to the strategic context.
- Develop strategy statements.
- Describe what delivering the national smart learning strategies will mean for stakeholders.
- Develop one or more scenarios that put the national strategies for smart learning into practice.
- Develop smart learning strategic architecture models
- Develop strategic recommendations

The outputs expected as a result of documenting national strategies for smart learning include descriptions of:

- the educational system outcomes that smart learning should enable or support;
- the rationale between outcomes and the strategic context for smart learning;
- the benefits to stakeholders; and,
- one or more scenarios that demonstrate the national strategies for smart learning in practice.

6.7.1 Agree the time horizon

This step determines the time horizon for the national strategies for smart learning. This improves focus and ensures that the benefits and outcomes can be described in terms of a target delivery date (e.g. “By 2020, smart learning will enable the country to...”). The time horizon takes into account:

- the existing national educational strategies and their timeframe for targets and goals;
- lessons from any existing smart learning strategies, and associated timeframes; and,
- guidance provided by senior educational and ICT sector decision-makers.

6.7.2 Define the desired smart learning outcomes

This step defines the change, or outcomes, that the implementation of national smart learning strategies should produce. It answers questions about what will be achieved or changed by using smart learning, and how the national educational system and services will change as a result.

The outcomes of the implementation of national smart learning strategies are derived from strategic themes (goals and challenges) and country context. Once agreed, these outcomes form the basis for determining the required components.

A concise description of how smart learning will be used to respond to the national educational system goals is formulated through internal working sessions, encompassing insights from research into smart learning trends and best practice. Consultation with stakeholders and other experts will ensure that different perspectives are considered and that there is appropriate buy-in.

6.7.3 Link smart learning outcomes to the strategic context

This step describes the rationale between the strategic context and the smart learning outcomes. The national strategies for smart learning should demonstrate how they address national educational system goals, and how they respond to stakeholders' needs. Without a clear link to the strategic context, the national strategies for smart learning risk being misinterpreted or considered irrelevant. In some cases, smart learning outcomes may address multiple educational system goals, so outcomes should be described in a broad manner. Describing the rationale clearly makes the relationships explicit.

Additional information could be provided to strengthen the rationale for the associated smart learning outcome. Examples include outcomes of relevant smart learning projects and other studies, identified through research and stakeholder consultation.

Sound rationale is developed through internal working sessions for each outcome. The knowledge to support this step should exist largely through activities already undertaken. Appropriate consultation with stakeholders and other experts is critical to obtain different perspectives.

6.7.4 Develop strategy statements

This step develops strategy statements that can be endorsed by educational and ICT sector decision-makers, used to support national educational policies, and easily communicated to stakeholders and constituencies. These statements should be meaningful and relevant to the country's educational needs, and should not be simply technology-oriented.

Strategy statements are high-level statements that communicate the value of smart learning in a simple and understandable manner. They describe how smart learning will lead to achieving the strategic benefits for the country's educational system, and within what timeframe.

A sample structure for a strategy statement is as follows:

By *[timeframe]*

Smart learning will deliver *[strategic benefits and outcomes for the national educational system and population]*

This structure ensures that the strategy statements for smart learning can exist in isolation and still communicate the value of investing in a national smart learning environment.

A sample national strategy statement for smart learning can be expressed as follows:

By 2020

Smart learning will enable a more efficient national educational system that is more responsive to people's needs and expectations

Compelling national strategy statements for smart learning are drafted in this step through internal working sessions. Once developed, the statements should be reviewed with a small group of stakeholders, who are

experts in specific aspects of smart learning. The focus should be on refining the content of the statements, the smart learning outcomes that underpin them, and the manner in which the strategies have been articulated. Broader consultation on the strategy statements should follow the small group consultations.

6.7.5 Describe what the national strategies for smart learning will mean for stakeholders

This step describes how smart learning will change stakeholders' experience with the national educational system. This helps stakeholders understand what smart learning means for them, and is critical to gaining their support. In particular, this step describes the national strategies for smart learning for important stakeholder groups, including:

- challenges they currently experience in relation to the national educational system; and,
- improvements they would experience if the national strategies for smart learning were implemented.

Descriptions of what the national strategies for smart learning will mean for important stakeholder groups are developed in this step, particularly in terms of benefits and improvements in their current experience with the national educational system. Once developed, the descriptions should be reviewed and refined with each group to ensure they are accurate and meaningful. This is where stakeholders start to understand what the national strategies means for them, so consultation may uncover opinions, perspectives and concerns that require revisiting the smart learning outcomes. In fact, this is often the point where refining the national strategies for smart learning begins.

6.7.6 Develop one or more scenarios that put the national strategies for smart learning into practice

This step develops scenarios that communicate how the national strategies for smart learning will look in practice. Scenarios typically describe hypothetical but common, real-world situations illustrating how challenges would be addressed by smart learning. They are valuable for educating and building awareness of the intended role of smart learning.

Scenario development step provides additional detail for stakeholders. Developing scenarios requires an understanding of:

- the stakeholder groups that should feature in the scenario;

- the current national educational system challenges that the scenario should focus on demonstrating; and,
- the future role of smart learning in overcoming these challenges.

Developing scenarios is a creative exercise that involves constructing a story to demonstrate how smart learning will improve the national educational system experience for stakeholders. Examples of smart learning services and applications can be used to add further credibility and realism to the scenario. Once developed, scenarios should be reviewed and refined with the relevant stakeholder groups. This provides an opportunity to gather input and insights to ensure the scenario is accurate, and builds awareness and support for the national strategies for smart learning.

6.7.7 Develop smart learning strategic architecture models

This step develops architecture models that describe the smart learning components required to implement the national strategies for smart learning. These should not be technical models, because they are focused on conveying information to senior-level stakeholders.

A range of models could be developed. One example worthy of consideration is a smart learning component map, which logically structures, on a single page, the smart learning components required to implement the national strategies for smart learning. This map can communicate complex information to various audiences in a way they can grasp quickly. Another possibility is a high-level stakeholder perspectives model, which describes what the national smart learning environment would enable different stakeholders (e.g. parents, teachers, senior education administrators, etc.) to do.

6.7.8 Develop strategic recommendations

This step describes the strategic recommendations for delivering the refined national strategies for smart learning. Strategic recommendations should be high-level, focused on outcomes, and should be described for each smart learning component areas identified during strategy development process.

Strategic recommendations describe the high-level actions required to implement the national strategies for smart learning. These actions may describe how new smart learning components will be delivered, or how existing smart learning components will be repurposed or extended. Dependencies between strategic recommendations should also be identified, along with the associated risks and barriers.

Each strategic recommendation should be uniquely referenced to enable traceability to the action plan associated with the national strategies for smart learning and should include:

- the rationale for the recommendation;
- a description of the high-level actions to be undertaken;
- dependencies with other recommendations, and the nature of this dependency; and,
- risks and barriers.

Brainstorming and working sessions will be needed in this step to formulate a set of recommendations that collectively deliver the smart learning components underpinning the refined actions. The strategic recommendations should be tested and refined with stakeholders, who should provide input on each recommendation.

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7. MODULE 7: Developing Action Plan

7.1 Purpose

This module is focused on the development of the Action Plan. Developing an Action Plan is a stressful task; there is never adequate time and the specific context of each Initiative is always a new challenge. A number of questions are identified in this module based in different experiences and projects; however, they should not be regarded as a handbook to solve the enormous hurdles associated with deployment.

In order to develop the Action Plan, seven Goals are identified, which represent the major hurdles that need to be addressed in order to facilitate the success of the Smart Learning Program.

Goal 1 – Management Structure

It is critical to define from the start the management structure of the program, and how all the major stakeholders can be coordinated. This Goal provides some insights on how to ensure such coordination.

Goal 2 – Information System

The information system is an important piece of the Smart Learning Program since it will allow controlling implementation, financing and economical issues and the maintenance and support program. This Goal provides an overview of the main design parameters needed to select or develop an Information System for the Program.

Goal 3 – Operational Challenges

Programs with the size and complexity of a Smart Learning Program will always present important operational challenges. This Goal helps to identify, based on the experience of similar programs, where the main operational challenges will be typically encountered, and how to address them beforehand, in order to minimize their potential impact. For instance, a careful analysis of the existing school infrastructures in terms of power and connectivity, and the implementation of Piloting Solutions can create the conditions for a smoother implementation of a national or regional program.

Goal 4 – Project Scope

It is fundamental to define from the start the project scope and segment the implementation in terms of regional aspects, income aspects and student profiles. In fact, the solution for each segment might need to be adapted to each reality and not a one-size-fits-all.

Goal 5 – Piloting Solutions

As stated in Goal 3. Piloting Solutions can be a good way to minimize large deployment operational challenges. This Goal provides guidance on how to implement Piloting Solutions, namely in accordance with the Johns Hopkins framework⁵¹.

Goal 6 – Implementation Models

This Goal is addressed in more detail on Module 4, where different implementation models are analyzed, as well as the trade offs between the Learning Value of the Scenario and its cost and implementation difficulties.

Goal 7 – Project Financing

This Goal provides information on how to develop Financing Strategies, discussing several options such as beneficiary contribution, national budget and regional development banks, and how they can be implemented and combined to ensure adequate project financing.

7.2 Goal 1: Creation of the Management Structure and Coordination between Stakeholders

The Creation of a Structure dedicated specifically to manage a Smart Learning Initiative is one of the key elements of success.

Although not mandatory, it is highly advisable to include in the Management Structure bodies which consolidate the transversal requirements of the smart learning program such as an Advisory Board or other similar structure.

The first step would be to identify the Stakeholders, which typically include the Beneficiaries (including students, education agents and Families), the Public Sector and the Private Sector, including Autonomous Regions, Telecom Operators and other entities (such as technology and education partners).

The information identified above has to be completed with all the relevant information regarding existing management and associative structures that can be integrated and consolidated in the Management Structure of a Smart Learning Initiative.

⁵¹ http://b.3cdn.net/dpromise/4e2869abb217c9062f_z6m6v2v9u.pdf

The partnership between all the Stakeholders requires a great deal of commitment, liaison and coordination between all parties involved in favor of the development of the strategic objectives set forth on the Smart Learning Initiative.

The articulation of the stakeholders is fundamental due to the variety of players and matters involved namely the Beneficiaries and their aspirations, Public Sector intervenient (Government Sectors of Communication and Education, Regional Education Bodies) and their strategic goals for the development of the country or region and finally, the telecom operators with their market targets.

The terms of such cooperation should be defined in a set of agreements and contracts between the Public Sector and the other Stakeholders, namely telecom operators and beneficiaries, and include the definition of each party's responsibilities, the Program's "modus operandi", monitoring and control procedures and the relationship terms to be observed by each party.

In what concerns the telecom operators, this relationship can be at the service offer level, and also at the network deployment level, since the availability of broadband is of paramount importance to the success of the project.

In order to ensure the executive management, implementation and monitoring of results, it is fundamental to create and define the scope and responsibilities of an Entity Responsible for Program's Supervision as an independent platform for Strategic Cooperation.

This Entity, by agreement between the Public Sector and the Private Sector, shall have the responsibility to monitor the operational procedures related to the implementation of the Smart Learning Initiative, both in its operational and financial dimensions, and to verify the contractual obligations of the various stakeholders.

The Smart Learning Initiative should be built considering that all the critical aspects concerning operation and management should observe the principle of the distribution of duties between the different intervenients and/or entities involved, whenever necessary.

As an example, a potential model of function distribution between Private Sector, e.g. telecom operators (operationalization of the program), Public Sector (Validation of the conditions of access to the program) and the Entity Responsible for the Program's Supervision (compliance with the conditions of the program) could be as follows:

- Beneficiary's is certified by the Validation Entities (Public Sector)
- Registration of the Application, delivery and return by the Operational Entities (Private Sector - telecom operators)
- Accomplishment of financial commitments by all stakeholders

This model of implementation, with the distribution of tasks, potentiates operational skills and preserves data privacy.

Other important bodies in the Management Structure of a Smart Learning Initiative are the technical advisory committees, which can bring information, knowledge and experience for the Program.

The technological permanent evolution requires a constant attention to the new solutions and only a plural number of stakeholders and industry partners can update on regular basis the strategic knowledge.

The option for a governance model represents a crucial decision towards ensuring an adequate and independent management and supervision of the whole Program guaranteeing the proper practices and procedures.

7.3 Goal 2: Definition of the Information System

The Information System of a Smart Learning Initiative is a key aspect to assure its success. Choosing the technology, defining the structure, the team to be responsible and also if it will be insource or outsource are among the main decisions to be made in this topic.

Considering the expectations, the information system has to be a demonstrator that technology adds value and makes the education system more efficient.

It is fundamental to define and implement an information system that will allow an adequate operation, control and monitoring of the implementation of the Smart Learning Initiative, and allows to identify the Users (Students, Teachers, Administrators) and Identify the Institutions, including schools.

Considering the Information Management System is key to the success of the Initiative, it is at the same time an enormous challenge and a huge opportunity. It can help to update the students database with an overall impact in the education information systems.

To ensure the access of all students to the virtual resources and the management of the devices in the system including the monitoring of its functioning or software licenses all users or devices must be identified.

If in a country, teachers are in a database focused on salary management, updated databases are not at the same level of development. The interests of the students to have access to devices in the case a Smart Learning Initiative which includes affordable device prices, software, connectivity and other resources, may catalyze students and families to update their data in the system in order to have access to all preferential conditions available.

This Information Management System (IMS) must be developed in articulation with the different entities involved, highlighting the following:

- Solution Development
- High Availability
- Security
- Reporting

7.3.1 IMS General Requirements

The IMS to be developed or adapted from existing solutions should include a functional distribution for all the entities involved in the process. Thereby each entity is solely responsible for its own features and data avoiding a multiplicity of redundant repositories. This logical and physical separation of several subsystems is designed to ensure the functional independence of the different layers. This model guarantees the availability of the whole process even when one of the subsystems is found to be unavailable.

It is important that the information systems are tested and certified by a competent entity and follow all applicable laws in terms of personal data privacy.

In terms of global application security, the manufacturer of the technology to be used in the application development should ensure the alignment with best practices.

7.3.2 Availability General Requirements

The design and implementation of the technological infrastructure that supports the management and supervision of the IMS should favor primarily all aspects related to high availability (HA), security and functional efficacy.

To attest the solution's resilience and compliance with HA requirements, stress and security tests should be carried out. The High Availability can be guaranteed by a set of technologies such as Data Base Failover Cluster, Redundant Web Peers, Load Balancing, Specialized alert system, among others.

The IMS should be in a cloud computing environment. The adoption of the "cloud" can lower the cost of the technological infrastructure and at the same time allows adjusting seamlessly the responsiveness to the requested load in each moment.

7.3.3 Security

Generically there are three fundamental concerns regarding the system: *i) system security, ii) privacy of the information transmitted and, iii) oversight mechanisms.*

i) system security

Implementation of a set of mechanisms that allow monitoring and verifying the applications' data integrity.

ii) privacy of the information transmitted

Concerning the privacy of personal data introduced by the Beneficiaries, the IMS should ensure that this information is accessed only by authorized parties and always following the principle of only providing strictly necessary information, as required by the existing **"Data Privacy Laws"** in each country.

iii) oversight mechanisms

The IMS should ensure the possibility of the **Smart Learning Initiative** being audited at any time. The system should be designed in order to allow access for audits to the code of the application system, as well as audit tests for loading and data security. In addition, the system should be designed to keep the data related with each individual application and thus permit adequate audit tracking at the unit level.

7.3.4 Reporting Tools

The IMS to be developed should include a set of tools that allow reporting and monitoring of the data of the different initiatives in its various aspects. These tools should enable the creation of "real-time" reports for various stakeholders that can be adjusted and be able to evolve following the operational needs identified during the evolution of the **Smart Learning Initiative**.

7.3.5 Outsourcing vs Insourcing

The Hosting and development of the Data Base and the Information system is a key decision, and choosing between outsourcing or insourcing has advantages and disadvantages which have to be analyzed in each case.

Insourcing allows for maintaining a greater control over the developments, and assuring privacy and a better alignment with the Smart Learning Initiative. On the other hand, it usually requires recruiting competences which are not usually present in house and managing the integration of temporary functions in the existing structures.

Outsourcing means acquiring the service to an external entity, and allows for obtaining immediately non existent expertise, concentrating on the core activities, adjusting the recruitment needs, specially when temporary functions, and, for example, sharing the risks. Notwithstanding, there are some challenges to take

into consideration when the option is outsourcing. Assuring data privacy, costumer priorities sharing and contracting with foreign entities may, in some cases, pose a big challenge.

7.3.6 CLOUD

When considering the Hosting of the Data Base and Information System, the option for Cloud-based Hosting, which is an internet-based computing, allows, in a flexible way, to make available all information and services through any access authorized connection.

A great advantage of Cloud Computing is the growing number of cloud based applications which enables addition of new services to the information system.

7.4 Goal 3: Identification of Operational Challenges

It is fundamental to identify the operational challenges at the beginning of the project, so that it is possible to take previous decisions and measures that will help to address and minimize these challenges in the implementation stage.

The major potential operational challenges can be divided into the following categories:

- Choosing Devices
- Piloting
- Procurement Best Practices
- Deployment
- Connectivity
- School Infrastructure
- Support
- Monitoring and Evaluation

7.4.1 Choosing Devices

The correct choice of the device is of paramount importance, and can avoid many operational challenges.

Some important points needed to be taken into account are presented here, namely four relevant factors that must be considered when choosing a device for digital learning.

7.4.1.1. Integration with schools infrastructure (Campus Compatibility)

A robust, well-designed infrastructure requires a thoughtful approach based on four key pillars:

- **Connectivity** – Is access always available? Is the information being retrieved always current? Are rich clients available when the devices are offline? Is local secure storage available?
- **Manageability** – Are the deployment of new devices and management of the PC fleet streamlined? Are software updates easy to roll out with minimal downtime?
- **Security** – Is multi-factor authentication enabled? Is encryption enabled and efficient? Is spyware protection systematically deployed?
- **Storage** – Do you have a storage strategy that can grow as your data storage needs grow?

Planning for a strong and resilient infrastructure is key to enabling the optimal learning experience for teachers and students. It enables informed decision making (through access to test data), fosters collaboration (through content sharing and collaborative tools), and improves efficiency with less downtime, faster performance, enhanced productivity with quicker boot-time, and optimized usage models inside and outside the classroom—all resulting in teachers feeling better supported.

7.4.1.2. What is the complete range of learning activities that students will engage in?

There are so many specific tasks teachers and students need to perform every day. Ideally, the features and functions of the devices chosen will not only allow these tasks, but make them easier and better.

