

Concepts
and
Methodology

Preamble: General Framework¹

Knowledge, and the way in which it is produced, utilised and managed, is considered an essential element in human development. Understanding and measuring knowledge is therefore an important step in devising the means with which to propel development.

This understanding has informed the development of the first Arab Knowledge Index (AKI), introduced in this publication. The Index intends to provide a framework through which to better define and measure the constituent elements of knowledge and improve its application to more effectively serve the purposes of development.

AKI builds on the three Arab Knowledge Reports, which were based on extensive surveys and consultations and have been instrumental in highlighting the gaps and opportunities in the knowledge systems of the Arab region. The Index utilises the data and analysis presented in these reports to provide a tool with which to assess “knowledge” based on scientifically constructed indicators. The purpose of the tool is to guide decision-making for development based on accurate, objective and credible data.

The Concept of the Arab Knowledge Index is Born

Decision-making that is based on knowledge can feed into visions, strategies and policies for inclusive growth and sustainable development approaches. As such, it helps to circumvent the tendency to improvise and take ad-hoc decisions imposed by the chaotic climate that accompanies urgent internal or external emergencies.

For knowledge to systematically feed into development approaches it must be manageable, which first requires the measurement of that knowledge; as Stewart notes, it is not possible to manage something that is “immeasurable”.² Bukh et al. also conclude that management and measurement are two sides of the same coin.³ These two

views further underscore the importance of developing scientific and methodological tools to allow the measurement and monitoring of the critical elements of knowledge, as well as the factors that form the basis of a knowledge society and economy. Such tools serve to guide policy-makers and experts in various essential fields in identifying both the weak and strong points in their development objectives, diagnosing factors of success and failure and revealing important milestones throughout progressive approaches to managing knowledge to serve development. This is the precise aim of the Arab Knowledge Project, which seeks to produce an AKI based on scientific standards. The Index described herein was incubated by the previous three Arab Knowledge Reports⁴ and is now finally coming to fruition, building on the extensive repository of data that has been carefully collected and compiled in recent years.

Intellectual and Conceptual Framework

The Arab Knowledge Reports: Monitoring Arab Knowledge and Identifying Future Challenges

Many factors hinder the generation, exchange and productive use of knowledge in Arab societies and economies. These factors are coupled with various social, cultural, economic and political circumstances which render the production, investment and exchange of knowledge considerably difficult. Hence, an efficient framework and associated system is required to deliver knowledge systematically into development processes in order to provide support in a given context. Knowledge systems should provide individuals with the necessary means for education, fostering an environment in which appropriate experience and skills may be transferred through access to cumulative knowledge. Similarly, public and private institutions should be enabled to seek and promote innovation based on the acquired skills of their workforces.

The three Arab Knowledge Reports highlight a knowledge gap which indicates that such knowledge systems are not yet readily

available across the region and focus on the interconnected aspects of the “knowledge paradigm” in the region. The first report⁵ sought to review numerous “axial” concepts, such as the bases, perspectives and foundations of the knowledge society, and to elucidate Arab performance in the new global society. It also sought to reveal the opportunities and risks facing the region in terms of production gains, innovation and knowledge utilisation – these elements being considered the main means with which to achieve human development and renewal – as well as focussing on adherence to the triangular relationship between development, freedom and knowledge. The report began with the assumption that a revival in Arab knowledge performance will constitute an important prelude to the broad reform and development of the Arab region with a view to ultimately drawing upon the Arab knowledge reservoir to achieve positive and productive intercommunication with the global knowledge resource.

Based on the first report’s conclusions, the second report⁶ proceeded to establish the fundamental requirements for building a knowledge society and knowledge economy, providing an explanation and approach to adopting the various mechanisms and strategies required to prepare coming generations for positive and active participation in building and benefiting from a contemporary knowledge society. The report was unique in its adoption of a comprehensive scientific research methodology, including the design of a set of specialised tools for the measurement of a number of cognitive, affective and social skills of secondary school students in the Arab region. These tools also served to determine the value systems defining students’ perceptions and behaviour, as well as the nature of the enabling environments available to them. In particular, the report revealed some of the characteristics of the Arab education system as the main gateway to investing in Arab youth with the requisite knowledge to effectively contribute to achieving global competitiveness and the establishment of a knowledge society. The report concludes by presenting an integrated vision for the strategies and processes required

to prepare future generations for building a knowledge society based on adherence to the key relationship between skills, values and empowerment.