Curriculum and pedagogical practices should be assessed first, and then determine the choice of hardware and software. If school goals include getting students ready for college and career, they will need devices that can perform complex tasks, for example creating documents with multiple media like text, graphics, sound, and video. Devices need to be able to run sophisticated software applications and enable learning both online and offline. They need to support digital learning models currently in use and be somewhat future-proofed for the ones now evolving. And they need to support the multiple input methods that are becoming standard for digital learning, like keyboard, touch, and stylus.

Multitasking is natural for students and essential for teachers. Devices should support opening multiple windows or doing more than one task at a time. Also important are being able to work both online and offline, connect to peripherals, and use various input methods like pen and mouse.

Battery life is another critical consideration. We are going to great lengths to give students the freedom and flexibility mobility brings. This is pointless if a device's power runs out mid-activity.

It is also needed to carefully evaluate a device's screen size. Smaller screens can be challenging for students, especially where reading comprehension is concerned.

When it comes to applications and content, productivity software is best for the kind of inquiry learning that's becoming increasingly popular, especially in digital classrooms. Workflow, data gathering, analysis, collaboration, and presentation needs should be considered. Web-based applications and many websites may not function properly in all tablet browsers.

7.4.1.3. How will the devices be managed?

The next step is to assess the device's manageability and ease of deployment.

The device should be able to support the use of the instructional software and content already in place.

- You have also probably spent money on professional development resources and lesson plans and need devices that allow to continue using these.
- Equally important is the device's flexibility to handle new applications you may want to purchase in the future. Compatibility for plug-ins like Flash* and Java* may also be important for you.
- Features like durability, ruggedness, protective case, and a good warranty. All of these things will help protect the investment.

Another consideration is IT management. Your district may have significant investments in back-end systems that allow you to install software, make security updates, and perform other management functions remotely or across the district very quickly. Management features can also make initial deployment easier.

Lastly, we all know how critical security and data privacy are for K-12 schools, particularly with things like online assessments. Infrastructure intended for institutional use should have end-to-end security features and you should make sure any device you're considering supports this. Apps intended for consumers may store sensitive data, jeopardizing the privacy of students and possibly violating local privacy laws.

7.4.1.4. What is the true cost of the device?

The final step is to understand the bottom line implications of the device choice. Capital cost does not tell the whole story.

Purchase price of the device itself is just the start. Consider additional costs over time:

- Cost to support, maintain, and repair the device
- Cost of software, apps, and content
- Cost of peripherals, such as keyboard and mouse
- Cost of professional development
- Cost of device training and adoption time for teachers
- Cost of equipment and peripheral replacement

While concerns about total cost of ownership (TCO) may seem better suited to business and finance staff than educators, everyone is affected when district funding is not used wisely.

Factor in the costs for Mobile Device Management (MDM) which allows schools and IT staff centrally manage multiple devices while reducing downtime. Similarly, LMS and CMS should not be overlooked.

Robust connectivity with sufficient bandwidth to support students and teachers with seamless access to the information is crucial for productivity and engagement. Consider the fixed and recurring costs.

Refresh cycle of the devices is a significant factor in planning.

The cost to support and maintain any device can add up quickly. Make sure you factor in regular costs like support, maintenance, storing, and charging—as well as budget for repairs. The good news is devices designed for institutional use can be managed and supported much more efficiently. And devices intended for consumer use typically have a much shorter lifecycle, needing to be replaced years before a device designed for institutional use.

An often unforeseen expense is when devices are not compatible with existing applications and content, and require new purchases to meet classroom needs. For example, if you switch to a new platform you will need to invest in new curriculum and resources and your teachers will need to be retrained. These costs can be significant.

Another consideration is peripherals. Make sure you understand which of your peripherals will work with the device you are considering—and figure in the cost of any new ones you'll need.

Finally, don't forget about training costs and the time it will take for teachers to get used to the new device and begin using it effectively. In addition, as your curriculum expands to include more digital learning, teachers will need professional development to effectively use technology in the classroom.

Consider these additional factors that affect costs over time: Insurance, Spares, Legacy SW imaging.

7.4.2 Piloting

This can anticipate and avoid many of the operational challenges in the full scale deployment. It will be addressed in Goal 5 below.

7.4.3 Deployment

A detailed deployment plan is required. What needs to be done, when and by whom.

Based on the best scenario defined (see Module 4 for scenario definition and modelling), a detail activity plan can be derived, including all the tasks required, from the solution definition to the implementation, monitoring,

evaluation and maintenance. All the aspects referred in other Modules will need to be taken into account, and the experience gathered with eventual piloting situations is fundamental to ensure a realistic expectation.

Project management expertise is required in order to identify all the required tasks, expected length, interdependencies (which task needs to be accomplished before starting a subsequent task) and responsible entities for each task. Critical path assessment is a useful tool, identifying which are the tasks whose delay will jeopardize the entire plan.

The risk of non-accomplishment or incomplete accomplishment of each task needs to be assessed and as well as the impact on subsequent tasks and contingency plans must be in place for the most critical tasks.

7.4.4 Connectivity

It is necessary to evaluate the existing connectivity to schools and at home and third places, both fixed and mobile, determine the requirements of the new technological infrastructure to be deployed and harmonize this into a national broadband plan.

It will be a challenge to assure connectivity is available where is needed at an affordable price. This challenge is, on the other hand, one of the best opportunities of a Smart Learning Initiative.

In fact, the capillarity of school distribution will give an incentive to extend broadband to all places where we can find a school and catalyze the connectivity of all public services, such as libraries, health centres and hospitals, agriculture departments and other sites that serve an overall population.

The diffusion of broadband services can be complemented with commercial offers at affordable prices, which will allow the telecom operators to share the cost of network and serve a larger population and market.

The collaboration of education and communication authorities and strategic partnership with the private sector are key points to achieve impacting results.

Tax policies, communication licensing and spectrum policies can encourage telecommunication operators to invest with high returns.

Subsidization of access for middle and low income families, specially if packaged with devices, can push the telecom operators to lead the access challenge.

The different policy tools combined and adjusted to each specific market will give a boost to the broadband offer, with an impact in the economy. Considering the average number of students and teachers compared with the number of inhabitants in a country, it means a business model shift.

The possibility of re-engineering all the public services to develop e-governement may make the administration more efficient, less expensive and more transparent.

7.4.5 School Infrastructure

The existing school infrastructure, both physical and in terms of power supply, needs to be matched with the requirements of the new technological infrastructure to be deployed. This is fundamental, since it is a key factor to the success of the deployment and can be a major driver of the costs involved.

Power is one of the main areas to be considered in the first place, namely assuring the adequate power and the charging system to the technical infrastructure. The electrical system needs to be dimensioned in order to allow simultaneous charging of the number of devices, as well as the other infrastructure, such as interactive whiteboards and projectors, WiFi networks, routers, printers, among others. The possibility of installing “wireless charging” should be considered from the start.

In terms of energy source the inclusion of renewable energies, specially in off grid places, may be a way to lower the costs and also can be an education tool.

In terms of infrastructure, it is also very important to consider the possibility of charging cabinets, that will stock, guard and charge the equipments, specially when they remain at the school during the night and weekends.

7.4.6 Support

Support plans and adequate entities to perform this support must be included in the deployment plan, and the costs evaluated and identified.

The service must be considered when the devices are acquired. Many acquisitions are made based on the cost of the device and not on the TCO – Total Cost of Ownership including the support.

The TCO costs are in two or three years what impacts the budget and if the service is not adequate it is absolutely disruptive for the student and for the teacher.

Considering the capilarity of a Smart Learning Initiative and the long term view, the inclusion of the support may be a drive for local companies or international one's to invest in nation wide network of computing assistance services and create skilled jobs in all regions. This network will serve other costumers and be an improvement of the market capacity.

7.4.7 Monitoring and Evaluation

The M&E process should be an integral component of any planned ICT in Education program and should be factored into planning before a project starts.

Appropriate, realistic and measurable indicators should be selected (and not too many!) to monitor outputs and outcomes.

All major stakeholders should be identified and involved in making M&E decisions. This will avoid possible problems with buy-in and commitment later in the process.

M&E implementation costs should not be underestimated. We suggest that approximately 5 to 10 percent of total project costs be set aside as a reasonable target for M&E programming.

M&E is a fundamental part of the Smart Learning Initiative and it will be further detailed in Module 8.

From the implementation stand point, the engagement of Universities and research centers to follow and evaluate the different steps of a Smart Learning Initiative is an unique opportunity to advance the country's capacity in pedagogical terms and catalyze the intelligentsia for the important challenge of using ICT in education.

The cooperation with international institutions like ALECSO and other countries will develop the knowledge tool to put Arab countries in the forefront of Smart Learning and Knowledge society and economy.

7.5 Goal 4: Definition of Project Scope

The definition of the **Project Scope** is very important since it will impact both on the choice of the device and solution, but also on all operational and financial aspects of the deployment.

In any project model referred in Module 4, but especially if choosing the 1:1 model, it is essential to define the **Project Scope** associated with the **Project Operational Calendar**. The criteria to prioritize the target groups should be clear and based on assessment. Below are presented some important considerations to be taken when planning the "**Scope Decision**", as well as the way to assure its application in an adequate manner.

This scope can be analyzed along four main criteria, with several sub-criteria to be taken into consideration:

7.5.1 Regional criteria

Typically we can have distinct approaches in what concerns Urban and Rural Areas. These areas have typically different student densities, telecommunications and utilities infrastructures which will generate different deployment and maintenance costs that need to be taken into consideration.

In the regional criterion, we should consider special situations, such as Conflict Zones and Emergency Areas, which will require special solutions.

The definition of the scope of a Smart Learning Initiative in terms of region can also have other approaches, namely it can consider the definition of a timetable based on the engagement of local authorities or based in the fact that it is a region with strong education institutions or entrepreneurial activity.

It is also possible to prioritize regions with socio-economic constraints or going through an economic depressive moment in order to catalyze investments and encourage local stakeholders.

7.5.2 Income Criteria

When a Smart Learning Initiative is launched, we need to consider the access to the Initiative, based on the beneficiaries' income and their economic capacity to participate.

If a contribution is considered is important to avoid a relation between the type and configuration of the personal device and the price to pay in order to avoid a stigmatization of the device. One possibility is to differentiate the contribution based on the income level, which should be treated with privacy, and the choice of devices can be universal.

The same principle can be applied to the internet access offer and pricing.

A key point in this criterion is always how to verify and validate the income level of the beneficiaries. In many countries there is already some system to support the students based on tax or social security systems. The definition of the system in each Smart Learning Initiative to attribute the adequate and fair support is a main element for the credibility of the project.

Typically we can divide this aspect into:

"High Income"

"Medium High Income"

"Medium Low Income"

"Low Income"

This will impact the Financial Project the way it will be designed. This will be further detailed in Goal 7 of this Module.

7.5.3 Student Profile Criteria

In what concerns student profile, we will have to take into account which are the target beneficiaries, in terms of grades, languages, curricula (arts, sciences, and others) since this will impact on the type of device and digital content.

Many different approaches can be planned, below we provide a couple of examples on how this criteria could be implemented:

Is possible to start by some grades, for example:

- Start with primary school or other grade level – it is always an option which has some advantages, like focus on training a specific group of teachers and monitoring the learning content.
- Start by the first non-mandatory school year to encourage students to stay in school.

7.6 Goal 5: Piloting solutions for the project

Before launching a full scale project, it is important to consider the possibility of launching piloting solutions, where many of the future operational challenges can be addressed in a more controlled way.

Piloting solutions are a crucial element of a good project design. Conducting a pilot study does not guarantee success in the full deployment, but it does increase the likelihood.

Piloting solutions fulfill a range of important functions and can provide valuable insights for the entities designing the Project, namely in what concerns the Operational Challenges referred to in Goal 3 – Identification of Operational Challenges.

The “Fostering Market Efficiency in K-12 Ed-tech Procurement” Report developed by Johns Hopkins University to Digital Promise in partnership with the Education Industry Association⁵² provides an excellent framework to develop a strategy for procurement and piloting Education Technologies.

The framework is divided into five key Action Points, as transcribed below:

⁵² http://b3cdn.net/dpromise/4e2869abb217c9062f_z6m6v2v9u.pdf

“Action Point I: Allotment of funding for ed-tech product acquisitions. The amount of funding available to purchase ed-tech products directly influences the degree of participant involvement in subsequent phases.

Action Point II: Assessment of needs for ed-tech products. By knowing where and how ed-tech support is needed, school districts aptly put the horse before the cart, so that the search for products (Action Point III) has direction and purpose.

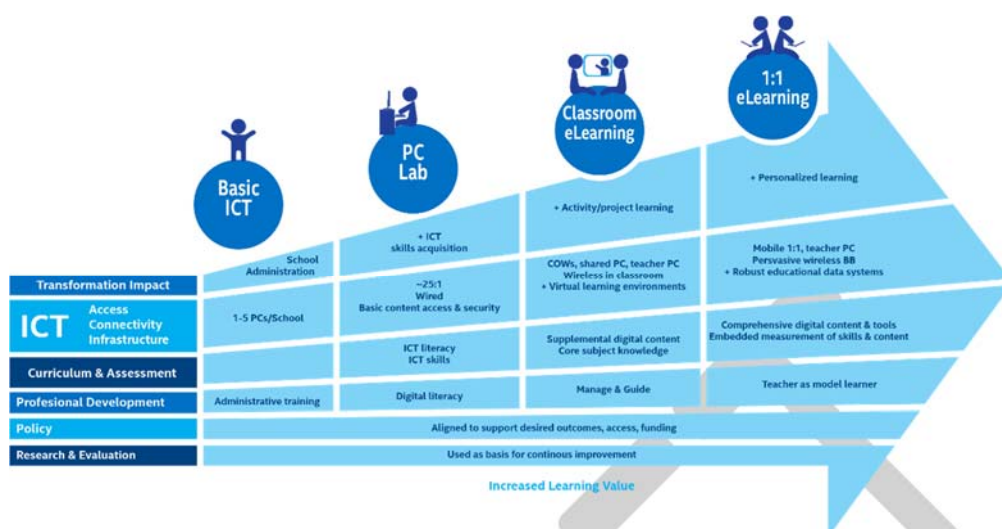
Action Point III: Discovery of ed-tech products that address priority needs. This phase exposes school districts to a variety of ed-tech products that perform different educational functions, thus, creating opportunity to further investigate those appearing to offer the best fit.

Action Point IV: Evaluation of product quality and effectiveness: Here, by examining evidence about the product, obtaining peer recommendations, observing demonstrations, and conducting “pilots” (quick-turnaround try-outs), school districts obtain information to guide selection of the product(s) likely to most reliably and effectively support instructional needs and goals.

Action Point V: Acquisition of selected products. In this culminating activity, the products selected are acquired through completed purchasing agreements with the vendors. The processes involved may be quite straightforward and rapidly completed, or complicated and slowed by district (e.g., school board) or external (state or municipal) policies.”

7.7 Goal 6: Implementation Models

Although the Implementation Models are described in Module 4, it is important to recall some of the basic scenarios for the Smart Learning Strategy:



There are obvious trade offs between the Learning Value of the Scenario and its cost and implementation difficulties.

From the implementation stand point, it is fundamental to correctly identify the scenario which is aimed at, and which can be achieved either on a stage by stage perspective or on a one shot deployment, and prepare all the steps of the plan accordingly. Expectations regarding the outcomes of the Smart Learning Initiative and its costs and hurdles should be adjusted to the chosen scenario.

7.8 Goal 7: Project Financing - the role of regional development banks

The Financing of a Smart Learning Initiative may open a number of possibilities which should be explored considering the significant investments involved, in particular if a nation-wide Plan is envisaged.

In general, four financing possibilities can be identified, as follows:

7.8.1 Government

It can be the national budget, but other sources can be used, such as telecom licensing revenues or spectrum fees.

7.8.2 Family/Beneficiary contribution

With the exception of some extreme cases, the existence of a contribution from the final beneficiary is very important in order to develop a sense of ownership and responsibility.

For instance, when the device is damaged or malfunctioning, if there was an initial contribution from the Beneficiary, this can improve the level of exigence, especially if there is a direct relation between the beneficiary and the provider of the device.

7.8.3 Private Partners (eg. telecom operators, IT companies)

It is quite straightforward to create a business model to engage private sector, since a Smart Learning Initiative has a close and direct relationship with the business of these partners.

7.8.4 Financing Institutions

The financing sources from Financial Institutions can be divided into two main groups:

- Commercial banks, or consortiums of banks, typically in situations of Project Finance or financing the families/beneficiaries, with Government or other kind of public guarantees.
- Development Banks, which are closer to this type of Projects, and which can present special conditions, such as non-refundable subsidies, no interest or low interest rates.

It is fundamental to define all financial aspects of the Project, from the initial investments to the deployment, operation and maintenance costs.

The initial definition is the base and the main element to fine tune the Financial Project and several aspects must be taken into consideration, such as the ones described below:

The first aspect to be decided is who are the contributors and in what percentage.

7.8.4.1. Contributions from the Beneficiaries

In general, the decision regarding whether there is a contribution from the Beneficiaries has many political implications and should be considered from the beginning.

Although in the case the Beneficiary is a financial contributor, it is necessary to define in which percentage and that there could be different contributions as a function of the income or other aspects (age, students, education officers, etc.)

Also is important to define whether is the payment is due upfront or if it is a recurrent fee during a certain time period or other possibilities.

Other key aspect is who will be responsible for collecting the payments and in what extent will this be associated to the operational tasks, in particular the delivery of the equipment.

7.8.4.2. Private subsidization

Typically this may come from Telecom Operators or IT Companies which are involved in the business model, which generates revenue that can be used for the subsidization or a mandatory contribute, resulting from spectrum licensing, that can be used in this context.

In addition to the financing of the device through the telecommunication access, the business model may include other potential sources of revenue, such as data centers, cloud services and other services. Discounts and incentives related to spectrum fees may also be appropriate.

An important framework to be taken into account when considering financing sources related to spectrum fees and other aspects of a broadband plan is the Report from the Broadband Commission, namely the citation below:

“... broadband is a transformational technology, whose global roll-out carries vast potential for sustainable development – by enhancing learning opportunities, facilitating the exchange of information and increasing access to content that is linguistically and culturally diverse.”

“education brings sustainability to all development efforts. Investing in education is the best way to invest out of poverty and in sustainable development.”

“In the twenty-first century, education cannot be separated from technology. Rapid advances in information and communication technology (ICT) and expanding connectivity to the internet have made today’s world increasingly complex, interconnected and knowledge-driven. Access to quality education for all – which includes access to ICT – is an imperative for building inclusive and participatory knowledge societies. However, disparities in access to technology and learning opportunities persist. Countries around the world are under pressure to bridge the digital, knowledge and gender divides by designing policies that enable access to the full potential of technology in a digital age.”

*TECHNOLOGY,
BROADBAND AND EDUCATION
ADVANCING THE EDUCATION FOR ALL AGENDA
A Report by the Broadband Commission Working Group on Education*

Further to this citation, the words of ITU Secretary-General Houlin Zhao⁵³ “Education is one of the most powerful uses to which broadband connectivity can be put”, also put into context the close relationship between the broadband policy of the country and a Smart Learning Initiative, from the operational stand point, but also from the financial stand point, since the financing of broadband deployment can provide be a source of financing for the Smart Learning Initiative.

7.8.4.3. Public subsidization

It can be the national budget, but other sources can be used, such as telecom licensing revenues or spectrum fees.

As mentioned in 7.4, public subsidization will require well defined criteria to be applied. In this context, the definition of the project scope, namely in what concerns the regional aspects, income aspects and student profile is very important in order to provide these criteria.

In terms of regional aspects, the levels of subsidization in rural areas will necessarily be different from urban areas, where access to technology and broadband is typically facilitated. Rural areas will also require a stronger relationship with the development of the broadband plan, since these areas are typically underserved in terms of broadband.

The relationship between subsidization and beneficiary income is also fundamental. Digital inclusion is a key driver to the success of the program, and different levels of subsidization will be required as a function of income. When designing the public subsidization policy, a careful analysis of the levels of available income needs to be performed, to ensure the expected uptake of the technology, and the adequacy of the subsidization budget.

Student profile can also play a role in the subsidization policy, since different technological solutions will be chosen to address different age groups and curricular needs, which will entail different price points and therefore different amounts of subsidization.

⁵³ http://www.itu.int/net/pressoffice/press_releases/2015/03.aspx#.Vf6Ty9iFPmR

8. MODULE 8: Monitoring Implementation and Evaluation

8.1 Purpose

This module provides a guide to establish a framework to monitor the action plan to implement the national strategies for smart learning by the countries and to evaluate the outcomes. The main aspects of this module are the development of indicators and targets to be measured, and the definition of the governance and processes required.

8.2 Audience

This module is intended for use primarily by government, officials of the ministry of education and ministry of ICT, leaders in education and ICT sectors, including personnel in ministries, departments and agencies who will monitor and evaluate their action plan to implement the national strategies for smart learning. It is formulated for use by countries that have already developed the national strategies for smart learning and associated action plan using the guidelines provided in the previous modules of this Guide, with the assumption that the outputs from them are available and have been endorsed. This module should also be useful to other decision-makers who have developed their action plans but are uncertain how to monitor and evaluate the results.

8.3 Orientation

This module provides guidance on establishing a national monitoring and evaluation framework. The introduction summarizes the outputs of the development of national strategies for smart learning and associated action plan, and how these relate to monitoring and evaluation. This is followed by the elements of a monitoring and evaluation framework, and the method by which the framework is developed. Finally, guidance on defining a national monitoring and evaluation framework is provided.

8.4 Introduction

By this point, a government should have established the national strategies for smart learning, and associated action plan. The action plan will have been endorsed by the leadership of education and ICT sectors and supported by the broader stakeholder environment. The action plan should describe:

- the action lines required to implement the national strategies for smart learning;
- the outputs and related activities for each action line;
- the dependencies and timings of activities;
- the resources required to deliver the outputs and activities; and,
- the phases in which the action plan will be implemented.

The next step is to establish a monitoring and evaluation framework, which will enable a government to track and assess the results of implementing the smart learning action plan. A monitoring and evaluation framework assigns accountability (who), and determines the approach (how) and timing (when) for measuring the results.

Monitoring and evaluation play essential role in demonstrating the progress that a country is making towards establishing national strategies for smart learning and their implementation, and the results or changes that these efforts are delivering. The outputs of monitoring and evaluation form a critical part of ongoing communication regarding a country's national smart learning implementation, which in turn is essential to building the support of stakeholders for further adoption and investment in smart learning.

In particular, communicating the progress and results of the smart learning action plan is important in demonstrating to various stakeholders, investors and funders the impact of their contributions. It can also help in building trust and understanding with potential investors and funders as to how their contribution would be used to further the country's national smart learning initiatives.

Establishing a successful national monitoring and evaluation framework requires dedicated resources and effort, often at various levels, to develop, manage and operate an effective process. The governments should consider monitoring and evaluation as part of the planning and costing of the implementation of their national smart learning strategies, thereby ensuring that appropriate resources are dedicated to the work.

8.5 Smart learning monitoring and evaluation framework

This section describes the elements to be considered in establishing a monitoring and evaluation framework for implementing the national strategies for smart learning (Table 8.1).

Table 8.1. Elements of smart learning monitoring and evaluation framework

Indicators:

- Stakeholders
- Smart learning outcomes
- Smart learning outputs

Measures (baseline and target measures for indicators):

Governance and processes:

- Output and outcome indicators
- Monitoring and evaluation timeframes
- Baseline measures
- Target measures
- Governance structures, functions and processes

8.5.1 Indicators for smart learning

An effective monitoring and evaluation framework is constructed around a set of meaningful indicators, the measurement of which provides insight into the adoption, use and results that the strategies for smart learning are being implemented effectively and are delivering.

Meaningful indicators should include the perspective of stakeholders, as this ensures that changes or improvements important to stakeholders are measured. Developing and selecting these indicators requires an understanding of smart learning outcomes that are important to each stakeholder.

There are two types of indicators to consider.

- *Output indicators* provide information and insight on the adoption of smart learning strategies.
- *Outcome indicators* provide information and insight on the results obtained.

8.5.2 Baseline and target measures for indicators

Monitoring the progress of the action plan requires an understanding of where a country is starting from (baseline measures), and what it is expecting to achieve (target measures). Targets should be defined for a range of timeframes throughout the duration of the action plan.

8.5.3 Governance and processes

National governance provides oversight, coordination and guidance for monitoring and evaluation efforts, and ensures timely intervention when there appears to be divergence between what is actually happening and what a country was aiming to achieve through its implementation of strategies for smart learning. Governance must be supported by processes that direct how the adoption and results of smart learning implementation are monitored and evaluated.

8.5.4 Developing monitoring and evaluation framework for implementing national smart learning strategies

The development of monitoring and evaluation framework for implementing national smart learning strategies is a sequential process that begins with determining the indicators to be monitored and outcomes to be evaluated. Baseline and target measures are set for each indicator. Targets serve as the basis for tracking actual progress against planned progress, and determining whether corrective action is required. The monitoring and evaluation framework also describes the governance model and processes through which national monitoring and evaluation is performed. Stakeholders are consulted throughout the process in order to gain commitment and understanding, as well as to ensure that their roles are considered in the governance structure and processes.

The development of a monitoring and evaluation framework is closely linked to the outputs of establishing national strategies for smart learning and implementing associated action plan, in particular:

- the important stakeholders from education and ICT sectors;
- the *outcomes* on which the national strategies for smart learning are based;
- the *outputs* that the action plan associated with the national strategies for smart learning will deliver; and,
- the implementation phases and timing for delivery of these outputs.

A considerable portion of developing a monitoring and evaluation framework involves using this existing knowledge.

8.5.5 Define indicators for smart learning

This step determines the purpose of monitoring and evaluation, based on the national strategies for smart learning established by the individual countries, associated action plan and stakeholder perspectives. It focuses on developing a set of output and outcome indicators that will measure the results that smart learning implementation delivers. An important aspect is to consider the consultations completed with stakeholders during the development of the national strategies for smart learning, and to link a number of the indicators to outcomes important to stakeholders. It is also important to link indicators to timeframes for measuring other education and ICT related outcomes where possible (for example, in the national digital learning content development initiatives, deployment of mobile devices in the classrooms, and establishment of high bandwidth wireless infrastructures) to show the contribution of smart learning to these outcomes and to avoid creating separate reporting processes.

Various activities in this step are as follows:

- Identify priority stakeholders for whom it is critical to show results of smart learning implementation.
- Review the outcomes of smart learning implementation for priority stakeholders.
- Identify the smart learning outputs that will lead to these outcomes.
- Review and confirm focus areas with priority stakeholders.
- Develop smart learning adoption and outcome indicators.

8.5.6 Identify priority stakeholders

It is important to prioritize the education and ICT sector stakeholders who need to see the results of the action plan associated with the national strategies for smart learning. The development of indicators should be informed by the perspective of stakeholders, minimizing the risk that indicators are based solely on the delivery of smart learning.

It is recommended that these priority stakeholders are described at the level of an organization, group or role, instead of specific individual or political party, because these will change with time. For example, a stakeholder could be defined as the 'Department of Higher Education' (organization-level) or the 'Minister of ICT' (role-level) rather than the particular individual fulfilling the role of the minister of ICT. An example of a stakeholder group could be 'School commissioners'.

The selection of priority stakeholders should be based on the knowledge gained during the establishment of the national strategies for smart learning and the development of associated action plan. The focus should be on stakeholders for whom the demonstration of progress and outcomes of smart learning is important in building support and momentum for further adoption of and investment in smart learning.

Stakeholders for whom smart learning outcomes may be especially important are:

- School teachers
- School principals
- Senior education administrators
- Educational researchers
- Parents
- Local educational technology industry

Funding bodies, such as social and economic development agencies and other donors, such as local telecommunication infrastructure providers, should also be considered. While they are not direct beneficiaries of smart learning implementations, these bodies may have stipulated requirements for monitoring implementation progress and the results of their investment in the national smart learning initiatives (as part of their provisions of funding).

8.5.7 Review the outcomes of smart learning implementation for priority stakeholders

The next step is to identify the outcomes that delivery of smart learning action plan will have for the priority stakeholders. As delivering the outcomes leads to concrete improvements and results for stakeholders, indicators should be based on them. The outcomes should be linked to each of the prioritized stakeholders and explored from each stakeholder's perspective in order to describe what delivering each outcome will mean for them. For example, the improvements or changes that a particular stakeholder will experience through the realization of a particular smart learning outcome.

The expected outcomes (concrete improvements) should then be described for each prioritized stakeholder, based on the outcomes of smart learning action plan implementation. Some examples of these outcomes for identified priority stakeholders are listed in Table 8.2.

Table 8.2. Examples outcomes for identified priority stakeholders (non-exhaustive)

Priority stakeholder	Example outcomes
School teachers	<ul style="list-style-type: none"> • Improve the ability of teachers to access high quality digital resources for their courses • Provide ongoing access to training resources for teachers to improve competencies to teach 21st century skills to students • Improve the ability of teachers to monitor and track their students' performance in real time • Improve the ability of teachers to exchange student information with other teachers • Enable teachers to interact with students and parents who are located remotely • Enable teachers to collaborate with other teachers and share their expertise, concerns and best practices effectively through ICT
School principals	<ul style="list-style-type: none"> • Improve ability of principals to access resources to implement virtual learning, online learning, blended learning and other emerging learning modes in their schools • Provide on-time and on-demand access to technical support for principals to continuously maintain ICT infrastructure in their schools
Senior education administrators	<ul style="list-style-type: none"> • Support national and regional education authorities to plan ICT infrastructure improvements • Support national and regional education authorities to monitor and respond to low performance of students • Support the education, training and development of the country's educator workforce • Provide reliable and quality data to inform and monitor the results

	of policy, investment and administrative decisions. <ul style="list-style-type: none"> • Provide access to quality data sources that inform service and workforce planning and management • Enable effective management of the creation, supply, distribution and availability of high quality digital learning resources
Educational researchers	<ul style="list-style-type: none"> • Provide researchers with greater access to evidence-based information to support experimentation of innovative and emerging pedagogical changes in learning and assessment • Improve access to the technology-enhanced learning literature, knowledge networks and resources.
Parents	<ul style="list-style-type: none"> • Improve the ability of parents to track the performance improvement of their children • Improve the ability of parents to provide technology-enhanced learning to their children in rural and remote areas • Improve parents engagement in their children's education by ensuring effective information flow between them and teachers
Local educational technology industry	<ul style="list-style-type: none"> • Improve the ability of local educational technology industry to innovate for enhancing education within local context • Streamline the process for local educational technology industry to engage with schools • Preference to somewhat more costly local educational technology products over cheaper solutions from large multinationals

The smart learning outcomes should be refined, as required, to describe the concrete results that the national strategies for smart learning are expected to deliver to each stakeholder. The descriptions should be concrete enough to support the identification of indicators that will allow these outcomes to be measured.

8.5.8 Identify the smart learning outputs

In this step, the outputs of the smart learning action plan need to be identified that will lead to the smart learning outcomes. These outputs and associated activities should be linked to the smart learning outcomes defined in the previous step.

Various examples of smart learning outputs linked to outcomes are listed in Table 8.3.

Table 8.3. Examples of smart learning outputs linked to outcomes (non-exhaustive)

Priority stakeholder	Outcomes	Outputs
School teachers	<ul style="list-style-type: none"> • Improve the ability of teachers to access high quality digital resources for their courses • Provide ongoing access to training resources for teachers to improve 	<ul style="list-style-type: none"> • National digital resources repository established • National mobile educational apps repository established • Appropriate teacher training

	<p>competencies to teach 21st century skills to students</p> <ul style="list-style-type: none"> • Improve the ability of teachers to monitor and track their students' performance in real time • Improve the ability of teachers to exchange student information with other teachers • Enable teachers to interact with students and parents who are located remotely • Enable teachers to collaborate with other teachers and share their expertise, concerns and best practices effectively through ICT 	<p>programs established</p> <ul style="list-style-type: none"> • Classroom Learning analytics based platform deployed • National smart learning data and messaging standards in place • High bandwidth data/telecommunications connectivity established to rural and remote communities • National communities of practice infrastructure established
School principals	<ul style="list-style-type: none"> • Improve ability of principals to access resources to implement virtual learning, online learning, blended learning and other emerging learning modes in their schools • Provide on-time and on-demand access to technical support for principals to continuously maintain ICT infrastructure in their schools 	<ul style="list-style-type: none"> • National digital resources repository established • School-level Learning analytics based platform deployed • Appropriate technical support infrastructure established
Senior education administrators	<ul style="list-style-type: none"> • Support national and regional education authorities to plan ICT infrastructure improvements • Support national and regional education authorities to monitor and respond to low performance of students • Support the education, training and development of the country's educator workforce • Provide reliable and quality data to inform and monitor the results of policy, investment and administrative decisions. • Provide access to quality data sources that inform service and workforce planning and management • Enable effective management of the creation, supply, distribution and availability of high quality digital learning resources 	<ul style="list-style-type: none"> • National and regional level Learning analytics based platform deployed • National and regional level Academic analytics based platform deployed • National and regional teacher training programs established • National and regional computing/access infrastructure deployed to rural and remote communities • National and regional reporting portal service established • Surveillance applications for mobile devices developed and deployed

Educational researchers	<ul style="list-style-type: none"> • Provide researchers with greater access to evidence-based information to support experimentation of innovative and emerging pedagogical changes in learning and assessment • Improve access to the technology-enhanced learning literature, knowledge networks and resources. 	<ul style="list-style-type: none"> • Appropriate ethics policy and standards established for educational technology research • Educational researcher network community infrastructure established • Appropriate channels of communication established between researchers and school administrators
Parents	<ul style="list-style-type: none"> • Improve the ability of parents to track the performance improvement of their children • Improve the ability of parents to provide technology-enhanced learning to their children in rural and remote areas • Improve parents engagement in their children's education by ensuring effective information flow between them and teachers 	<ul style="list-style-type: none"> • Regional Learning analytics based platform deployed • High bandwidth data/telecommunications connectivity established to rural and remote communities • Reliable computing/access infrastructure deployed to rural and remote communities • Multiple channels of communication established between teachers and parents
Local educational technology industry	<ul style="list-style-type: none"> • Improve the ability of local educational technology industry to innovate for enhancing education within local context • Streamline the process for local educational technology industry to engage with schools • Preference to somewhat more costly local educational technology products over cheaper solutions from large multinationals 	<ul style="list-style-type: none"> • Local educational technology industry database established • Appropriate channels of communication established between local educational technology industry and school administrators • Transparent tender process supporting local educational technology industry established

Some smart learning outputs will be delivered progressively over time (such as the high bandwidth data/telecommunications connectivity established to rural and remote communities) while others will represent a 'point in time' event.

8.5.9 Review and confirm focus areas with priority stakeholders

The next step is to confirm the smart learning outcomes and outputs for monitoring and evaluation by reviewing them with stakeholders. This step will establish the relative importance of different smart learning outcomes and outputs to emerge. This is particularly important given that the resources to undertake

monitoring and evaluation will likely be limited and therefore measuring ‘everything’ is unlikely to be possible. This step will also provide an opportunity to:

- build stakeholder support;
- gather stakeholder input on indicators that could be used; and,
- communicate the expected outcomes relevant to stakeholders.

As a result of this step, a list of the smart learning outcomes and associated outputs will become available that will be the focus of national monitoring and evaluation efforts. Consultation with stakeholders will be required to review and confirm the smart learning outcomes and outputs that are of particular importance to them. Consultation should focus on understanding those aspects that ‘must’ be monitored and evaluated, versus those that ‘should’ or ‘could’ be measured. Typically this discussion will tend to focus more on stakeholder priorities in the short to medium timeframes. Once smart learning outcomes and outputs are prioritized, stakeholders should also be consulted regarding the indicators that they regard as being practical and appropriate to measure.

8.5.10 Define smart learning output and outcome indicators

The indicators need to be defined as the next step that will be used throughout the execution of the action plan associated with the national strategies for smart learning. Two types of indicators should be considered:

- Smart learning output indicators provide information and insight into the adoption of smart learning; and,
- Smart learning outcome indicators provide information and insight into the results for stakeholders.

Output indicators are derived from the smart learning outputs, whereas outcome indicators are derived from the smart learning outcomes. These indicators are closely related, in that the rate of adoption (measured by smart learning output indicators) will drive the expected improvements (measured by smart learning outcome indicators). Typically, smart learning output indicators are used for those outputs that are delivered progressively, such as the high bandwidth data/telecommunications connectivity established to rural and remote communities, or the take-up of ethics policy and standards by educational researchers.

Various outputs of this step are as follows:

- Smart learning output indicators, which will be used to measure the adoption and take-up of smart learning by education and ICT sectors.
- Smart learning outcome indicators, which will be used to measure the results of the adoption and take-up of smart learning.

Some examples of smart learning outcome indicators are listed in Table 8.4.