The third AKR aimed to support Arab efforts to achieve an integrated approach to building knowledge societies and economies as the main gateway to reform and development in the region. The report explored the crucial issue of preparing and qualifying young people to contribute to the transfer and localisation of knowledge in order to broaden the range of areas in which sustainable human development can be achieved. Employing a dynamic methodology combining field surveys and desk reviews, the report also sought to establish further evidence to support the thesis that,

“... if knowledge is the engine of progress and the source of peoples’ wealth in the era of the knowledge society in contemporary global civilisation, then young people are the power entrusted with the transfer, dissemination, localisation and employment of knowledge in new development initiatives. However, unless there are effective cultural and political structures that allow participation and integration and support the acquisition of various knowledge and skills these young people will not be able to integrate effectively in life and society.”⁷

Together, these three Arab Knowledge Reports therefore constitute an established tool for monitoring the situation in the Arab region, highlighting its strengths and weaknesses, opportunities, challenges and future potential based on methodological principles, objective analysis, active participation and an advanced vision. The accumulated knowledge offered in these reports and the awareness they have raised regarding the capacities and challenges facing the Arab states have facilitated the adoption of the initial bases for methodological assessment and survey tools (tests, measurements, questionnaires) as well as the development of the indicators required for subsequent comparison and follow-up. In addition to desk reviews, the reports employed field surveys to collect primary

data and secure the active participation of respondents among the population. In doing so, these surveys provided added impetus for constructing the Arab Knowledge Index. As the first Report stated:

There is no way to revive knowledge without a careful and objective check of the range of defects and gaps that have begun to broaden in the absence of a clear plan to overcome the knowledge flaws in our society ... The Index is considered a central step in preparations for building an Arab knowledge society: the foundations will be laid, the data compiled and the indices devised in the framework of intercommunication with the self and its knowledge conditions, without ignoring the benefits of previous experience in this field.⁸

A New Approach to the Concept of Knowledge for Sustainable Development

The concepts of knowledge, development and sustainability were subjected to extensive analysis in the last Arab Knowledge Report;⁹ therefore, this section will offer only a brief review of these basic concepts, focusing in particular on the links among them.

“Knowledge-Able”: The Vehicle for Sustainable Development

“Knowledge-able” refers to a state of preparedness in which knowledge can be effectively utilised to bring about positive change and both develop and expand the capabilities and options of individuals. It necessarily implies strong associations and links between “knowledge-able” human resources and development, simultaneously representing both an incubator and a driving force of development.

With this understanding in mind, it is not surprising that knowledge is a key preoccupation in major societal projects across the world. Those countries that possess a solid knowledge platform are all the more capable of achieving economic success, as well as providing for the well-being of their

citizens and attaining successful rankings in global indices. Knowledge has therefore increasingly become a prerequisite, rather than a benefit, in pursuing national development objectives. Consequently, many countries seek to integrate knowledge into the social culture and value system that inform decision-making bodies.

Knowledge that contributes to development and growth is amorphous - it is not a ready-made commodity. Rather, it is actively pursued and attained through a combination of concerted effort, intellectual rigour and curiosity that fosters creativity and innovation to enrich the choices and potential of individuals. To be knowledge-able is to put data, facts and information to good use in achieving successful development.

Knowledge in this context refers to a multi-disciplinary matrix of processes including research, scrutiny, analysis, criticism and deduction that can be applied in producing innovative and practical ideas and tools. This notion of knowledge represents “not a mere product of progress, but ... also – and most importantly – a means to an end, and it is even possible for the Arab countries to use knowledge in order to achieve progress in development and social revival. There is a need to absorb knowledge like a sense, in exactly the same way as absorbing and using sight, touch and smell ... etc.”¹⁰

Development as a concept is considered to be a relatively modern phenomenon. It acquired particular significance following the Second World War, and was initially linked with economics as a science in a one-dimensional approach.

The concept of human development, on the other hand, is far from novel. Aristotle observed that, “wealth is evidently not the good we are seeking, for it is merely useful for the sake of something else”¹¹, pointing centuries ago to a relationship between individual attainment and development. Similarly, Ibn Khaldun emphasised more than five centuries ago in his *Muqaddimah* [Introduction] that humanity comprised

three dimensions: economic, political and intellectual; and that the human being should be understood, a reference to what is today known as human development.

In keeping with these ancient observations, modern thinking on development has adopted a broad definition that includes all its societal, economic and political facets, an expansion that accompanied the repositioning of human beings at the centre of the concept. Generally speaking, development is today considered in a wider context to economics and is not restricted to any single element, reflecting the fact that human beings are by their very nature multifaceted, with a plethora of different needs to which development may respond.

Furthermore, this contemporary thinking on development has absorbed two concepts that in the previous century were considered the purview of economics and political science, namely progress and advancement. Over time, development has also incorporated two additional concepts of no lesser importance – knowledge and sustainability – adding to the importance and complexity of all three concepts.

So what is the significance of this association? Definitions of the concept of sustainable development abound; the most common among international economic organisations was issued in 1987 by the World Commission on Environment and Development (the Brundtland Commission) which defined sustainable development as that which meets the needs of the present without compromising the ability of future generations to meet their own.¹² The World Bank adopted this concept from the outset and sought to extricate it from its abstract surroundings in order to maximise its procedural application. This involved a methodological reformulation of the concept of sustainability, allowing it to be tested subjectively in conjunction with a three-dimensional approach incorporating the economic, the social and the environmental. Subsequently, development is considered sustainable when it meets the present and future needs of society in each of these three fundamental dimensions.