Table 8.4. Examples of smart learning outcome indicators (non-exhaustive)

Priority stakeholder	Outcomes	Outcome indicators
School teachers	<ul style="list-style-type: none"> • Improve the ability of teachers to access high quality digital resources for their courses • Provide ongoing access to training resources for teachers to improve competencies to teach 21st century skills to students • Improve the ability of teachers to monitor and track their students' performance in real time • Improve the ability of teachers to exchange student information with other teachers • Enable teachers to interact with students and parents who are located remotely • Enable teachers to collaborate with other teachers and share their expertise, concerns and best practices effectively through ICT 	<ul style="list-style-type: none"> • Percentage increase in the use of digital resources by the individual teachers • Percentage increase in the use of mobile educational apps by the teachers • Percentage increase in the number of teachers trained to teach 21st century skills to students • Percentage increase in the number of student information exchange among teachers • Percentage increase in the number of exchange between teachers and parents • Percentage increase in the number of digital resources developed and shared by the teachers
School principals	<ul style="list-style-type: none"> • Improve ability of principals to access resources to implement virtual learning, online learning, blended learning and other emerging learning modes in their schools • Provide on-time and on-demand access to technical support for principals to continuously maintain ICT infrastructure in their schools 	<ul style="list-style-type: none"> • Percentage increase in the use of digital resources by the schools • Decrease in the off-time of technical equipment and ICT infrastructure due to technical problems • Increase in the uptime of network

Quantitative indicators minimize the level of ambiguity regarding the results achieved. Some outcomes require the use of qualitative indicators, which are usually derived from surveys, questionnaires, feedback and other evaluation mechanisms, and may also allow for greater insights into the potential cause(s) of divergence from expected results.

An internal analysis is required to define a set of candidate smart learning output and outcome indicators, which is then confirmed with stakeholders. Each outcome or output is considered individually in order to analyze what needs to be monitored or measured to monitor progress towards that outcome or output.

Consultation with stakeholders should focus on confirming the initial set of candidate indicators and identifying any others that should be considered. This may include confirming that indicators meet the criteria that they are observable, reliable and controllable. Specific stakeholders may be consulted on how best to measure a particular smart learning outcome or output. Table 8.5 lists some example criteria for selecting indicators.

Table 8.5. Example criteria for selecting indicators (non-exhaustive)

Criteria	Description
Linked to objectives	Indicators should provide information that can be linked to and support the monitoring and evaluation of smart learning outcomes and outputs
Quantifiable	Indicators should be concrete, as opposed to conceptual, and should be measurable and easily expressed in relevant units of measurement
Observable	Measurement data exists (or will exist) that will allow an indicator to be derived
Reliable	The data used for the indicators should not be arbitrarily derived and should reflect accurate, verifiable information as much as is possible
Controllable	Indicators should measure the results of delivering the action plan associated with the national strategies for smart learning, and should be selected to control the potential impact of activities that fall outside the scope of the plan
Ongoing and comparable	Indicators should provide information that is comparable and relevant across periods, rather than being 'one time' indicators of progress

There is little value in defining a set of indicators where the data do not exist or cannot be regularly collected, analyzed and reported. This step should consider the reality of the country's current environment, in particular the challenges or barriers that exist to gathering the required data. The result of this may be the need to consider using a mixture of quantitative and qualitative indicators.

In practice, a country will use a mixture of both quantitative and qualitative measures over the course of implementing the action plan. Both types of measures can play a useful role in understanding whether the desired outcomes and outputs are being delivered, as well as providing insights into the results obtained. Countries need to ensure that the appropriate skills and expertise exist to do both types of research.

8.5.11 Define baseline and target measures for indicators

Once the indicators have been defined and prioritized, the baseline measures need to be validated and target measures need to be created for each indicator. Target measures are defined for different timeframes so that progress can be monitored throughout the execution of the plan.

Baseline measures provide an understanding of a country's starting point and assist in defining realistic and achievable targets, which allow evaluation of the progress in implementing the action plan (i.e. are we achieving what we set out to achieve?). Evaluating indicators against targets should occur at regular intervals

to ensure that the implementation of smart learning is delivering tangible results to stakeholders in a timely manner and that potential problems are identified and addressed as soon as possible.

Various activities in this step are as follows:

- Determine national monitoring and evaluation timeframes.
- Identify baseline measures for each indicator.
- Define target measures for output indicators.
- Define target measures for outcome indicators.

Various outputs in this step are as follows:

- Indicator monitoring and evaluation timeframes.
- Agreed baseline and target measures for smart learning output and outcome indicators.

8.5.12 Determine national monitoring and evaluation timeframes

In this step, the timeframes for national monitoring and evaluation are defined. Regular monitoring and evaluation allows a government to:

- determine whether the action plan is delivering the expected results;
- identify issues and challenges affecting the delivery of results, for which corrective actions can be applied; and,
- regularly communicate the results to stakeholders, which will assist in building further momentum and support for smart learning.

Ideally, a single set of consistent timeframes should be defined for all indicators but this may not always be possible due to the nature or requirements of a particular indicator. Monitoring and evaluation timeframes should align with the implementation phases defined in the action plan associated with the national strategies for smart learning. For example, a country may define a set of implementation targets that align with the strategy's short, medium and long term implementation horizons, which in turn lead to the definition of quantitative and qualitative implementation targets for timeframes of, say, 3, 6 and 10 years.

While the implementation phases provide a good starting point, other factors may require using different timeframes, such as:

- Specific stakeholder requirements, such as those related to reporting requirements that may need to be met as part of the provision of funding.
- Political and funding cycles, such as government election terms and national funding cycles which may influence when reports on the results of investing in smart learning are required.
- Level and timing of smart learning implementation activity, which in turn drives when indicators should be measured. Monitoring and evaluation timeframes have little point if nothing is expected to be delivered during them. Conversely, periods of very high smart learning activity may require closer monitoring of

particular indicators.

8.5.13 Identify baseline measures for each indicator

This step defines the baseline measure for each smart learning output and outcome indicator. Evaluating the progress of smart learning adoption and the results flowing from this requires identification of the starting point (current status) for each indicator that will be monitored.

Research and analysis will be required to determine baseline measures for each indicator. To start with, the country should determine whether its overall starting position warrants further effort in identifying a baseline measure for a particular indicator. For example, consider a country that has defined a smart learning outcome indicator to measure 'percentage increase in the use of mobile educational apps by the teachers'. If that country has few or no mobile educational app stores in place, it may opt to define a baseline measure for this indicator as zero. A country that has already made substantial investment in mobile educational app development, however, would need to research and identify an appropriate baseline measure to allow the results of further investment to be quantified and demonstrated.

Once it has been confirmed that a baseline measure for an indicator is required, a country will need to analyze historical data that allows a baseline measure to be calculated. Such data may be available from ministries of education, ministries of ICT, chambers of commerce, non-profit organizations, teacher communities, research publications, and so on. If no historical data is available, the country may need to consider using a proxy source of data to infer a baseline measure for the indicator.

In practice, many countries may not have the people, processes or infrastructure in place to support the collection of data. They may need to build this capacity over time and incorporate it into the action plan.

8.5.14 Define target measures for output indicators

This step defines target measures for each smart learning output indicator in order to monitor the adoption of smart learning. Target measures for output indicators must be defined prior to defining targets for outcome indicators, because the latter depend on the former. Targets should be realistic and achievable in order to remain relevant and motivating. The result of this step would be a set of achievable target measures for each smart learning output indicator within a given timeframe. Internal analysis will be required to start this step, although input from specific stakeholders and other experts may also be required.

Internal analysis should focus on drafting an initial set of targets for each output indicator. Defining targets is an estimation exercise that considers various aspects:

- Baseline measures and timeframe: What is the starting point for this indicator and what can be realistically achieved within the monitoring timeframe?
- Smart learning activities: What other activities (in the action plan) are occurring in the same timeframe and how will this influence what can be achieved?
- External research: What have other relevant national programmes achieved and what timeframes were associated with this output?
- Target measures for other smart learning output indicators: What relationships exist between smart learning output indicators, and how do target measures that have been defined for other indicators influence the targets for this indicator?

This internal activity will result in establishing a set of draft targets for smart learning output indicators, supported by rationale as to why these measures represent achievable adoption targets.

Input from specific stakeholders and other experts can provide insight into achievability of the draft targets measures for output indicators through knowledge of:

- similar initiatives or change programmes, and the outcomes that these were able to deliver;
- the particular risks, challenges and barriers to adoption of smart learning; and,
- other national or international programmes, initiatives or events that may influence the adoption of smart learning in the country.

The draft indicators should be reviewed in consultation with relevant stakeholders to refine the targets and ensure that the rationale is sound.

8.5.15 Define target measures for outcome indicators

Targets for each smart learning outcome indicator are defined in this step across the previously-defined timeframes. These targets allow the evaluation of the results for stakeholders. The targets set for the smart learning outcome indicators should accurately reflect the results that can be realized given the target rates of smart learning adoption. Targets should be ambitious but realistic.

Similar to the process used for output indicators, internal analysis will be required to start the process for identifying targets for outcome indicators, although input from specific stakeholders and other experts may also be required.

Internal analysis should focus on drafting an initial set of targets for each smart learning outcome indicator by considering various aspects:

- Related smart learning output indicators: What results can be achieved given the targets that have been defined for related output indicators?

- Baseline smart learning outcome indicator measures: What is the country's starting point in terms of the tangible results that are to be measured? Are there results already delivered that need to be accounted for?
- Monitoring and evaluation timeframes: What results can realistically be achieved within the monitoring and evaluation timeframe?

This internal activity should establish a set of draft target measures for smart learning outcome indicators which will reflect the tangible results that can be expected, given the anticipated rates of adoption of smart learning.

Input from specific stakeholders and other experts can provide insight into the potential to realize tangible results for stakeholders, given the levels of smart learning adoption anticipated and targeted by the smart learning output indicators.

8.6 Define supporting governance and processes

This stage defines the governance and processes within which the monitoring and evaluation of smart learning adoption and associated results are undertaken. Typically, monitoring the progress of, and evaluation of, smart learning may be carried out at multiple levels and by multiple parties. It is important that these various efforts are planned and executed within an overall national monitoring and evaluation model.

Various activities in this step are as follows:

- Define a governance model for national monitoring and evaluation.
- Define a process for it.

Various outputs in this step are as follows:

- Governance model for national monitoring and evaluation.
- High-level process for undertaking it.

8.6.1 Define a governance model for national monitoring and evaluation

A governance model is defined at this step for national monitoring and evaluation of the smart learning adoption and the subsequent tangible results. This model should describe the governance functions and structure within which national monitoring and evaluation will be undertaken.

Monitoring and evaluation is typically an effort performed by various parties. A governance model provides the structure by which these collective efforts are aligned. It consists of a range of functions and the required mechanisms to deliver them. Table 8.6 lists some example functions for governing national monitoring and evaluation.

Table 8.6. Example functions for governing national monitoring and evaluation (non-exhaustive)

Function	Purpose
Monitoring oversight and steering	Provide executive-level oversight in regard to national monitoring and reporting (i.e. input, escalation, review and endorsement of deliverables).
Project management	Provide overall management of national monitoring and reporting functions (i.e. planning and scheduling, progress monitoring, financials, risk management).
National indicator development	Develop national smart learning output and outcome indicators to enable monitoring of the delivery of the action plan associated with the national strategies for smart learning.
National measures definition	Define national baseline and target measures for smart learning output and outcome indicators, against which national progress can be measured.
National capability development	Develop national monitoring processes and supporting frameworks, tools and templates, and the communication and education of others regarding these processes and timelines.
Activity monitoring and evaluation	Define activity-specific indicators and targets aligned to national indicators and targets, and the subsequent monitoring and reporting of these.
Education and ICT sector monitoring and evaluation	Define education and ICT sector-specific indicators and targets (if required) aligned to national indicators and targets, and the subsequent monitoring and reporting of these.
Expert support	Provide expert support in the monitoring, analysis and evaluation of smart learning adoption and the subsequent tangible results.
Research	Provide broader research and analytical capabilities to support monitoring and reporting of smart learning, potentially through the provision of data and insights from other national and international smart learning programmes.

The governance model developed in this step will enable monitoring and evaluation of smart learning action plan implementation. The model should identify and describe:

- the governance mechanisms required; and
- the structure and relationships between them.

A governance mechanism is a committee, council, team or special group that has the mandate or responsibility to perform one or more of the functions described. The composition of a governance mechanism should be the best available to carry out this mandate or responsibility.

Individual smart learning projects, including external projects on which the action plan is dependent, are responsible for monitoring their own progress within the overall national framework. External projects may include those undertaken outside the scope of the national action plan. Table 8.7 describes the role of governance mechanisms as they relate to national monitoring and evaluation.

Table 8.7. Role of governance mechanisms as they relate to national monitoring and evaluation

Mechanism	Responsibilities
Education and ICT sector leadership	<ul style="list-style-type: none"> • Acting as the vocal and visible champion of the national smart learning action plan implementation • Accountable for the delivery of national smart learning adoption and associated results
National smart learning programme steering committee	<ul style="list-style-type: none"> • Provides monitoring and evaluation oversight and steering, which includes: <ul style="list-style-type: none"> ○ providing guidance and input to definition of national indicators, measures, and monitoring and evaluation timeframes; ○ reviewing and endorsing national indicators, measures, and monitoring and evaluation timeframes; ○ assisting in resolving risks, issues and conflicts related to monitoring and evaluation; ○ reviewing and endorsing recommendations on corrective actions to the programme to address divergences between actual and target targets; and, ○ ensuring targets are being achieved and that corrective actions are being made to the smart learning action plan implementation to resolve divergences.
Programme management	<ul style="list-style-type: none"> • Ensuring monitoring and evaluation processes and tools are aligned and integrated with broader programme management processes and tools • Working with the national monitoring and evaluation function to identify options for taking corrective action to address divergences between actual and target indicator measures • Undertaking corrective actions that have been endorsed by the programme steering committee
National monitoring and evaluation function	<ul style="list-style-type: none"> • Project management (i.e. day-to-day management of activities, progress, financials, risks and issues) • Development of national smart learning output and outcome indicators • Development of baseline and target measures • Liaising with stakeholders and other experts to gain input into the definition of indicators and baseline/target measures for indicators • Confirm indicators, and associated baseline and targets, with decision-makers • Develop and communicate processes, schedules, templates, etc., for the operation of the national monitoring and evaluation process • Collate and analyse activity, education and ICT sector reporting to assess against national indicators and targets, and identify where corrective actions may be required

	<ul style="list-style-type: none"> • Develop recommendations regarding corrective actions, and advise the programme steering committee (Note: The national monitoring and evaluation function does not have accountability for correcting programme actions) • Provide expert support in the monitoring, analysis and evaluation of smart learning adoption and associated results • Provide broader analytical capabilities to support monitoring and evaluation, including the provision of data and insights from other national programmes
Subject matter experts	<ul style="list-style-type: none"> • Provide input into the definition of and insights into the achievability of the draft target measures for indicators • Provide input into corrective actions that may be appropriate to address divergence
Multi-sector stakeholders	<ul style="list-style-type: none"> • Provide input into the definition of and insights into the achievability of the draft target measures for indicators • Provide input into corrective actions that may be appropriate to address divergence
Smart learning project team	<ul style="list-style-type: none"> • Define smart learning output and outcome indicators and targets aligned to national indicators and targets • Undertake monitoring and evaluation of activity-level indicators • Report on activity-level indicators to the national monitoring and evaluation function in accordance with defined processes, schedules, templates and tools
External smart learning projects on which the action plan is dependent	<ul style="list-style-type: none"> • Define smart learning output and outcome indicators and targets aligned to national indicators and targets • Undertake monitoring and evaluation of activity-level indicators • Report on activity-level indicators to the national monitoring and evaluation function in accordance with defined processes, schedules, templates and tools
Broader education and ICT sector monitoring team(s)	<ul style="list-style-type: none"> • Same as per External smart learning projects except that their focus is on the smart learning outputs and outcomes within a particular part or segment of the country's education and ICT sectors

The process of defining a governance model for national monitoring and evaluation involves a number of steps:

- Confirming the functions required
- Identifying existing governance mechanisms that could be used, based on:
 - mandate, which represents the scope of responsibilities officially given to that governance mechanism;
 - external perception, which represents the perception of that governance mechanism within the wider education and ICT sectors, and enables that mechanism to perform its role;
 - engagement and influence, which represent the ability of that mechanism to engage with, influence and consult with stakeholders; and,
 - internal capabilities, which represent the capability of that mechanism to fulfill its responsibilities.

- Defining a pragmatic governance model that will deliver the required governance functions, taking into account the existing governance mechanisms that can be used, and new mechanisms that need to be developed to address gaps. The role and responsibilities of each governance mechanism, and the nature of the relationships and interactions between them, also need to be clearly defined.

8.6.2 Define a process for national monitoring and evaluation

This step defines the national monitoring and evaluation process. It will be an ongoing process, in the background of the implementation of action plan, with monitoring and evaluation undertaken at the agreed timeframes for each of the indicators. The specific monitoring and evaluation processes for smart learning activities should be aligned with the national approach.

Defining a pragmatic monitoring and evaluation process is a complex undertaking, particularly for large-scale smart learning programmes in which many parties will be involved. Table 8.8 provides some examples of national- and activity-level monitoring and evaluation activities.