The World Bank was one of the first organisations to place knowledge at the heart of development through its Knowledge for Development (K4D) initiative.¹³ The K4D initiative determined that the true source of disparity lay in the capability to acquire knowledge rather than in income, and that the ability to achieve development was as important as material capital. It also endorsed the view that the difference between rich and poor countries or social groups lies not solely in a lack of financial resources but also in the ability to produce, share and employ knowledge to confront everyday challenges. In a remarkable departure from the economics of absolute economic freedom, the initiative also stressed the need for active support from the state and regional country groups in knowledge acquisition.

Interest in knowledge for achieving development in the Arab region is embodied by the “Arab Encyclopaedia of Knowledge for Sustainable Development”, which represents a reference for understanding sustainable development in all its aspects and supports the notion that the role of knowledge as a means of production and development is indisputable. The Encyclopaedia states that:

“...any discussion on sustainable development in the Arab region cannot take place without a complete understanding of what is happening around us, and what affects both the social and economic aspects of development, along with a monitoring of technological changes and their impacts while identifying the fundamental characteristics of the current century, dealing with which requires a clear understanding and long-term planning and careful implementation with a full capacity for follow-up...”¹⁴

While the importance of wealth accumulation recedes, the importance of knowledge accumulation continues to increase, and has become both the cornerstone of contemporary thinking and a focal standard for sustainable human development. Thus, as some concedes, it has posed one of the greatest challenges to the Arab countries in recent times:

"History tells that the blossom of a civilisation, coupled with a rise of the national language, have been linked in this part of the world, as in other parts, with the distinguished capacity in the field of acquiring knowledge, the same way that the deterioration of civilisation in the region in the past seven centuries was accompanied with the degeneration of knowledge capacities. Perhaps this is general human law: where a nation stands from acquiring knowledge determines its value, rising or falling. Human beings are the source and the fount of knowledge, and any claim linking the attainment of knowledge¹⁵ to the acquisition of tools and equipment from the latest imported technologies is nothing but mere nonsense stemming from ignorance of the reality of things."¹⁶

With respect to measuring knowledge for development, the World Bank's Knowledge Assessment Methodology (KAM) is one of the leading initiatives in this area. In order to assist states in determining the opportunities and challenges facing them in their progress towards developing knowledge economies, an interactive reference tool was developed that aimed to monitor the general level of readiness of a country to adopt a knowledge-based economy. The KAM produces two indices, a knowledge index and a knowledge economy index. The first presents an average based on three foundations – innovation system, education and training, and ICT infrastructure – while the second constitutes the mathematical mean of four – innovation system, education and training, ICT infrastructure, and economic and institutional system.¹⁷

At the Arab level, attempts have been made to measure aspects of knowledge using sub-indicators that form part of a comprehensive composite indicator. For example, the Arab Competitiveness Index includes a sub-index – the Potential Competitiveness Index – consisting of three main pillars:

- Capacity for innovation/localisation of technology (eight variables): Rate of High-tech exports; net inflow of foreign direct investment as a percentage of total

investment; proportion of equipment and machinery imports out of total imports; number of published scientific and technical articles; proportion of students registered in science and technology programmes; expenditure on scientific research; number of research projects per million inhabitants; and number of patents;

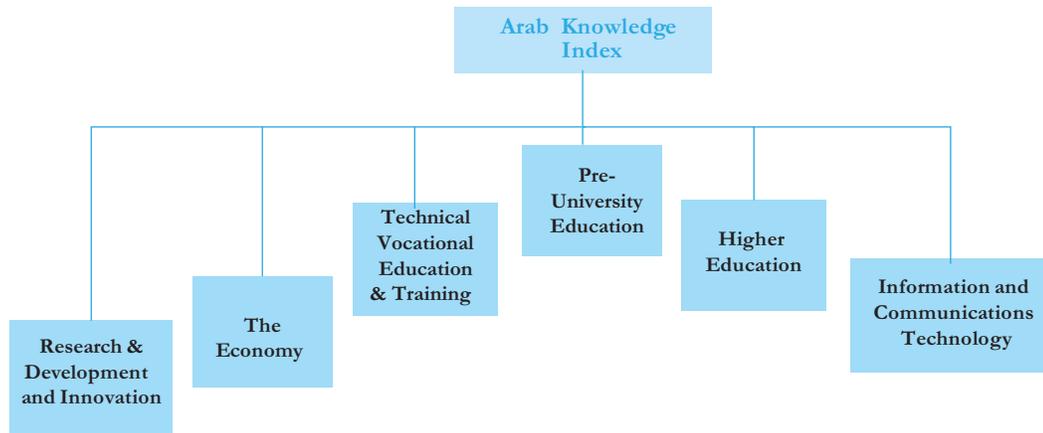
- Human capital (seven variables): Expenditure on health; average life expectancy; illiteracy reduction rate; expenditure on education; ratio of females to males in elementary and secondary education; secondary school enrolment rate; and university enrolment rate;
- Technological infrastructure (seven variables): Cost of Internet use; number of fixed-line telephone subscriptions per 100 inhabitants; number of Internet users per 100 inhabitants; number of mobile phone subscriptions per 100 inhabitants; number of personal computers per 100 inhabitants; number of secure servers per 100 inhabitants; and the average cost of local telephone calls.¹⁸

The Arab Knowledge Index: Elements of a Multidimensional Concept

The inspiration behind the establishment of an index to measure knowledge in the Arab countries can be traced to the Arab Knowledge Reports, which called for ways to better monitor and capture knowledge production and its use in fostering development in society. Recognising the multi-dimensional aspects of knowledge and taking into account the specific developmental context of the Arab region (and the variance therein), the Arab Knowledge Index (AKI) was developed based on six essential components employed in defining the knowledge base of a given country:

- Pre-University Education;
- Higher Education;
- Technical Vocational Education and Training (TVET);
- Research & Development (R&D) and Innovation;

Figure 1:
AKI Components



- Information and Communications Technology (ICT);
- Economy.