Table 8.8. Example of national- and activity-level monitoring and evaluation activities (non-exhaustive)

Process	National-level	Activity-level
Planning and initiation	<ul style="list-style-type: none"> • Define and communicate national evaluation schedule and milestones • Develop and communicate national monitoring and evaluation frameworks, tools and templates • Provide advice and support to activity-level teams in defining appropriate indicators and targets that support national-level indicators and targets 	<ul style="list-style-type: none"> • Establish local monitoring and evaluation roles and responsibilities • Define detailed monitoring and evaluation timelines and milestones that align with national timings • Develop and deploy detailed monitoring and evaluation procedures, tools and templates that align with national requirements • Define detailed indicators that support measurement of national indicators • Define target measures that support national targets • Define indicator measurement approaches
Execution and measurement	<ul style="list-style-type: none"> • Provide advice and expertise to activity-level teams on developing indicator measures to assess current performance 	<ul style="list-style-type: none"> • Collect measurement data while activity is being undertaken • Develop and track current indicator measures

		<ul style="list-style-type: none"> Identify and resolve issues in developing current indicator measures
Progress analysis and reporting	<ul style="list-style-type: none"> Collate activity-level reports on actual versus target performance for indicators Liaise with activity-level teams to explore performance and understand causes of divergences Develop reports that describe actual versus target performance for national-level indicators Identify causes of divergences in actual and target performance at the national level 	<ul style="list-style-type: none"> Develop reports that describe actual versus target performance for activity-level indicators Identify causes of divergences in actual and target performance at the activity level
Corrective action planning	<ul style="list-style-type: none"> Liaise with activity-level teams to understand corrective actions that can be taken to address activity-level and programme-level divergences Identify and assess programme-level corrective actions to address divergences in actual and target performance at the national level Assess impact, costs and risks of implementing programme-level corrective actions Review and gain endorsement programme-level corrective actions with the programme steering committee Manage changes in the scope of national programme (if required) to implement corrective actions 	<ul style="list-style-type: none"> Identify local actions that can be taken to address divergences in actual and target performance for activity-level indicators Identify programme-level actions that can be taken to address divergences in actual and target performance for activity-level indicators Assess impact, costs and risks of implementing local and programme-level actions for the activity in question Manage changes in scope (if required) to implement corrective actions
Refinement	<ul style="list-style-type: none"> Identify national target measures for indicators that may be unrealistic or unachievable within the required timeframe Liaise with activity-level teams to understand changes to activity-level targets Understand implications on national level target measures 	<ul style="list-style-type: none"> Identify activity target measures for indicators that may be unrealistic or unachievable within the required timeframe Refine target measures for indicators to be realistically achievable Agree changed target measures for indicators for future

	<p>for indicators</p> <ul style="list-style-type: none">• Develop revised national target measures for indicators• Review and gain endorsement of revised national target measures with the programme steering committee	<p>monitoring periods</p>
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DRAFT

Annex 1 – Status of Smart Learning and future plans in Arab region

Executive Summary

This report is the outcome of study conducted to understand the state-of-the-art in smart learning in Arab region. Desk research was conducted to identify various initiatives taking place in the region facilitating smart learning in K-12 sector. A survey was conducted with Ministries of Information Technology and Ministries of Education in the region to further understand the readiness of various Arab countries to embrace smart learning and their plans in near future in this direction. Analysis of desk research and findings of the survey suggest that while the awareness about smart learning is increasing in Arab world, there are significant differences in the level of preparedness among various countries. There are very few smart learning implementations and those that exist are primarily in pilot stages. However, there are a number of projects and initiatives that are not necessarily smart learning, but have the potential to move the region forward towards smart learning, as they demonstrate systemic use of information and communication technologies. These initiatives can be classified in two categories: eLearning and open access resources. The survey findings are analyzed in terms of smart learning strategies, 21st century competency development, human capacity development, priorities towards smart learning, policy, and learner-centred initiatives. The report concludes with several recommendations for potential outputs over next four years to meet the demands of Smart Learning in the region. These recommendations are made policy development, content, mobile access, intellectual capacity building, smart classroom infrastructure, analytics approaches, and training infrastructure.

Introduction

The extremely rapid growth of wireless and sensor technologies in recent years and increasing availability of high bandwidth network infrastructures, have opened up new accessibility opportunities for education. As a result, the realm of learning is changing rapidly the boundaries of classrooms in recent years with the notions of eLearning (learning supported by digital electronic tools and media) achieving mainstream status, and with m-learning (eLearning using mobile devices and wireless transmission) and u-learning (learning in context using a combination of physical objects and virtual information) emerging as potential next steps in the process of transforming the notion of the classroom. With increasing opportunities for learning in individual contexts

anytime and anywhere, the expectations of customization of learning to suit individual needs are more pressing than ever before. These advancements provide additional opportunities for individual students within the context of Smart Learning to make learning process adaptive, effective, efficient, engaged, flexible, thoughtful and accessible (Spector, 2014).

Smart learning environments exhibit various qualities that differentiate them from typical online learning environments. Typical online learning environments facilitate teachers to share learning content with students within a general structure. These environments enable some customization but are essentially generic teacher-centred shells. Smart learning environments on the other hand provide learner-centred environments that are intelligent and open, and integrate digital virtual reality learning space. These environments are primarily based on constructivist learning theory, blended learning theory and modern teaching theory, with a sophisticated interplay of equipment, tools, technology, media, textbook, teachers, students (Zhong & Zhang, 2006) and even parents.

Huang et al. (2012) identify following characteristics of smart learning environments:

- *Learning resources*: Smart learning environments encourage resources independent of the devices, provide seamless connection and automatic synchronization of learning content and learner's progress across multiple devices, and deliver on-demand resources.
- *Learning tools*: Smart learning environments provide specialized tools for effective learning. They enable integration of emerging technology within existing infrastructure, and allow teachers and students to create diverse learning scenarios.
- *Learning community*: Smart learning environments enable interconnectivity of real communities through mobile devices to enable communication anytime and anywhere. They may also match various learner communities based on various characteristics. These environments depend on media literacy.
- *Teaching community*: Smart learning environments automatically form teaching communities and connect cross-regional communities.
- *Learning methods*: Smart learning environments foster knowledge construction through collaboration among learners and learner communities. They focus on high-level cognitive objectives. They support diverse assessment approaches, and promote critical and analytical thinking skills.
- *Teaching methods*: Smart learning environments emphasize on activity design and guidance. They support adaptive evaluation of learning outcomes based on the cognitive characteristics of the learners. They enable timely and real-time intervention in the learning activities to enable both formative and summative feedback.

Spector (2014) identify a number of characteristics for smart learning environments, classifying them into necessary, highly desirable and likely. Necessary characteristics include effectiveness in terms of desirable learning outcomes better than other environments with similar learners; efficiency in terms of cost for capital expenditure, support and maintenance; scalability with demonstrated effectiveness and efficiency on ranging number of learners; and, autonomy in terms of being able to react appropriately and autonomously to different

learning situations and circumstances. Highly desirable characteristics include ability to engage learners, be able to motivate them and sustain continued interest; provide flexibility in terms of adjusting to changes needed for new students, addition of different resources, and modifications in learning goals; adaptivity towards individual learners based on their competencies, learning styles and interests; and personalization of assignment and feedback for individual learners. Likely characteristics include the facility to foster conversation among community of learners; reflection on individual learners' performance; innovation in terms of making use of new and emerging technologies to support learning and instruction; and, self-organization of resources and control mechanisms to improve its own performance over time.

This report looks at the readiness of various Arab League countries to embrace various characteristics of smart learning in K-12 sector and analyzes existing policies, development of strategic directions, projects at various levels of governmental infrastructure, and roadmap for next few years going forward.

Scope

The focus of this research is limited to twenty two Arab League countries: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, State of Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, and Tunisia.

Inputs

The data for this report was collected in two ways:

1. A comprehensive review of literature was conducted in the form of desk research. Since the area of smart learning is still emerging, majority of the literature consisted of various governmental reports, studies conducted by non-profit organizations, reports published by or on behalf of United Nations and its agencies, various press releases from commercial and non-commercial organizations, along with some academic literature. The review first briefly looked at the level of education and literacy in Arab world, and then analyzed various initiatives within the scope of smart learning.
2. A survey was conducted in the month of November 2014 with the Ministries of Information Technology and Ministries of Education in various Arab countries. The survey contained questions related to the current state of various smart learning strategies, the focus on 21st century competency development, human capacity development for effective implementation of smart learning, priorities towards various features of smart learning, existence of various related policies and the future roadmap, and details of any learner-

centred initiatives. The sample questionnaire used for this survey is enclosed in Appendix at the end of this report.

Education and literacy in Arab world

The level of education varies significantly in various parts of the Arab world. Magin (2010) reported UNESCO estimate of 40% of those over 15 years of age in Arab world (about 70 million people) as illiterate. UNESCO Institute for Statistics (<http://www.uis.unesco.org>) provides a more recent estimate of the level of education. While there are gaps in the data available, the following insights are taken for the most recent year where majority of the countries have reported the data:

- Gross enrolment ratio of pre-primary level for both sexes in 2012 is highest in Lebanon (91%), followed by Morocco (59%), and lowest in Djibouti (4%). Lebanon reports this ratio to 102% in year 2013. There is a significant gap between genders, though, with only Comoros, Lebanon, Oman, Palestine, Qatar, Syria and Tunisia reporting gender parity at pre-primary level.
- Gross enrolment ratio at primary level for both sexes, on the other hand, is around 115% in year 2013 for Lebanon, Morocco and Oman, with Oman leading at 117%. The lowest reported data is for Djibouti (68%). The gender parity is reported only by Mauritania, Morocco, Oman, Palestine, Saudi Arabia, Syria and Tunisia.
- There is a sharp decline at secondary level in 2013, with only 116% estimated for Saudi Arabia and 91% reported for Tunisia, and others well below, e.g., Palestine 82%, Lebanon 75%, Comoros 64%, and others who reported (Djibouti, Mauritania and Syria) being well below 50%. The gender parity is reported for only Comoros, Lebanon, Saudi Arabia and Syria. Djibouti reported a rather high imbalance (only 77 females for every 100 males).
- The decline continues at tertiary level, with highest gross enrolment ratio reported for both sexes in 2013 is 58% for Saudi Arabia, followed by 48% for Lebanon and 46% for Palestine. Others are rather low, with 28% reported for Kuwait, 17% for Sudan, 14% for Qatar, 10% for Comoros and only 5% for Mauritania. Gender parity is very uneven at this level, data for 2013 reporting only Lebanon and Saudi Arabia with parity.

Nature Middle East (2011) reported six million primary school-aged children in Arab world remain out of school, with majority being girls. There is therefore an acute need for new approaches to education that can revolutionize education. Increasing use of technology has started to open up new avenues and opportunities. One of the recent initiatives in this direction comes from the World Telecommunications Development Conference 2014, where a mandate to focus on smart learning in years 2015-2018 was agreed upon by Arab countries.

State of Smart Learning in Arab World

The review of various literature revealed that while the awareness about smart learning is increasing in Arab world, there are significant differences in the level of preparedness among various countries. These differences exist at both national policy and implementation level. While the true smart learning initiatives exist in very few countries, a number of countries have embarked on projects, initiatives and policy development that will help them moving forward towards smart learning in next several years. Still, it is clear that overall awareness of the benefits smart learning can bring to the citizens and proactive attempts in this regard will require a highly systematic and determined action plan for achieving any significant impact.

Smart learning initiatives

Majority of smart learning initiatives in the region are primarily government initiatives, with public-private partnership and involvement of non-governmental organizations. While some have moved forward towards implementation, others demonstrate a desire on the part of the individual countries to provide their citizens the best digital advancements can offer. Examples of smart learning initiatives below give a sense of the level of smart learning in the region.

- **Bahrain:** The Bahrain Institute of Public Administration (BIPA) has been offering free-of-charge eTraining courses as part of the national eGovernment portal services (Bahrain.bh) to provide all employees of government entities and ministries (McIlhone, 2014). These courses use the latest techniques and approaches which would help create a climate for advanced training by utilizing the most up-to-date technologies and practices within an integrated e-environment that enables employees to learn flexibility-oriented advanced concepts. BIPA was awarded the Smart Learning Best Practices Award at the award-distribution ceremony at the Smart Learning Best Practices Forum, held on October 20, 2014 in Dubai.
- **Egypt:** ICT 2020 Strategy of Egypt, which is currently being finalized, identifies building of digital society and educational system development as a priority area, with the objective of a massive and comprehensive development for the educational ecosystem by using ICT tools (MCIT, 2014). Egypt has been a pioneer in smart learning area by having Smart School Network project initiated as early as 2002 with aim to modernize Egyptian school system through the introduction of IT education and IT-aided learning in schools (UNDP, n.d.). While the intention was to cover all preparatory schools across the country, the costs associated with such extension proved to be too high. Virtualization technologies were then adopted as an innovative solution, which allowed one virtualized PC, or ultra-thin client device, to be turned into 10 independent workstations at a cost of about US\$ 50 per seat. More recently, cloud-based solutions are also being considered (UNCTAD, 2011).

- **Iraq:** University of Baghdad in Iraq announced in June 2014 a smart education initiative in the areas of medicine, engineering, science and humanities with the help of major international corporations (University of Baghdad, 2014). The aim of the initiative is to use a data center and mobile computing as the basis for smart education management. The initiative will use smart electronic control systems for educational classes and laboratories, allowing direct access to the theoretical and practical components, and laboratory experiments. The system will be able to collect and analyze students' answers in electronic exam, laboratory reports and all related data in order to evaluate individual performance of students and teachers as well as their departments and institutions.
- **Jordan:** Queen Rania's Jordan Education Initiative (JEI) has initiated a number of smart learning projects such as e-Content Deployment and Training, Interactive White Boards, Innovative Teachers Network (Bannayan et al., 2012), innovative software for enhancing students' English skills (Nasdaq, 2014). "JEI is about creating innovative e-curricula...forging connections between students miles away and cultures apart...training teachers in new, interactive methods...and understanding that we can invite the world into our classrooms, even as we broadcast ourselves to the world (JEI, 2011).
- **Kuwait:** In November 2014 an initiative from the Ministry of State for Youth Affairs was announced inviting international experts in technology-based learning and teaching to help Kuwaiti youth learn the benefits of acquiring aptitudes and skills through smart learning (KUNA, 2014). The initiative also aims to incorporate the basics of smart learning in Kuwaiti school systems. The initiative was announced at a forum, which was organized by the Ministry of State for Youth Affairs with aim to involve private and public sectors, and non-governmental organizations in charting out strategy for the promotion of smart learning in Kuwaiti schools and institutions.
- **United Arab Emirates:** In United Arab Emirates, Mohammed bin Rashid Smart Learning Programme initiative was launched in 2012 with the aim to deliver world-class educational technology solutions to the UAE education community to improve educational achievements, excellence and creativity of the students (Pennington, 2014). Specific objectives of the program included provision of technology enhanced teaching and learning environments in schools, supporting improved quality of decision-making and interventions, enabling students to improve the quality and range of their learning opportunities, enabling school principals to improve the educational effectiveness of their institutions, enabling teachers to plan, track and deliver more personalized learning and effective teaching, and enabling parents to more effectively engage in and support their child's learning (Jigsaw Consult, 2014). The initiative introduced school-issued tablet computers with stylus pens to both teachers and students which can be used not only to access electronic textbooks but also to interact with the Smart Board in the classroom. Both teachers and students can take these devices home in order to make the most use of them. Use of instant messaging system for submitting answers in the class, private messaging between a student and a teacher or shared messages with whole class, and educational applications available on the tablet that can be used offline in the comfort of students' homes makes this initiative perhaps the most advanced in the region. The initiative also promotes social learning and a social learning gateway, namely "Study Live" has been created for live discussions and messaging to encourage interaction among teachers, students and parents. This Smart Learning Programme is slated to be installed in all K-12 government school classes by 2017. An important aspect of this program is teacher training and regular support to ensure that the technology is used as effectively as expected.
- **United Arab Emirates:** The first smart university of United Arab Emirates, called Hamdan Bin Mohammed Smart University (HBMSU), was established in 2002. HBMSU emphasizes on e-learning as the future and empowerment in the region. Its mission statement focuses on providing "high quality programs using virtual learning environment, supporting the pursuit of lifelong learning, addressing critical activities of economic development in the Arab World, pioneering in e-learning, providing unique learners experience

and growing knowledge and its dissemination through excellence in research and knowledge transfer.” (HBMSU, 2015)

Initiatives helpful in moving towards smart learning

Many countries in the region are active in implementing projects and initiatives that are not necessarily smart learning, but have the potential to move the country forward towards smart learning. These initiatives have demonstrated the development of infrastructure for information and communication technologies, and provide basic services to their citizens to become familiar with digital resources. Two major areas in this category are eLearning and open education resources.

eLearning:

Egypt

- Egypt’s Global Campus initiative (<http://www.gc.com.eg/>) aims to build a global eLearning community through the intelligent utilization of the evolving distance learning state-of-the art tools and techniques (e-CoNTeNT, n.d.).
- The Arab Cyber Education (ACE) is a joint project between Egypt and the United States’ National Education Foundation to offer various ICT distance learning courses in both Arabic and English languages (<http://www.cyberlearning-arab.com/acesite/index.html>).
- Arabic Language for non-native Speakers (<http://www.arabacademy.com/>) is a commercial venture by an Egyptian firm to provide an educational portal with aim to teach Arabic language and Islam to Muslims around the world. Comprehensive learning package are offered for non-native speakers that guide them through all Arabic language levels.
- Another eLearning initiative is in the area of cinema and television, which aims to provide learning of the professional arts of direction, editing, photography, decoration, sound, production, and animation (<http://www.arabfilmtvschool.edu.eg/mainpage.asp>).
- ICT for Education has been identified as a national priority in Egypt, where Egypt Education Initiative is looking at adding value to the national education process in new and innovative ways, enhancing the creativity of teachers and students through the use of ICT, and preparing the schools and the universities for the digital age (Darwish, 2013)

Jordan

- Eduwave (<http://www.itgsolutions.com>) is a commercial instructional design, authoring and publishing environment designed by a Jordanian company for use as a country-wide electronic learning management system providing publishers, instructors, students and administrators (e-CoNTeNT, n.d.).
- SchoolArabia (<http://www.schoolarabia.net>) is another Jordanian eLearning initiative, which provides free lessons for a large number of subjects in Arabic language.

Kuwait

- In 2013, Kuwait government implemented 'e-education' plan to digitize all school textbooks and deploy e-learning in all schools.

Qatar

- As part of a series of 'e-education' initiatives, students in Qatar have been provided with personal learning devices.

Sudan

- A framework has been established for the service of eLearning, which comprises management of distance education, an authoring system, and virtual classrooms with student-instructor and student-student interaction (e-CoNTeNT, n.d.). The framework has subsequently been used to develop an asynchronous collaborative eLearning system.

United Arab Emirates

- Various digital self-learning materials have been developed under MY ICT SCHOOL initiative to teach students ICT skills in grades 1 to 9 (e-CoNTeNT, n.d.).
- e-Campus Knowledge Online @ Sharjah Colleges (ECKO) initiative has enabled communities to undertake teaching, learning, administrative and management tasks from a single common interface (<http://swcweb.hct.ac.ae>).
- Career Coach is an innovative, multimedia package, which comprises a series of personal and career development workshops tailor-made for Middle Eastern students (http://swcweb.hct.ac.ae/career_coach).

Open access resources:

- There are about fourteen academic Open Access repositories currently in existence in Arab states (UNESCO GOAP, 2014). The UNESCO Open Access Portal GOAP for Arab States is expected to cover following countries: Algeria, Bahrain, Egypt, Jordan, Kuwait, Libyan Arab Jamahiriya, Iraq, Lebanon, Malta, Morocco, Oman, Qatar, Saudi Arabia, Palestine, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, and Yemen.
- UNESCO's Digital Library "Majaliss" provides hundreds of free classical works of Arabic literature in digital format through an Internet-based modern platform.
- Yemeni Manuscript Digitization Initiative (YMDI) is, for the first time, attempting to preserve and present access to the largest and most important set of unexamined Arabic manuscripts in the world today from the private libraries of Yemen.

- The Digital Assets Repository (DAR) system at the Library of Alexandria, Egypt, aims to preserve and archive all types of media, including books, slides, negatives, manuscripts, maps, audio and video, for public access. Over 200,000 books are already available in digital format.
- The Library of Alexandria, Egypt has initiated another project, namely the Supercourse, through global partnership in order to create a digital repository of freely accessible lectures on public health and prevention. There are currently 4700 lectures in 31 languages in the collection.
- The Open Digital Space for the Mediterranean (e-Omed) project, initiated by Moroccan Virtual Campus (MVC) in 2009 aims to build open digital library using a comprehensive framework of educational resources and facilitating co-production, exchanges and localization of educational content and pedagogical practices in the region.
- Egypt based Hindawi Publishing Corporation has adopted Gold Open Access model, in the form of publishing service provider rather than content provider and publishing more than 300 Open Access journals across a range of academic disciplines.
- Bloomsbury Qatar Foundation (BQF) has launched QScience.com, a peer-reviewed online publishing platform to provide free access to the full text of its research articles under Gold Open Access model.

Analysis of survey:

A survey questionnaire was sent to the Ministries of Information Technology and the Ministries of Education of all Arab League countries, to understand their state of preparedness for smart learning, existing policy infrastructure, and future plans. Responses were received from the following Ministries:

Ministries of Information Technology: Algeria, Egypt, Iraq, Kuwait

Ministries of Education: Egypt, Iraq, Jordan, Kuwait, Morocco, Oman, Palestine, Qatar, Sudan, United Arab Emirates

Considering a serious lack of smart learning initiatives in majority of the Arab League countries, as observed during the desk research conducted for this report, the most likely reason for unresponsiveness from the rest of the countries seems to be the lack of existing initiatives and plans in near future for smart learning. Consequently, the responses received would represent the level of smart learning in the region.

Within the responses received, while some trends are evident, the level of implementation, the current state of policy development, and the priorities for various components of smart learning vary significantly. Following analysis takes a closer look at the trends and the variations.

Smart learning strategies:

Survey revealed that major emphasis in past years has been primarily on eLearning infrastructure. Majority of the efforts have concentrated on formal learning settings; informal learning is not a priority at least in next few years. A detailed analysis of the state of various smart learning strategies is as follows:

- *National digital learning materials database(s), including open education resources:* Majority of countries, including Algeria, Iraq, Kuwait, Oman, Qatar, Palestine, Sudan and UAE mentioned initiatives for national level learning materials databases currently under development. Jordan reported having no current plans

to develop such repositories. Only Egypt's Ministry of IT and Morocco's Ministry of Education reported having national level learning materials databases currently in place. Egypt's Ministry of Education, on the other hand, reported such databases under development, which suggests that while the infrastructure for such databases is already available in Egypt, the educational implementations are not yet ready.

- *National digital learning material authoring tool(s)*: While majority of countries reported plans under development for national level digital learning authoring tools, including Algeria, Iraq, Morocco, Palestine and Sudan, only Egypt, Qatar and UAE identified such tools currently in place. Jordan and Oman reported having no current plans to develop such tools. Kuwait's Ministry of Education also reported no current plans; however, Kuwait's Ministry of IT reported such initiative under development, which suggests that such initiative is currently at infrastructure level, and has not yet ready for educational applications.
- *National digital learning material evaluation tool(s)*: Majority of countries reported initiatives currently under development for national level digital learning evaluation tools. These include Egypt, Oman, Palestine, Qatar, Sudan and UAE. Only Morocco reported having such initiative already in place. Algeria, Iraq and Jordan reported having no plans for such initiative. Kuwait's Ministry of Education also reported no current plans; however, Kuwait's Ministry of IT reported such initiative under development, which suggests that such initiative is currently at infrastructure level, and has not yet ready for educational applications.
- *Online lessons in formal education schools/institutes*: None of the respondents reported not having plans for online lessons in formal education. Algeria, Egypt, Jordan, Morocco and UAE already have online lessons in classrooms, while Iraq, Oman, Qatar, Palestine and Sudan have such initiatives under development. Kuwait's Ministry of Education identified such initiative under development, while Kuwait's Ministry of IT reported such initiative already in place, which suggests that such initiative is currently at infrastructure level, and educational applications will be coming soon.
- *Online assessment in formal education schools/institutes*: Jordan and Qatar reported the use of online assessment either as already in place, while Iraq, Palestine and UAE reported it under development. Egypt's Ministry of IT reported such initiative already in place, whereas Ministry of Education identified it under development. Kuwait's Ministry of Education, on the other hand, reported it under development, while its Ministry of IT reported having no plans. This suggests that educational initiative is ahead of infrastructure in Kuwait for the uptake of online assessment approaches. Algeria, Morocco and Sudan reported having no current plans for national initiative in online assessment area in formal education.
- *Web based collaboration in education*: All respondents except Sudan reported having national level initiatives for web based collaboration in education. Egypt and Iraq's Ministries of IT identified it as currently in place, whereas Ministries of Education for both countries reported it under development. Kuwait's infrastructure for online assessment was reported as ready, while educational applications not yet planned. Among the rest, Algeria, Jordan, Morocco, Qatar and UAE identified such initiatives already in place, and Oman and Palestine are on the way.
- *Web/Mobile-based platform for smart learning*: Jordan, Qatar, Palestine and UAE reported the existence of web-based platform for smart learning. Algeria, Morocco and Oman are on the way. Only Sudan reported having no plans for such initiative. Egypt reported as having infrastructure ready with educational applications coming soon. In Iraq, the infrastructure is currently under development. In Kuwait, educational planning is underway but infrastructure is not yet planned. Only UAE reported also having national initiative for mobile platform to support smart learning. Algeria, Jordan and Sudan do not have plans for mobile access, whereas Egypt, Iraq, Kuwait, Morocco, Oman and Palestine have national level initiatives currently under development for mobile access to smart learning.

- *Web/mobile based school administration*: Other than Oman and Sudan, all other countries reported web or mobile based school administration tools either already in place (viz., Morocco, Qatar and UAE) or under development (viz., Algeria, Jordan and Palestine). In Egypt, infrastructure is already in place whereas educational applications are under development. In Iraq, infrastructure is under development but no plans yet for educational applications. In Kuwait, educational planning is underway but infrastructure is not yet planned.
- *Web/mobile based classroom apps for content access*: Majority of the countries (except Oman) reported web or mobile based classroom apps for content access either already in place or under development. Jordan, Morocco, Palestine, Qatar and UAE already have such initiatives in place at national level, whereas Algeria, Egypt, Iraq, Kuwait and Sudan reported such initiatives on the way.
- *Web/mobile based apps for parents*: Only Jordan, Morocco and UAE have web or mobile based apps for parents to get involved in their children's education. Algeria, Egypt, Kuwait, Palestine and Sudan are currently working on such initiatives. Only Oman does not have any such plans at this stage. In Iraq, infrastructure is under development but educational applications are not yet planned.
- *Mobile devices in classrooms*: More countries reported having plans for high-end devices than for low-end devices. Jordan and Egypt already have low-end mobile devices being used in classroom. While Egypt is working for moving towards high-end devices, Jordan has no such plans. Morocco and UAE both have high-end devices in the classroom, and UAE has no plans towards supporting low-end devices. Iraq, Oman, Palestine and Sudan are working towards supporting both high and low-end devices. While Kuwait does not have any plans for low-end devices, it is working on the national initiative for bringing high-end devices in the classrooms.
- *Networks in schools*: Respondents were asked about the state for national level initiatives to provide wireless local area networks (WLAN) and voice over Internet protocols (VoIP) in schools. Egypt, Iraq, Jordan, Oman and UAE reported having national initiatives for WLAN in schools, with Iraq's Ministry of Education currently working on the implementation. Only Kuwait's Ministry of IT reported having no plans for the WLAN infrastructure; however, planning is underway as per Kuwait's Ministry of Education. In contrast, no country reported having any national initiatives in place for VoIP. Algeria, Egypt, Iraq and UAE have plans currently under development, while other countries have no such plans yet.
- *Robot-aided learning initiatives*: Use of robots in learning is not a high priority for majority of the countries. Only Jordan and Oman have national level initiatives for robot-aided learning in place. Egypt, Kuwait and Palestine are on the way. Algeria, Iraq, Morocco, Sudan and UAE do not have such plans at national level.
- *Cloud computing initiatives in learning/ education*: Cloud computing is an emerging technology that uses distributed servers and software networks to provide wider access to centralized data. Majority of the respondents, including Egypt, Iraq, Jordan, Kuwait, Morocco and Palestine reported that efforts to bring cloud technologies in education are currently under implement. Only UAE already has such national level initiative. Algeria, Oman and Sudan do not have any current plans to bring cloud to education at national level.
- *Learning analytics initiatives in formal education schools/institutes*: Learning analytics enables discovery, extraction, analysis and reporting of data about the learners for better understanding of learning processes and identifying meaningful patterns that can provide insights to the state of instruction at various levels, ranging from classrooms and schools to regional and national levels. No country reported having national level initiatives in this area. However, a number of countries, including Egypt, Iraq, Kuwait, Morocco, Palestine and Sudan reported national initiatives currently under development. Algeria, Jordan, Oman and UAE do not have such plans at this time.

- *Use of "Big data" technologies in education:* Big data refers to very large and complex data sets where typical data analysis and processing approaches do not work. With exponential increase in the use of multimedia in education, the amount of data available for learning analytics is slowly reaching towards Big data threshold. While only Kuwait reported having national initiatives for the use of Big data technologies in education, a large number of respondents, such as Egypt, Iraq, Jordan, Morocco, Oman, Palestine and UAE have such initiatives currently under development. Only Algeria and Sudan do not have any plans for such initiatives at the moment.
- *Smart Learning Management System(s):* Egypt, Jordan and UAE reported having national level initiatives for smart learning management systems already in place. Algeria, Iraq, Kuwait, Morocco, Oman and Palestine have such initiative under development. Sudan reported not having any plans for such initiatives at the moment. This aligns with the fact that Sudan also does not have any national level initiatives for web or mobile platforms for smart learning.
- *Programmes to develop smart schools and smart cities:* While all respondents reported national level initiatives to develop smart schools either in existence or under development, majority of the countries do not have similar plans when it comes to develop smart cities. Only Iraq, Morocco, Sudan and UAE have national level initiatives currently underway for developing smart cities. Regarding smart schools, Egypt and UAE already have national initiatives, while Algeria, Iraq, Jordan, Kuwait, Morocco, Oman, Palestine and Sudan have such initiatives under development.
- *National strategy for smart learning:* All respondents reported plans for national strategy for smart learning. Egypt, Jordan, Kuwait and UAE already have such strategies in existence. Algeria, Iraq, Morocco, Oman, Palestine and Sudan are currently working on it.
- *Province level strategies for smart learning:* In contrast to national level strategies for smart learning, not every country is looking towards having such strategies at provincial level. Only Egypt, Jordan and UAE have such provincial strategies for smart learning already in place. Algeria, Egypt, Iraq, and Morocco are currently working on such provincial initiatives. Kuwait, Oman, Palestine and Sudan have no plans in this area.
- *Institutions/bodies level strategies for smart learning:* Even less number of countries are active towards institution level strategies for smart learning. Only Jordan and UAE have such strategies in place. Iraq, Morocco, Palestine and Sudan are currently working on it. On the other hand, Algeria, Egypt, Kuwait and Oman have no plans for developing institution level strategies for smart learning.
- *Empirical studies to assess impact of smart learning:* The impact of smart learning is on the radar for many countries. Egypt, Iraq, Jordan, Kuwait, Morocco and UAE already have national level initiatives to assess impact of smart learning. Palestine is working on it. Algeria, Oman and Sudan do not have any plans for such studies at the moment.
- *National level smart learning pilot project(s):* All respondents expect Sudan reported having national level smart learning pilot projects either in place or under development. Egypt, Iraq and UAE already have such projects, while Algeria, Jordan, Kuwait, Morocco, Oman, and Palestine are working to start such projects at national level.
- *Smart learning societies/ NGOs/ clubs:* Majority of countries reported having no current plans for national level smart learning societies, NGOs or clubs. Only Morocco has such entities in existence and Iraq, Jordan and Kuwait are working on it. Algeria, Egypt, Oman, Palestine, Sudan and UAE have no current plans.
- *Reference to smart learning in other strategies/plans:* Egypt, Jordan, Morocco and UAE reported that smart learning is already referred in other national strategies or plans. Iraq, Kuwait, Palestine and Sudan expect such reference in near future. Only Algeria and Oman do not have such plans.

In summary, there are strategies already in place in many countries for online lessons and assessment in schools, web-based tools and platforms for enhancing educational experience, with collaboration identified as a key component. Implementation of wireless infrastructure in schools has also been a priority area in several countries.

There are several areas where efforts are currently underway, which would help countries move forward in the realm of smart learning. Digital content development is one such area that is seeing efforts underway for content repositories, authoring tools for digital content development and evaluation tools for assessing quality of the developed content.

More advance web-based tools for improving classroom education and school administration is also current priority for some countries. There seems to be a greater recognition towards involving various stakeholders in education process, including parents. While informal learning is not a priority, access to digital content outside of the classroom within the context of formal education is also on the radar.

Survey also revealed emphasis on newer technologies and methodologies, such as Big Data and cloud computing. Several countries also reported national level smart learning pilot projects; however, desk research suggests that these are isolated initiatives which have not yet materialized into large implementations. This also aligns with the feedback received in the survey that smart learning as such is not yet a priority for most of the countries. Several respondents in the survey identified no current plans to develop and materialize smart learning related strategies, programmes and implementations.

- Various initiatives reported by different countries are as follows:
 - *Algeria*: The National Center for the Integration of Educational Innovation and Development of Information Technology and Communication in Education (CNIIPDTICE) <http://www.cniipdtice.dz/>
 - *Algeria*: *ENCY-Education*: <http://www.ency-education.com/>
 - *Algeria*: DIRAASSATIC Gestion des écoles (private school): <http://dirassatic.info/>
 - *Algeria*: Strategic plan for the management of Algiers (2010-2029) includes smart city project.
 - *Egypt*: Ministry of Education Portal, I-book authoring tool
 - *Iraq*: Advance and modern screens for lectures
 - *Jordan*: ICT strategy has been developed for the Ministry of Education for 2014-2017. ICT strategic plan also refers to smart learning (e-learning).
 - *Kuwait*: Since 2001, Kuwait has been developing the technological infrastructure of the educational institutions by working on the components of Sheikh Sabah Al-Ahmed Al-Sabah's national e-learning project. This supports the initiatives of the Ministry of Education in the development of technological projects, including building a central data center for the ministry, which is considered one of the largest databases in the Gulf area in terms of its facilities; it is designed to serve the educational process and link each primary education institutions (schools, educational areas and departments) through a fiber-optic project.

- *Kuwait:* Regarding the national strategy for smart learning, the Ministry of Education has developed the National Strategy for the infusing of ICT in the educational process since 2008; a strategy that is now subject to review and development by qualified national people with the benefits from the experiences of others in this regard. The national strategy contains all e-learning projects (smart learning) to develop infrastructure and technological requirements for education and guidance, as well as the construction of the national educational e-content in an appropriate manner to achieve the goal of smart learning.
- *Kuwait:* With regard to the experimental studies to assess the reality of smart learning (employing technology in the educational process), the Ministry of Education is seeking continuously to conduct evaluation studies for the educational system (through academic studies published in scientific journals) and also with the aid of foreign expertise represented by the World Bank and academic institutions. In 2013, the study of the reality of e-learning (smart Learning) has been conducted in collaboration with the British Council. The most important recommendations of that study are unifying the efforts, highlighting the importance of adopting a strategy for the training of teaching staff and learners, and modernizing the infrastructure to cope with the rapid evolution of the technology. Consequently, the committee has been established to review the national strategy, and the ministry has kept eyes on the efforts to modernize the infrastructure and the projects related to e-learning (smart learning), and begun to support initiatives and provide awards for outstanding teachers.
- *Morocco:* <http://www.taalmice.ma/>
- *Oman:* Online learning was started in the Ministry of Education long ago but not as a complete project for learning. It was initiated to expose teachers to online environments. There are positive collaborations with Microsoft and Intel for empowering teachers and students with ICT skills.
- *Palestine:* Program for infusing ICT in learning design, Curriculum Centre portal and Palestinian educational portal
- *Qatar:* A number of projects have been developed within the e-learning program such as learning management system that covers all independent schools in Qatar, electronic bag project that completed its first phase, digital library project, digital content, assessment project that stated with the assessment of prospective educators, in addition to several electronic services.

21st century competency development:

As one of the outcomes of smart learning, development of 21st century skills in students is gaining significant interest worldwide. These skills, that include “a broad set of knowledge, skills, work habits, and character traits that are believed—by educators, school reformers, college professors, employers, and others—to be critically important to success in today’s world, particularly in collegiate programs and contemporary careers and workplaces.” (Edglossary, 2015). Survey asked respondents to identify priorities towards various dimensions of 21st century skills.

Critical Thinking, Problem Solving and Decision Making:

- Students are able to review, analyze and assess information from variety of sources and points of view.
- Students are able to use application, analysis, evaluation and conceptualization as appropriate for the context.
- Students are able to solve simple to complex problems, including novel to ill-defined ones.
- Students are able to use variety of resources in problem solving and make decisions

Egypt and Palestine selected critical thinking skills as the highest priority, whereas Kuwait identified it as second most important, just after social, cultural, global and environmental responsibility. Qatar, Jordan and UAE ranked it at third place, whereas Iraq and Sudan placed it at fourth.

Creativity and Innovation

- Students are optimistic, curious and open to new and diverse ideas.
- Students are appreciative of creative works of others and value aesthetic expressions.
- Students are able to demonstrate initiative, imagination, spontaneity and ingenuity.
- Students are able to generate original ideas and recognize one

Creativity and innovation was identified by Egypt and UAE as one of the top priorities. Iraq and Palestine placed it at second rank, Sudan at third, and Jordan, Kuwait and Qatar ranked it at fourth place.

Social, Cultural, Global and Environmental Responsibility

- Students behave responsibly and contribute positively to the quality and sustainability of environment, communities and society.
- Students are able to appreciate social, cultural, economic and environmental interconnectedness and diversity.
- Students are able to demonstrate stewardship, and respect the rights and beliefs of others.

Kuwait identified social, cultural, global and environmental responsibility as its top priority. Jordan, UAE and Sudan ranked it at second, third and fourth place respectively. Egypt and Palestine ranked it at fourth place whereas Iraq and Qatar identified it at fifth priority.