Figure 1 illustrates these six components, which are referred to herein as “sub-indices”.

Components of the Arab Knowledge Index: The Importance of Sectors and Their Constituents

Education (all types): Education is the pivotal constituent in the dissemination of knowledge and is rightfully considered to be the “manufacturer” of development and growth. As such, education and development represent two sides of the same coin; both focus on human beings and aim to invest in them, develop their capabilities and broaden their choices. It generates creative, innovative

human beings and advanced nations and societies, as well as distinguished minds that produce the knowledge capital so often referred to in modern economic parlance.¹⁹ Education is therefore a natural and necessary component of any knowledge index.

In a new world economy that is increasingly knowledge-based, education has become the primary vehicle for investing in a nation’s future via its youth. Countries that fail to establish comprehensive and high quality education systems face the risk of slowing growth, widening knowledge gaps and the loss of opportunities that would otherwise be made available to its people. In fact, education is the incubator for leadership – be it public or private – technical, scientific and literary competencies, skills and experiences.

Figure 2:
Main Pillars of the Pre-University Education Index

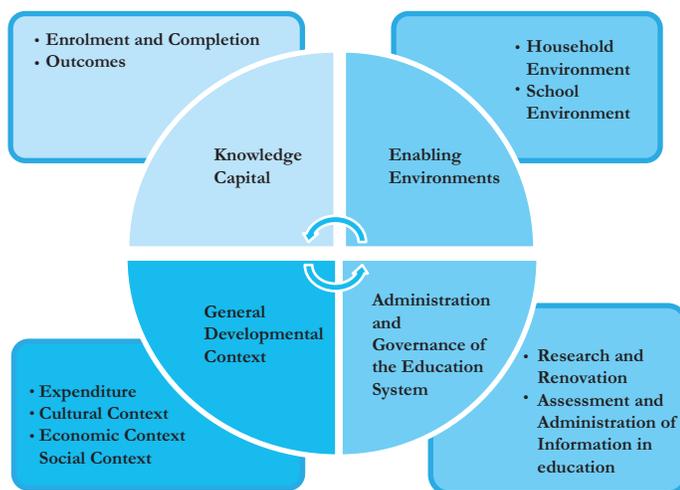
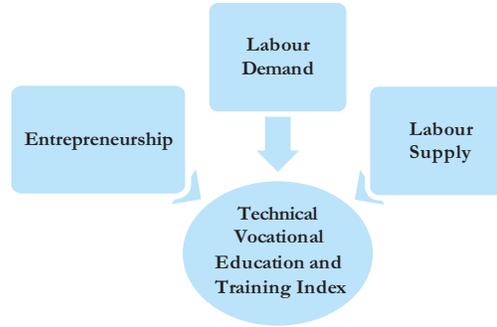


Figure 3:

Main Pillars of the Technical Vocational Education and Training Index



The pre-university education system is the main gateway for youth entering the realms of knowledge production and creativity, and offers opportunities for young people to realise their aspirations. The Arab Knowledge Index seeks to move beyond the narrow focus on the quantitative dimensions of the educational system and its outputs; it incorporates important elements such as enabling environments and general development contexts as key factors in determining the performance of the system and the quality of its outputs. The result is a composite index based on the four key foundations presented in Figure 2.

The data required to pursue these founding pillars and populate their sub-indicators were drawn in particular from the UNESCO Institute for Statistics and the World Bank, as well as the results of the Trends in International Mathematics and Science Study (TIMSS) 2011 and other established studies.²⁰

The role of technical education and vocational training has become pivotal in steering the economic and social life of nations, as it

represents a key tributary in the preparation of national human resources and one of the most important weapons in combatting poverty. Not only does this factor directly contribute to reducing unemployment and raising both income and living standards, it also constitutes a yardstick for developmental plans and objectives related to the provision technical vocational education and training for young people. It is also responsible, alongside the other higher education sectors, for rapid adaptation in response to the changes brought about by the technology and information revolutions. Given the direct link between technical vocational education and training systems and the labour market, the composition of this Index was based on three main pillars, as detailed in Figure 4. Data availability comprised one of the greatest challenges encountered in the construction of this Index, preventing the inclusion of numerous important and relevant variables; therefore, the decision was taken to calculate the Index at this stage using available data, forming a base that may be expanded gradually as plans are implemented to bridge these data gaps.²¹

Figure 4:

Main Pillars of the Higher Education Index

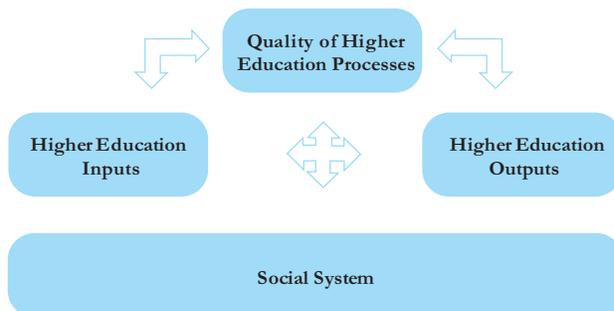
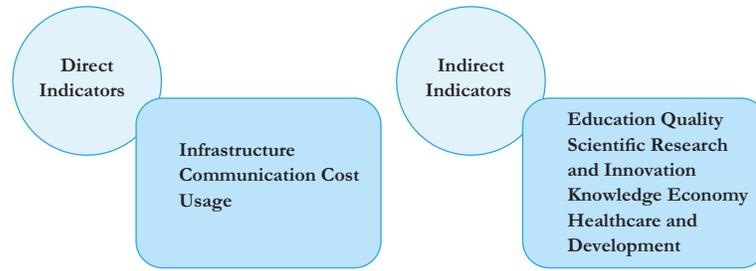


Figure 5:

Pillars of the Information and Communications Technology Index



Higher Education, with its intimate links to scientific research, constitutes a vital preparatory gateway to new societies transformed by knowledge-based economies that strive for the development, advancement and improvement of human life. As illustrated in the third AKR,²² higher education institutions produce the human capital required by the labour market and the process of comprehensive development itself. As such, they represent a key, decisive factor in social and economic progress in any society. In order to build a composite index on systems of higher education in the Arab region, a systematic approach was required that would not only measure outputs, but also allow for the study of interactions among the various sub-systems, as well as their interactions with the social system as a whole (Figure 4). The Index was produced using UNESCO and World Bank data, AKR 2014,²³ and other indices measuring economic competitiveness, knowledge economy and global innovation.

Information and Communications Technology (ICT): This sector is of particular impor-

tance owing to its direct impact on activities and services in all sectors of the state; it therefore occupies a position at the heart of a country's knowledge strategies that form the basis of its plans for the future. At the same time, the various elements of this sector are strongly influenced by the quality of the other components of the knowledge system. Consequently, it was imperative that a special indicator be designed to determine two equally important factors: the strength of the information infrastructure of the state and the extent of the suitability of communication costs for individual access; and the degree of individual, institutional and government use of ICT in life transactions. This indirect indicator expresses the extent of the quality of elementary, vocational and higher education systems, the status of scientific research and innovation, regulatory climate and ease of business, as well as the efficiency of the healthcare system (Figure 5). The data used was drawn from the World Economic Forum's Global Information Technology Report, the UNESCO Institute for Statistics, the World Bank and the database of the Global Health Observatory.²⁴

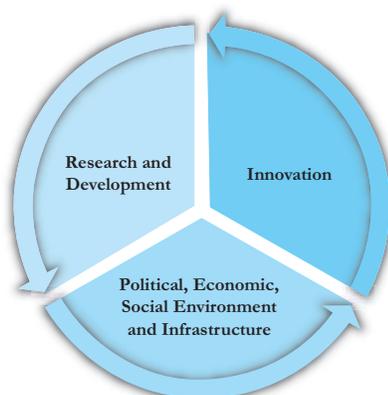
Figure 6:

Pillars of the Economy Index



Figure 7:

Pillars of the R&D and Innovation Index



The Economy: Given that most of the problems facing development efforts across the world relate directly or indirectly to economic factors, the economy is clearly central to modern life and progress. Many of the obstacles facing development initiatives and provision of the fundamental elements thereof relate to the prevailing economic situation. Some researchers view the economic challenge as the most important of all, because it is a key factor in maintaining the independence of a country, preserving its dignity and achieving its ambitions in terms of progress and well-being. Economic growth is linked to other essential sectors of society such as politics, education and justice, as well as to other factors that either encourage or hinder economic investment. Consequently, economic reform necessitates an investment climate that is reassuring for capital - both material and human.²⁵

The Economy Index is built on three main pillars divided into a number of sub-indicators (Figure 6) selected from international sources, notably the World Economic Forum, UNESCO and the World Bank.²⁶

Research & Development (R&D) and Innovation: Scientific Research, development and innovation are considered among the main features that distinguish the economies of developed countries from their developing counterparts. They are today considered indispensable attributes for achieving development based on innovative and actionable knowledge. Given the need for the

Arab countries to develop science, research and technology as a basis for establishing and supporting an innovative, contemporary knowledge society, the composition of the R&D and Innovation Index focuses on highlighting the interactive relationship between these three pillars, alongside a set of environmental and structural variables. This methodology is in keeping with the current trend toward constructing integrated cycles of research and innovation supported by modern research infrastructure. As such, the structure of the composite index on R&D and Innovation includes three composite sub-indices: a political, social, economic and institutional context sub-index; an innovation sub-index; and an experimental research and development sub-index. Each comprises indicators and sub-indicators produced using indicators selected from international databases including those of the World Bank, the UNESCO Institute for Statistics, the World Economic Forum, the Organisation for Economic Cooperation and Development (OECD) and Global Competitiveness Reports.²⁷

It is important to note that the six components of the Arab Knowledge Index are interrelated and share a number of common variables. For example, numerous variables and sub-indicators relating to the education sector contribute either directly or indirectly to production factors in the economy. The same applies to ICT indicators, which are interlinked both horizontally and vertically to all the other components. Similarly, higher

education indicators form key variables in the performance of the R&D and innovation sector, which in turn contribute directly to determining knowledge levels in the economy, the growth in processes of production, investment and various economic factors. Therefore, these combined indicators can take on different roles; for example, the outputs of pre-university education may form inputs to higher education, or serve as variables affecting the environment for R&D and innovation. The indicators in each thematic-index could also differ in their respective weights; for example, the relative weight of the availability of a technological environment may differ between the Pre-University Education Index and the R&D and Innovation Index.

AKI General Methodology

The current challenge is to deliver an integrated, composite index by 2017 that comprises an amalgam of data on essential development areas and is sufficiently flexible to be adapted and employed across countries with different levels of development. The Index should be designed and adapted in a way that accurately pinpoints achievements and weaknesses, and allows countries to transform results into usable information that may be applied in the planning, development and reform processes as well as in building a spirit of competitiveness. This, in turn, will contribute to the growth of the Arab share in global knowledge accumulation.

The initiative does not claim to originate from an intellectual vacuum; indeed, it seeks to create a new link in a vast chain of global knowledge pathways, based on existing methodological approaches that have proven their scientific worth. Consequently, from the outset the research team was keen to define the concept of the composite index and to explore previous pioneering Arab initiatives in the production of similar indices. The process also respected the need to determine study phases and methodological tools while maintaining the participatory approach diligently implemented in the AKRs. Participation was secured through regular consultative meetings between members of the Index core team, as well as complementary workshops with external

experts in fields directly related to those under investigation. Further detail on this aspect of the initiative is provided in the next chapter.

Index Concept, Type and Specifications

Despite the recent popularity of the term, an adequate definition for what constitutes an “index” remains elusive. Many dictionaries simply define it as “a pointer to something or to a sign indicating the possibility of a certain thing or a number that expresses a relationship between two quantities”,²⁸ which often leads to confusion with other similar concepts (such as statistics, symbols, marks, etc.). In short, an index can be defined as a quantitative or qualitative piece of information produced in accordance with specific methodological conditions that guarantee its validity and reliability, the result of which can be established and employed for conducting regular or continuous temporal and/or spatial comparisons. An index fulfils the role of a sensor that detects any change occurring in a given variable, serving as the starting point for any subsequent investigation to explain this change. Pottany and Toujinlan, two experts from the team supervising the production of European Union indices, state that indices are not merely expressions, numerical representations or ambiguous statistics, but rather important pointers aiming to present information to whoever is interested in the results or the functioning of a system.²⁹ Indices can also provide the basis for new decisions and approaches. In the present context, indices can be defined as measurement tools employed in a certain area to describe a human condition in society. Development indices, for example, represent symbols of the standard of living attained by a society, and the type of life experienced by the members of that society, and may be used to estimate the impact of development programmes and projects on its constituents. The importance of such indices stems from their provision of quantitative or qualitative measurements summarising information and facts about the events and phenomena occurring in society. Indices can take the form of raw figures, rates or averages, or set phrases indicating a certain level of accomplishment. According to Al-Hout and Al-Shaadly, indices

are also considered a yardstick for progress in any sector at any stage which may be used to objectively judge achievements.³⁰

It is crucial to distinguish between two tools - indices and statistics. Indices express quantitative or qualitative measurements used for evaluating phenomena or performance during a defined period of time, while statistics are the presentation of a fact about a certain phenomenon at a certain time in numerical form. As such, indices differ from statistics in that they not only present simple facts, but go further to explain and analyse those facts. It is therefore possible to say that statistics are the foundation upon which an index is prepared, because they offer an accurate and realistic measurement of the scope of a problem that is then further characterised in terms of its dimensions and causes through an index. This process supports planning, policy-making and the generation of strategies to confront prevailing problems.

In this sense an indicator is richer than a statistic in terms of content and possesses stronger connotations, since it represents a broader and more comprehensive phenomena relating to its subject. For example, the indicator of life expectancy at birth can also serve as an indicator of general improvement in living conditions. In addition, an index is linked to a declared goal, while in the absence of an indicator, a statistic is linked to a basic objective. It is also assumed that indices are part of a greater entity comprising an integrated framework of information necessary for informing decision-making, while it is not necessary for statistics to belong to any such entity.³¹

Indicator Categories

Indicators can be categorised according to three types, namely:

- Representative indicators: The most widespread and frequently used type in research, management and planning. These entail the selection of a variable to

represent single or multiple characteristics of the theme or system to be measured. This type of indicator has been criticised for reducing a complex and compound system into a single variable, the selection of which is sometimes difficult to justify.