Communication

- Students are able to understand and interpret the thoughts, ideas and emotions of others and express themselves clearly and effectively.
- Students are able to use a variety of verbal and nonverbal modes to communicate with people from diverse cultural backgrounds.

Iraq identified communication as one of the top priorities, followed by Egypt and UAE ranking it at second place. Sudan identified it as third place. Egypt and Palestine ranked it at fourth place, whereas Qatar and Jordan put it at fifth and sixth place respectively.

Digital and Technological Fluency

- Students are able to competently use information and communication technologies in a variety of digital environments and media.
- Students are able to access, understand and manipulate digital information creatively and effectively.

Digital and technological fluency was Jordan's top priority, and Qatar's second topmost. Egypt and Iraq identified it at third place. Morocco, Sudan and UAE ranked it at fourth place, whereas Kuwait identified it at fifth. For Palestine, it was the last priority.

Lifelong Learning, Personal Management and Well-Being

- Students understand learning as a lifelong endeavour.
- Students are able to manage various roles in life, and balance school, work, family and other priorities.
- Students are able to take ownership of and responsibility for emotional, intellectual, physical, spiritual and social well-being.

No country identified lifelong learning, personal management and well-being as first or second priority. Kuwait and UAE ranked it at third place, Sudan at fourth place, Egypt at fifth place, and Palestine at sixth place. For Qatar, Iraq and Jordan, it was the last priority.

Collaboration and Leadership

- Students are able to build respectful, caring and effective relationships to manage conflict and differences.
- Students are able to seek consensus towards common goals.
- Students are able to work with others in team situation to influence, motivate and mentor everyone.
- Students are able to demonstrate leadership in personal life and in community.

Collaboration and leadership was identified by Qatar and UAE as one of the top priorities. Palestine ranked it at third place, whereas Kuwait and Sudan placed it at fourth. Jordan and Iraq identified it at fifth place. For Egypt, it was the last priority.

While no clear trends emerged for any particular skills, digital and technological fluency, and critical thinking and problem solving and decision making skills were identified as higher priority by many respondents compared to lifelong learning, personal management and well-being, collaboration and leadership, and social, cultural, global and environmental responsibility. Communication, and creativity and innovation received middle ratings from several respondents.

Human capacity development:

Survey revealed that while training programs for technology leadership have received attention in some countries, many others identify them to be future activities. Similar responses were received for training of teachers, principals and senior administrators. Majority of the respondents also identified training programmes to build teachers competencies in smart learning also as a future activity. It is clear from the survey that existing efforts in human capacity development are primarily concentrated at national level and have not spread to regional sectors.

Specific responses for various dimensions of human capacity development are as follows:

- *Technology leadership training programs for teachers:* Algeria, Egypt, Jordan, Kuwait, Qatar, Palestine, Sudan and UAE already have national level initiatives for technology leadership training programs for teachers. Examples include Egypt's Intel Teach, Microsoft ITN, IBM E-Content Dev., ICDL, Thinkquest, Microsoft Academy, Cisco Academy, Oracle Academy, ICT Leadership and Citizenship programs. Qatar has initiated e-learning training for teachers in LMS project & 1:1 project. They are also working with ISTE organization for technology education standard training. Palestine has initiated Active class, Wlar and Intel initiatives. Iraq and Oman have plans for national level initiatives in near future. Kuwait has several initiatives, such as training program in cooperation with the Arab Bureau of Education (technological skills for leaders), computer literacy program for teachers, and a number of programs and courses related to technological skills and smart learning. Egypt, Iraq and Kuwait also have regional level initiatives for teacher training in technology leadership.

- *Technology leadership training programs for principals:* For principals, Algeria, Egypt, Iraq, Kuwait, Palestine, Qatar, Sudan and UAE have existing national level initiatives for technology leadership training. For example, several national and external training programs have been created in Kuwait within the project of school administrations, as well as a variety of training programs for technological leadership targeting school administrators. Qatar has implemented change management workshops. Jordan and Oman are expecting similar initiatives in near future. Egypt, Kuwait and Qatar also have regional initiative for technology leadership training for principals.
- *Technology leadership training programs for senior education administrators:* Algeria, Egypt, Qatar, Sudan and UAE also have national level training initiatives for technology leadership for senior education administrators. Kuwait has several national and external training programs for technological leadership, targeting educational leaders. Similar initiatives are planned for near future in Iraq, Jordan, Oman and Palestine. Iraq, Kuwait and Qatar also have similar initiatives at regional level.
- *Programmes to build teachers' competencies to lead smart learning (smart teachers):* Many countries, including Egypt, Iraq, Jordan, Kuwait, Qatar, Sudan and UAE have national initiatives to build teachers' competencies for transition towards smart teachers. In Kuwait, various training and awareness campaigns have been initiated within the national project for the awareness of e-learning. They have also instituted teacher electronic certification and guide electronic certification. Algeria, Oman and Palestine expect to have such national initiatives in near future. Egypt and Qatar also have similar initiatives at regional level.

Priorities towards smart learning:

Respondents identified several features of smart learning as urgent priority, including virtual learning, online learning in formal education, blended learning, and mobile learning. Informal learning was seen as low priority by majority of respondents. Collaborative learning and game based learning received middle ranking, while the responses to virtual and augmented reality were mixed.

Specific responses for various features of smart learning are as follows:

- *Informal learning:* Only Sudan identified informal learning as urgent priority. For Egypt, Iraq, Palestine and UAE, it was intermediate priority. Algeria, Jordan, Kuwait, Oman and Qatar identified informal learning as low priority.
- *Virtual learning:* Majority of countries identified virtual learning as urgent priority (Algeria, Egypt, Iraq, Jordan, Oman, Sudan and UAE) or intermediate priority (Qatar and Palestine). Only Kuwait identified virtual learning as low priority.
- *Online learning in formal education:* Majority of the countries identified online learning in formal education as urgent priority. These include Algeria, Egypt, Iraq, Jordan, Kuwait, Oman, Palestine and Qatar. Sudan identified it as intermediate priority whereas UAE identified it as low priority. Since there are already many smart learning initiatives in UAE, typical online learning is not seen as important any more.
- *Blended learning:* There was greater recognition of blended learning as urgent priority by many countries, including Egypt, Iraq, Jordan, Kuwait, Qatar and Palestine. Oman, Sudan and UAE identified it as intermediate priority. Only Algeria ranked it as low priority.
- *Mobile learning:* Egypt Iraq, Jordan, Kuwait and Palestine identified mobile learning as urgent priority. For Algeria, Qatar and Sudan, it was intermediate priority. Oman and UAE identified it as low priority.
- *Collaborative learning:* All respondents identified collaborative learning as either urgent or intermediate priority. None identified it as low or no priority. Iraq, Jordan, Kuwait, Palestine, Qatar and UAE identified

collaborative learning as urgent priority whereas Algeria, Egypt and Sudan ranked it as intermediate priority.

- *Game based learning*: Except Algeria, which identified game based learning as low priority, all other respondents ranked it as urgent or intermediate priority. In particular, Egypt, Iraq, Jordan, Kuwait and Palestine identified it as urgent priority, whereas Qatar, Sudan and UAE identified it as intermediate priority.
- *Virtual and augmented reality*: Only Egypt, Jordan and Palestine identified virtual and augmented reality as urgent priority. Iraq, Kuwait, Sudan and UAE ranked it as intermediate priority, whereas Algeria and Qatar identified it as low priority.

Policy:

Respondents were asked whether their countries have any existing policies or are in the process of developing policies in various aspects related to smart learning, such as data privacy, accessibility, 21st century competencies, open education resources, mobile devices and social media in education, teacher innovation, and teacher training. Majority of respondents identified that they either already had such policies or were in the process of developing them. This is a strong indication of awareness of the need for smart learning in these countries.

Specific responses to various types of policies are as follows:

- *Data privacy*: Egypt, Iraq, Jordan and Kuwait have existing national level policies for data privacy. Qatar, Palestine, Sudan and UAE, on the other hand, are in the process of policy development.
- *Accessibility for learners with disabilities*: Only Algeria, Egypt and Jordan have existing national level policies for accessibility for learners with disabilities. All other countries, namely Iraq, Kuwait, Palestine, Qatar, Sudan and UAE are in the process of development.
- *Development of 21st century competencies in learners*: Algeria, Egypt, Jordan and Palestine already have national policies in place for the development of 21st century competencies in learners. Iraq, Kuwait, Qatar, Sudan and UAE are in the process of developing such policy.
- *Development of open education resources*: Egypt, Jordan, Oman and Sudan have national policy in place for the development of open education resources, whereas Iraq, Kuwait, Palestine, Qatar and UAE are in the process of developing such policy.
- *Use of mobile devices in classrooms*: Except Algeria, Iraq and Sudan, which are in the process of developing national policy for the use of mobile devices in classrooms, all other countries, namely Egypt, Jordan, Kuwait, Oman, Qatar, Palestine and UAE already have such national level policy in place.
- *Use of social media in education*: Egypt, Iraq, Jordan, Palestine, Qatar and UAE have existing national policy for the use of social media in education. Kuwait, Oman and Sudan, on the other hand, currently developing such policy.
- *Ability for teachers to innovate in educational process*: Egypt, Iraq, Jordan and Kuwait reported that they have existing national level policy in place for ensuring the ability for teachers to innovate in educational process. Algeria, Oman, Palestine, Qatar, Sudan and UAE are in the process of developing such policy.
- *Technology training for teachers*: All countries except Sudan reported that they already have existing national level policy in place for technology training for teachers. These include Algeria, Egypt, Iraq, Jordan, Kuwait, Oman, Palestine, Qatar and UAE. Sudan is in the process of developing such policy.

Learner-centred initiatives:

Several respondents identified that there were at least some programmes in place to promote gifted learner as well as supporting learners with disabilities. There was also recognition for the need of alternative assessment approaches, such as portfolio based assessment, project based assessment and continuous assessment, which emphasize competency development rather than assessing rote learning. The area that was identified as receiving the least attention was personalized learning.

Specific responses for various learner-centred initiatives are as follows:

- *Gifted learners*: Algeria, Egypt, Iraq, Jordan, Kuwait, Oman, Palestine and Sudan already have initiatives implemented for gifted learners. For example, Algeria has initiated a national secondary program for gifted students in mathematics in the capital Algiers. Egypt has several programs for gifted learners, such as Oracle Academy, JDP, Cisco Academy, and Thinkquest. Iraq has special schools for gifted learners and have also implemented various scholarships for such students. Jordan has initiatives for robots projects related scientific research prize. Kuwait has implemented programs for gifted learners in collaboration with Sabah Al-Ahmed Center for Giftedness and Creativity. There are also special classes established as a result of this cooperation. There are also schools for gifted learners in Oman, such as King Abdullah for excellence. They have also initiated Intel prize for science and engineering/scientific research. Oman has initiatives involving students in competitions on robotics and Intel prize for science. Qatar is planning such initiatives in the form of Qatar gifted learners center. Palestine has accelerated program for talented students.
- *Learners with disabilities*: Algeria, Egypt, Jordan, Kuwait, Palestine and Qatar have already implemented initiatives for learners with disabilities. For example, Algeria has multi-sector policy for children solidarity with special needs. In Egypt, in collaboration with the Ministry of Communications through the initiative of social responsibility, various projects have been initiated for learners with disability. Jordan has initiated both public and private schools for children with disabilities. They also have Higher Council for affairs of persons with disabilities. Kuwait has a variety of programs for students with learning difficulties, as well as students with disabilities through special education sector. In Qatar, there is a private office in SEC regarding students with disabilities, in cooperation with MADA. Iraq is in the process of exploring and Sudan is currently planning such initiatives. Palestine has implemented inclusive education program.
- *Personalized learning*: Only Qatar and Sudan have implementations in progress for personalized learning. For example, two virtual schools are under construction in Qatar for personalized learning under e-learning initiative. Palestine has implemented Active class. Iraq is in the process of exploring various options.
- *Alternative assessment methods, such as portfolio based assessment, project based assessment and continuous assessment*: Majority of the countries have either implemented or currently in the process of implementing alternative assessment methods. Egypt, Jordan, Palestine and Qatar have already implemented such initiatives. For example, Egypt has initiated Student Response System. Jordan has assessment strategies and modern assessment tools, such as portfolio and learner's profile. They have also implemented manual and digital self-assessment. In Qatar, continuous assessment takes place in kindergarten and grades 1 and 2. Project based learning is also implemented and part of students assessment is for project. In Palestine, integration of learning projects is implemented as a strategy in teaching. Teachers also adopt alternative assessment tools in student assessment. In Kuwait, assessment portfolio was applied in 2013 in the primary school sector but was cancelled due to the shortcomings in the application. Tests for self-assessment are available for learners in the form of working papers or previous tests. A project of question bank for self-assessment is being developed. They are also developing

a project of electronic testing for workers and progressive supervisory jobs. Iraq, Kuwait, Oman and Sudan are in the process. Algeria is currently exploring various options.

Potential outputs over next four years to meet the demands of Smart Learning in the region

Based on the desk research and the analysis of survey findings, several potential outputs have been identified to meet the demands of smart learning in the Arab region:

- *Policy development:* While some countries in the region have identified smart learning as the vehicle for future generation's success, there is a significant need for improving awareness for smart learning in large parts of Arab region. Both top-down and bottom-up approaches are needed to rectify the situation. Following outputs are recommended to increase awareness and demonstrating the benefits that smart learning can bring to the region:
 - Policy development workshops should be conducted for senior ministry officials of those countries that do not have yet started policy development in smart learning related areas. These workshops could be facilitated by policy experts from those countries that have appropriate policies in place and have already engaged in the implementation of those policies through projects and other initiatives. Sharing of sample policy documents from such countries would also be very helpful in those workshops.
 - Regional workshops should be conducted for school administrators and local government officials in the countries where no infrastructure has been identified even for facilitating typical online learning. Demonstration of best practices from other parts of Arab world will help to increase understanding of the benefits of smart learning.
- *Content:* Easy access to high quality content is crucial for the success of smart learning. However, it is also important that the content is relevant and meaningful to the learners. Therefore, initiatives to develop high quality content locally in Arabic language and to localize high quality content from outside are recommended. While major digital content repositories help in easy dissemination of content, it is important to recognize the value of local activities for the development of content, particularly in those regions where awareness of smart learning is low. Such approach will not only receive buy-in from the region but will also create an inclusive environment where local stakeholders are involved in the smart learning initiatives.
- *Mobile access:* With the proliferation of mobile devices, it is important to not only ensure the availability of content on these devices but also exploit the benefits such devices bring, such as location adaptation, improved interactivity, and contextualization, to name a few. It is recommended to create initiatives that support development of mobile apps in different parts of Arab region.
- *Intellectual capacity building:* Programs for joint research and innovation in smart learning with teams consisting of experts and researchers from regions with high awareness and involvements in smart learning as well as regions yet to embrace smart learning will not only facilitate knowledge and technology transfer but will also create opportunities for faster proliferation of smart learning in all regions.
- *Smart classroom infrastructure:* Focus needs to be given on development of all three levels of technical infrastructure needed for successful implementation of smart classrooms: (1) classroom level, which

includes connectivity for in-class interactions on mobile devices, smart boards, devices and apps for classroom management, etc. (2) institutional level, which includes server infrastructure, content management systems, multimedia editing tools (preferably separate studios), analytics tools, etc. (3) regional level, which includes high bandwidth connectivity infrastructure, regional repositories, regional level data collection and analysis mechanism, backup sites, etc.

- *Analytics approaches*: A cornerstone of smart learning is competency based instruction and assessment, supported by emerging approaches for analytics at various levels. These include technologies for data collection from different sources, analytics tools for synthesis, and just-in-time reporting tools with appropriate levels of abstractions for different users, ranging from students and teachers, to senior bureaucrats and ministries involved in creating and implementing policies.
- *Training infrastructure*: For successful and sustained implementation and use of various technological initiatives in smart learning, a top-down training infrastructure, with pyramid-like train-the-trainer approach should be considered, with focus on developing bottom-up learning communities in local environments and communities of practice at regional levels.

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Appendix - Survey Questionnaire

Smart Learning Readiness and Future Plans

الوضع الحالي والخطط المستقبلية للتعليم الذكي

- This questionnaire survey is being conducted to assess the status of Smart Learning in the Arab countries as a first step to implement the newly adopted Regional Initiative on Smart Learning adopted by the ITU World Telecommunication Development Conference 2014. These regional initiatives are designed to prioritize specific issues such as Smart Learning for the ITU to focus on in the coming four years in this case 2015-2018. This questionnaire is developed in collaboration with ALECSO and is addressed to both Ministries of ICT and Ministries of Education in the countries of the Arab region.
- يهدف هذا الاستبيان لتقييم وضع التعلم الذكي في الدول العربية كخطوة أولى لتنفيذ المبادرة الإقليمية الحديثة للتعلم الذكي التي اعتمدها المؤتمر العالمي لتنمية الاتصالات (ITU 2014). وتهدف هذه المبادرات الإقليمية لتحديد أولويات قضايا محددة للاتحاد الدولي للاتصالات مثل التعلم الذكي للتركيز عليها في السنوات الأربع القادمة (في هذه الحالة خلال الفترة من 2015 إلى 2018). تم تطوير هذا الاستبيان بالتعاون مع الألكسو والموجه إلى كل من وزارات الاتصالات وتكنولوجيا المعلومات ووزارات التعليم في دول المنطقة العربية.
- Through this questionnaire, a general overview of the status of Smart Learning will be developed and used as a basis to plan for activities in the coming four years. Moreover, a regional workshop will be organized in the first quarter of 2015 to present the analysis of this survey and suggest the outputs and activities planned for the coming four years by the ITU in this Regional Initiative.
- سوف يسهم هذا الاستبيان في وضع لمحة عامة عن وضعية التعلم الذكي و التي سيتم استخدامها كأساس للتخطيط للأنشطة خلال السنوات الأربع القادمة. وعلاوة على ذلك، سيتم تنظيم ورشة عمل إقليمية في الربع الأول من عام 2015 لعرض التحليلات الخاصة بهذه الدراسة واقتراح مخطط الأنشطة للسنوات الأربع المقبلة لهذه المبادرة الإقليمية من قبل الاتحاد الدولي للاتصالات.

- Inputs to the questionnaire from Ministries of Education should be sent to kinshuk@ieee.org with a copy to koutheair@alecso.org.
- برجاء ارسال المساهمات على الاستبيان من قبل وزارات التعليم إلى : kinshuk@ieee.org مع نسخة إلى koutheair@alecso.org.
- Inputs to the questionnaire from Ministries of Communications and Information Technology should be sent to kinshuk@ieee.org with a copy to karim.abdelghani@itu.int.
- أما بالنسبة إلى وزارات الاتصالات وتكنولوجيا المعلومات فالرجاء ارسال المساهمات على الاستبيان إلى : kinshuk@ieee.org مع نسخة إلى : karim.abdelghani@itu.int.
- The deadline to submit these questionnaires is November 10, 2014. Please complete the survey in English as much as possible. Please respond in Arabic only if it is not possible to respond to any particular question in English.
- علماً بأن الموعد النهائي لتقديم هذه الاستبيانات هو 10 نوفمبر 2014. يرجى استكمال الاستطلاع باللغة الإنجليزية قدر الإمكان و استخدام اللغة العربية فقط إذا كان من غير الممكن الرد على سؤال معين باللغة الإنجليزية.
- For further inquiries please contact Mr. Karim Abdelghani, Programme Coordinator, ITU Arab Regional Office: karim.abdelghani@itu.int.
- لمزيد من الاستفسارات يرجى الاتصال بالسيد / كريم عبد الغني، منسق البرنامج، المكتب الإقليمي العربي للاتحاد الدولي للاتصالات: karim.abdelghani@itu.int.

Country:	الدولة
Ministry:	الوزارة
Contact person's name for smart learning in your ministry:	اسم الشخص المسؤول عن التعلم الذكي في وزارتك
Contact person's email address:	البريد الإلكتروني للشخص المسؤول
Contact person's postal address:	العنوان البريدي للشخص المسؤول

Section 1: Smart Learning Strategies:

Kindly indicate the **current status** of each of the following items, whether already developed, currently in development phase, or no current plans to develop, focusing **ONLY** on smart learning (**Applications related to learning** not just availability of hardware or software)

القسم الأول: استراتيجيات التعلم الذكية

يرجى توضيح **الوضع الحالي** لكل من العناصر التالية، سواء طورت بالفعل ، أو حالياً في مرحلة التطوير، أو لا خطط حالية للتطوير، مع التركيز **فقط** على التعلم الذكي (**تطبيقات تتعلق بالتعلم** وليس فقط بتوافر الأجهزة أو البرامج)

S. م.	Item عنصر	Currently in Place (developed) طورت بالفعل	Under development في مرحلة التطوير	No current plans to develop (materialize) لا خطط حالية للتطوير
1.	National digital learning materials database(s) [including open education resources] قاعدة (قواعد) بيانات وطنية رقمية للمواد التعليمية [بما في ذلك الموارد التعليمية المفتوحة]			
2.	National digital learning material authoring tool(s) أداة (أدوات) وطنية لتأليف المواد التعليمية الرقمية			

S. م.	Item عنصر	Currently in Place (developed) طورت بالفعل	Under development في مرحلة التطوير	No current plans to develop (materialize) لا خطط حالية للتطوير
3.	National digital learning material evaluation tool(s) أداة (أدوات) وطنية لتقييم المواد التعليمية الرقمية			
4.	Online lessons in formal education schools/institutes دروس عبر الإنترنت للتعليم الرسمي في المدارس / المعاهد			
5.	Online assessment in formal education schools/institutes تقييم عبر الإنترنت للتعليم الرسمي في المدارس / المعاهد			
6.	Web based collaboration in education التعاون في التعليم على شبكة الإنترنت			
7.	Web-based platform for smart learning إطار للتعليم الذكي على شبكة الإنترنت			
8.	Web/mobile based school administration إدارة المدارس عبر شبكة الإنترنت / المحمول			

S. م.	Item عنصر	Currently in Place (developed) طورت بالفعل	Under development في مرحلة التطوير	No current plans to develop (materialize) لا خطط حالية للتطوير
9.	Web/mobile based classroom apps for content access تطبيقات الوصول إلى المحتوى للفصول الدراسية عبر شبكة الإنترنت / المحمول			
10.	Web/mobile based apps for parents تطبيقات للآباء عبر شبكة الإنترنت / المحمول			
11.	High-end mobile devices in classrooms أجهزة محمولة متقدمة في الفصول الدراسية			
12.	Low-end mobile devices in classrooms أجهزة محمولة بدائية في الفصول الدراسية			
13.	Wireless local area networks (WLAN) in schools الشبكات المحلية اللاسلكية (WLAN) في المدارس			
14.	Voice over Internet Protocol (VoIP) in schools الصوت عبر بروتوكول الإنترنت (VoIP) في المدارس			

S. م.	Item عنصر	Currently in Place (developed) طورت بالفعل	Under development في مرحلة التطوير	No current plans to develop (materialize) لا خطط حالية للتطوير
15.	Mobile-based platform(s) for smart learning إطار (إطارات) للتعليم الذكي عبر المحمول			
16.	Robot-aided learning initiatives مبادرات التعلم بمساعدة الروبوت			
17.	Cloud computing initiatives in learning/ education مبادرات الحوسبة السحابية في التعلم / التعليم			
18.	Learning analytics initiatives in formal education schools/institutes مبادرات تحليلات التعلم للتعليم الرسمي في المدارس / المعاهد			
19.	Use of "Big data" technologies in education استخدام تقنيات "البيانات الكبيرة" في التعليم			
20.	Smart Learning Management System(s) نظام (أنظمة) إدارة التعلم الذكي			
21.	Programmes to develop smart schools			

S. م.	Item عنصر	Currently in Place (developed) طورت بالفعل	Under development في مرحلة التطوير	No current plans to develop (materialize) لا خطط حالية للتطوير
	برامج لتطوير مدارس ذكية			
22.	Programmes to develop smart cities برامج لتطوير مدن ذكية			
23.	National strategy for smart learning استراتيجية وطنية للتعليم الذكي			
24.	Province level strategies for smart learning استراتيجيات للتعليم الذكي علي مستوى الأقاليم			
25.	Institutions/bodies level strategies for smart learning استراتيجيات للتعليم الذكي علي مستوى المؤسسات / الهيئات			
26.	Empirical studies to assess impact of smart learning دراسات تجريبية لتقييم وقع التعلم الذكي			
27.	National level smart learning pilot project(s) مشاريع أسترشادية للتعليم الذكي على الصعيد الوطني			

S. م.	Item عنصر	Currently in Place (developed) طورت بالفعل	Under development في مرحلة التطوير	No current plans to develop (materialize) لا خطط حالية للتطوير
28.	Smart learning societies/ NGOs/ clubs مجتمعات /منظمات غير الحكومية / أندية للتعليم الذكي			
29.	Reference to smart learning in other strategies/plans إشارة إلى التعلم الذكي في غيرها من الاستراتيجيات / الخطط			

Please give references, or summary, for more details on the items checked as “Currently in Place” (please use additional sheets, if needed.):

يرجى إعطاء مراجع ، أو ملخص ، لمزيد من التفاصيل عن العناصر المحددة بأنها " طورت بالفعل " (يرجى استخدام أوراق إضافية إذا لزم الأمر):

Section 2: 21st century competency development:

Going forward, how would you rank the priorities for various 21st century competencies in the children of your nation (please rank from 1 to 7, using each number only once, where 1 is highest and 7 is lowest)?

القسم الثاني: تطوير كفاءات القرن 21

للمضي قدما، يرجى ترتيب أولويات اكتساب مختلف كفاءات القرن 21 لأبناء بلدك (رتب من 1 إلى 7، وذلك باستخدام كل رقم مرة واحدة فقط، حيث 1 هو الأعلى و7 هو الأدنى)؟

Competency الكفاءة	Features الملامح	Priority level مستوى الأولوية
Critical Thinking, Problem Solving and Decision Making التفكير النقدي وحل المشكلات واتخاذ القرار	<ul style="list-style-type: none"> being able to review, analyze and assess information from variety of sources and points of view being able to use application, analysis, evaluation and conceptualization as appropriate for the context being able to solve simple to complex problems, including novel to ill-defined ones being able to use variety of resources in problem solving and make decisions القدرة على مراجعة وتحليل وتقييم المعلومات من عدة مصادر ووجهات نظر القدرة على استخدام التطبيقات والتحليل والتقييم والتصور بما يتناسب مع السياق القدرة على حل لمشاكل البسيطة والمعقدة، بما في ذلك تلك الغير المحددة القدرة على استخدام مجموعة متنوعة من الموارد في حل المشكلات واتخاذ القرارات 	<p>[1]</p> <p>[2]</p> <p>[3]</p> <p>[4]</p> <p>[5]</p> <p>[6]</p> <p>[7]</p>
Creativity and Innovation الإبداع والابتكار	<ul style="list-style-type: none"> being optimistic, curious and open to new and diverse ideas 	<p>[1]</p> <p>[2]</p>

Competency الكفاءة	Features الملامح	Priority level مستوى الأولوية
	<ul style="list-style-type: none"> • appreciative of creative works of others, value aesthetic expressions • being able to demonstrate initiative, imagination, spontaneity and ingenuity • being able to generate original ideas and recognize one • التفائل، الجدية والانفتاح على افكار جديدة ومتنوعة • تقدير الأعمال الإبداعية للآخرين، والعبارات القيمة • القدرة على إظهار المبادرة والتخيل، والتلقائية والإبداع • القدرة على توليد أفكار جديدة وإدراك غيرها 	<p>[3]</p> <p>[4]</p> <p>[5]</p> <p>[6]</p> <p>[7]</p>
Social, Cultural, Global and Environmental Responsibility المسؤولية الاجتماعية والثقافية والعالمية والبيئية	<ul style="list-style-type: none"> • being responsible and contribute positively to the quality and sustainability of environment, communities and society • being able to appreciate social, cultural, economic and environmental interconnectedness and diversity • being able to demonstrate stewardship, and respect the rights and beliefs of others • المسؤولية والإسهام بشكل إيجابي للحفاظ علي البيئة، والمجتمع • القدرة على تقدير الترابط والتنوع الاجتماعي والثقافي والاقتصادي والبيئي • القدرة على إظهار الرعاية، والاحترام لحقوق ومعتقدات الآخرين 	<p>[1]</p> <p>[2]</p> <p>[3]</p> <p>[4]</p> <p>[5]</p> <p>[6]</p> <p>[7]</p>
Communication التواصل	<ul style="list-style-type: none"> • being able to understand and interpret the thoughts, ideas and emotions of others 	<p>[1]</p> <p>[2]</p>

Competency الكفاءة	Features الملامح	Priority level مستوى الأولوية
	<p>and express themselves clearly and effectively</p> <ul style="list-style-type: none"> being able to use a variety of verbal and nonverbal modes to communicate with people from diverse cultural backgrounds • القدرة على فهم وتفسير أفكار ومشاعر الآخرين، والتعبير عن أنفسهم بوضوح وفعالية • القدرة على استخدام مجموعة متنوعة من الوسائل اللفظية وغير اللفظية للتواصل بين أشخاص من خلفيات ثقافية متنوعة 	<p>[3]</p> <p>[4]</p> <p>[5]</p> <p>[6]</p> <p>[7]</p>
<p>Digital and Technological Fluency</p> <p>الطلاقة الرقمية والتكنولوجية</p>	<ul style="list-style-type: none"> being able to competently use information and communication technologies in a variety of digital environments and media • القدرة على استخدام تكنولوجيا المعلومات والاتصالات بكفاءة خلال مجموعة متنوعة من الوسائط والبيئات الرقمية • القدرة على الوصول والفهم والتعامل مع المعلومات الرقمية بشكل خلاق وفعال 	<p>[1]</p> <p>[2]</p> <p>[3]</p> <p>[4]</p> <p>[5]</p> <p>[6]</p> <p>[7]</p>
<p>Lifelong Learning, Personal Management and Well-Being</p> <p>التعلم مدى الحياة والإدارة الشخصية و الرفاهية</p>	<ul style="list-style-type: none"> understanding learning as a lifelong endeavour • being able to manage various roles in life, and balance school, work, family and other priorities • being able to take ownership of and responsibility for emotional, intellectual, physical, spiritual and social well-being • فهم التعلم كمسعى مدى الحياة 	<p>[1]</p> <p>[2]</p> <p>[3]</p> <p>[4]</p> <p>[5]</p> <p>[6]</p> <p>[7]</p>

Competency الكفاءة	Features الملامح	Priority level مستوى الأولوية
	<ul style="list-style-type: none"> • القدرة على إدارة الأدوار المختلفة في الحياة، وتحقيق التوازن بين المدرسة والعمل والأسرة وأولويات أخرى • القدرة على تحقيق اعلي مستوى من الاستقرار العاطفي والفكري و المادي والروحي والاجتماعي 	
Collaboration and Leadership التعاون والقيادة	<ul style="list-style-type: none"> • being able to build respectful, caring and effective relationships to manage conflict and differences • being able to seek consensus towards common goals • being able to work with others in team situation to influence, motivate and mentor everyone • being able to demonstrate leadership in personal life and in community • القدرة على بناء، احترام، ورعاية علاقات فعالة لإدارة النزاع والاختلاف • القدرة على تحقيق التوافق نحو الأهداف المشتركة • القدرة على العمل مع الآخرين في حالة الفريق للتأثير، وتحفيز وتوجيه الجميع • القدرة على إظهار القيادة في الحياة الشخصية والمجتمع 	<p>[1]</p> <p>[2]</p> <p>[3]</p> <p>[4]</p> <p>[5]</p> <p>[6]</p> <p>[7]</p>

Section 3: Human capacity development:

القسم الثالث: تنمية القدرات البشرية

	Existing/past regional level initiatives المبادرات الإقليمية القائمة / الماضية	Existing/past national level initiatives المبادرات الوطنية القائمة / الماضية	Planned within next four years المخطط لها ضمن السنوات الأربع المقبلة
Technology leadership training programs for teachers برامج الريادة التكنولوجية لتدريب المعلمين			
Technology leadership training programs for principals برامج الريادة التكنولوجية لتدريب المديرين			
Technology leadership training programs for senior education administrators برامج الريادة التكنولوجية لتدريب كبار مديري التعليم			
Programmes to build teachers' competencies to lead smart learning (smart teachers) برامج لبناء كفاءات المدرسين لقيادة التعلم الذكي (المعلم الذكي)			

Section 4: Priority towards various features of smart learning:

القسم الرابع: الأولوية نحو خصائص مختلفة للتعليم الذكي

Support for: لدعم:	Urgent priority أولوية عاجلة	Intermediate priority أولوية متوسطة	Low priority أولوية منخفضة	No priority لا توجد أولوية
Informal learning التعلم غير الرسمي				
Virtual learning التعلم الافتراضي				
Online learning in formal education التعلم الرسمي عبر الإنترنت				
Blended learning التعلم المدمج				
Mobile learning التعلم عبر أجهزة المحمول				
Collaborative learning التعلم التعاوني				
Game based learning				

Support for: لدعم:	Urgent priority أولوية عاجلة	Intermediate priority أولوية متوسطة	Low priority أولوية منخفضة	No priority لا توجد أولوية
التعلم القائم على الألعاب				
Virtual and augmented reality الواقع المعزز و الافتراضي				

Section 5: Policy:

Does your country have any policies for the following areas:

القسم الخامس: السياسات

هل توجد في بلدكم أي سياسات للمجالات التالية:

	Currently has policy توجد سياسة حالية	Policy is in development السياسة تحت التطوير	No current plans for such policy لا توجد خطط حالية لمثل هذه السياسة
Data privacy خصوصية البيانات			
Accessibility for learners with disabilities			

	Currently has policy توجد سياسة حالية	Policy is in development السياسة تحت التطوير	No current plans for such policy لا توجد خطط حالية لمثل هذه السياسة
التفاد للطلاب ذوي الأعاقه			
Development of 21 st century competencies in learners تطوير الطلاب لكفاءات القرن 21			
Development of open education resources تطوير الموارد التعليمية المفتوحة			
Use of mobile devices in classrooms استخدام الأجهزة المحمولة في الفصول الدراسية			
Use of social media in education استخدام وسائل التواصل الاجتماعي في التعليم			
Ability for teachers to innovate in educational process قدرة المعلمين على الابتكار في العملية التعليمية			
Technology training for teachers تدريب المعلمين في مجال التكنولوجيا			

Section 6: Learner-centred initiatives:

Please provide brief details of any recent national or regional level initiatives (or those planned in next four years) in the following areas:

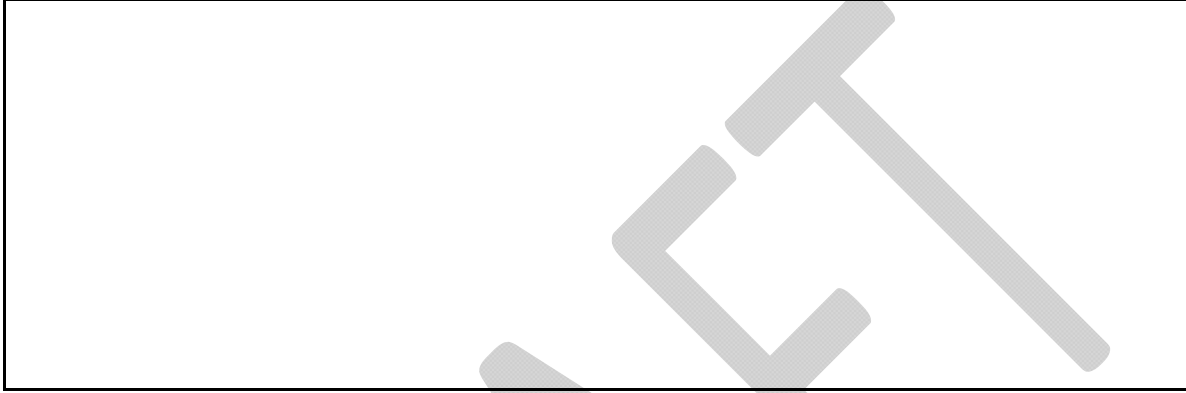
القسم السادس: المبادرات التي تتمركز حول المتعلم

يرجى تقديم تفاصيل موجزة عن أي مبادرات حديثة علي المستوى الوطني أو الإقليمي (أو تلك المخطط لها في السنوات الأربع المقبلة) في المجالات التالية:

Gifted learners الطلاب الموهوبين	
Learners with disabilities الطلاب ذوي الإعاقات	
Personalized learning التعلم الشخصي	
Alternative assessment methods, such as portfolio based assessment, project based assessment and continuous assessment طرق تقييم بديلة مثل تلك القائمة على تقييم الإنجاز والمشاريع، والتقييم المستمر	

Section 7: Any other information:

القسم السابع: أي معلومات أخرى



Thank you!

وشكرا لكم

i Global Meeting on 'Literacy and Sustainable Societies'
<http://unesdoc.unesco.org/images/0023/002338/233891E.pdf>

ii Idem