- Sub-group indicators: These differ from the previous type in that they are based on determining the variables of each constituent element of the system separately and exclusively (without interconnection), instead of using a single variable as an indicator for the system as a whole. One of the deficiencies of this approach is that it leads to a long and interconnected list of variables that may present practical difficulties in terms of their interpretation.
- Composite indicators: These comprise a number of variables that represent the phenomenon or theme being measured. Although this type of indicator has been criticised for leading to generalisations that conceal the weaknesses of certain constituents, they are considered to be closer to reality, in that they reflect the structure of compound and complex phenomena.

The extent to which composite indicators are accepted, or their validity recognised, varies between scholars. For example, Hicks and Streeten consider composite evidence to be unnecessary, undesirable or even impossible to construct.³² McGranahan et al. (1985) claim that adopting a general index in the assessment of economic and social development should not be completely condemned. This is because certain practical needs call for a general index, or a number of indices. Drewnowski (1966) concluded, however, that cumulative evidence of social conditions is an essential resource for assessing past accomplishments and innovation policies for the future, and although individual social indicators provide accurate information about some of the elements of social conditions, acquiring a reasonably complete and accurate picture of them all in no way undermines any of the aggregated evidence.³³

Previous Arab Experiences in Building Composite Indices

As explained above, the concept of development itself presents the necessity of measurement in all the phases of a project, from planning through to the assessment of results. Vast transformations in the concept of development have generated greater diversity in indicators. In this regard, numerous Arab initiatives have emerged to identify or construct composite indicators in a variety of areas, thus enriching the Arab arena with specialised indicators in various fields of development. These initiatives include:

- The Arab Future Energy Index:³⁴ A successful Arab example of a specialised indicator resulting from an initiative launched by The Regional Centre for Renewable Energy and Energy Efficiency in participation with Plan Bleu³⁵ and the MED-ENEC project³⁶ to study energy efficiency in 17 Arab countries using more than 30 different indicators. This instrument deals with assessing and measuring policies, providing detailed comparisons for use in achieving development and efficiency of renewable energy through quantitative and qualitative analyses. It also provides an account of the key aspects of the energy market, including policies and institutional and technical capacities, as well as strategies, relevant socio-economic data and investments. This Index is the first Arab index specialising in monitoring the competitive capacity of the Arab region in the area of sustainable energy, and relies on data collected from international and domestic sources to ensure accuracy and transparency.
- The Arab Competitiveness Index:³⁸ This composite index, established by the Arab Planning Institute in Kuwait, focuses on measuring the development of the level of competitiveness of the Arab economies in international markets. The index adopts a select country group as a reference, consisting of states that once possessed similar conditions to those found in the Arab countries but which have since surpassed them in competitive performance. It comprises two sub-indicators, a “current” competitiveness indicator based on 53 variables, and a “potential” competitiveness indicator based on 17 variables. It relies on regional and international databases for relevant data. Comparisons with the reference country group are made based on the gap between their averages and those of Arab states, from which “it is possible to translate this [gap] into the amount of effort that should be exerted and the nature of the policies that should be followed if this gap is to be bridged”.³⁹
- The Dhaman Investment Attractiveness Index (DIAI):³⁷ As flows of foreign investment into developing and transition countries has increased, competition for investment as a driving force for domestic economic growth has intensified between these countries. The Arab Investment and Export Credit Guarantee Corporation therefore launched a composite index in 2013 to measure the ability of countries to attract foreign investment. The index consists of three main pillars: “fundamental or prerequisite requirements”, “potential factor” and “external factors”. It includes 10 sub-indicators comprising 114 qualitative variables for which data are collected from international databases that are capable of being used for comparison. The index includes 110 countries, of which 17 are Arab states. The results are presented in the form of an index value for each country, an international ranking and a comparison among country groups (Arab States, Latin America, Africa, Europe, Middle Asia, East Asia, Pacific Ocean and South Asia).

General Methodological Guidelines: Principles, Stages and Instruments

Establishing an Arab Knowledge Index that is structurally sound, sustainable and competitive requires a set of basic principles and methodological instructions that lead the process in all of its stages. These include joint principles covering all relevant sectors, and those that are specific to internal choices relating to each sector.

General Principles

- Constructing the Index on pillars relating to areas listed within the developmental priorities of the Arab countries, without isolating them from global developmental movements elsewhere around the world;
- Taking into consideration the differences among the Arab countries themselves, and allowing the manifestation of national peculiarities, facilitating regional and international comparisons to the greatest extent possible;
- Ensuring that the presentation of the indicators produces a formula that is as accurate as possible, including a focused and summarised presentation of cognitive–developmental conditions, while containing sufficient detail to avoid misleading over-simplification of complex realities;
- Emphasising within the list of indicators the need for sufficient information (perhaps the greatest challenge) to provide strong support for policy-makers in countries facing various challenges in the knowledge area, without resorting to the use of unattractive lists of statistics;
- Selecting the data necessary for implementing the suggested indicators, drawn from approved databases and/or recognised international reports. Due to the experimental nature of this stage, which does not employ any type of comparison or scrutiny of current realities, it has been decided that data sources from as early as 2005 may be utilised in order to secure sufficient data to calculate the indicators, while recognising the restrictions this may impose in the future stages of index construction.

Guiding Principles for Sectoral Indicators

- A composite index, specific to each sector, is produced in accordance with the expert researcher’s vision, while ensuring consistency with the framework set by the Arab Knowledge Reports.
- Individual researchers select the sub-indicators and variables they deem necessary for constructing the sectoral indicator which, upon being applied to a

specific country, will provide readers with an integrated insight into the condition of that country in all aspects relating to the fundamental constituents of the Index.

- Since the sectors interact with each other, it is natural for common indicators or variables to appear. In this case, coordination between researchers is necessary to avoid inconsistency in concepts and data sources.
- Individual researchers determine the suitable composition for each sector under their supervision and consult with other team members to determine and justify corresponding weighting.
- In cases where data is unavailable for fundamental pillars, sub-indicators or variables within the composition of the suggested indicator, researchers either employ the most adequate proxy within available data (providing this does not detract from the essence of the indicator), or choose to retain the indicator in a limited form until such time as data becomes available. In this case, the researcher may consider both an aspired-for composition (what the next stages should fulfil) and a current composition (what is possible now).

Construction Stages of the AKI

At this initial stage (considered preparatory), in view of the demands of the technical and methodological procedures required for constructing a composite index, as well as those of field testing in terms of data collection, calculating values and undertaking quantitative analysis of the results, work is focused on setting the composition of the structural ‘sectoral’ indices constituting the general index. This also involves the process of selecting suitable inputs with which to expand the index in terms of currently used indicators, both regionally and internationally. Furthermore, this stage entails identifying gaps that require future methodological plans to ensure the provision of necessary data.

This preparatory phase comprises three fundamental stages: descriptive, analytical and “constructional”, followed by an experimental and validation stage:

- Descriptive stage: Includes desk reviews and individual consultations in order to explore the most important indicators in each sectoral pillar of the Arab Knowledge Index currently adopted in both the Arab and international arenas. The significance of this process lies in developing familiarity with the available indicators and their characteristics in order to identify both those features that should be adopted and discarded.
- Analytical stage: This stage entails a critical study of these indicators to expose their advantages (conceptual and technical) and their limitations (the limits of their use). This stage is valuable in terms of identifying areas of action that could potentially achieve “added value” in the AKI.
- Construction stage: Following the two previous stages, each sector then adopts the direction it will follow in this initial phase of construction.
- Experimental stage: During this stage, the external validity of the selected indicators is tested through consultation with a group of external experts. Statistical analyses of data for these indicators test their internal validity along with the relations between them and their assigned weights, as detailed in the following chapter.

Adopted Sources

- Desk studies: relying on a diverse compilation of sources composed of key international references in building and using indicators, the latest regional and international reports concerned with the areas of knowledge and development, and the most important databases of regional and international organisations that relate to the subject of the current work;
- In-depth interviews with foreign and Arab experts experienced in the methodologies employed in creating and developing indicators on education;
- A regional workshop with education experts and specialists in education monitoring and assessment;
- Statistical analyses of data and results interpretation;
- Background papers produced by experts from the Arab region.

Conclusion

Six sectoral composite indices were produced and are detailed in the following chapters, which mainly focus on presenting the conceptual and theoretical foundations of these indices, as well as highlighting the methodological procedures employed. Each chapter will present the components of each thematic index and its various branches, along with the justifications for their selection and the technical details behind the weights assigned to the indicators and their components.

The final output for this stage is the application of these various indicators to the Arab states, each in accordance with the available data, generating a detailed profile offering a synopsis of the knowledge situation in each country through the various sectors covered in the overall Index.

In order to highlight the significance of the knowledge situation as a whole and its impacts on the lives of individuals in terms of their well-being and the quality of the services available to them, and starting with the Arab Knowledge Index, a range of essential areas relating to quality of life will be examined (such as health, environment, security and others), as well as important issues that have had the greatest impact on knowledge for development (social, gender, media, freedoms, etc.). The starting point will be health, given its importance and the extent to which it is directly affected by knowledge levels. Health constituted one of the fundamental developmental objectives of the Millennium Development Goals and thereafter the Sustainable Development Goals. Health also figures in the Human Development Index (HDI) as one of three key pillars alongside illiteracy and adjusted GDP per capita. Low achievement in these three selected aspects leads to the loss of many other opportunities at all levels of development. The aim is for people to live

healthy long lives, acquire knowledge and have access to the necessary resources to secure a decent standard of living.

Undoubtedly, good health is a fundamental human right, and health security is closely linked to development by protecting populations from disease and infection. Health security indicates a state of achievement of physical, mental and social health, and not the mere absence of disease or disability.⁴⁰ Regrettably, however, it may be noted that health issues do not receive the same focus and attention in programmes and budgets in the Arab region as economics, growth and employment, despite the direct impact of health on various forms development. Poor health can never benefit work and perseverance - two dynamic elements in development process. It is true that some countries in the Arab region have accomplished tangible progress in the area of health in recent decades, increasing life expectancy and reducing child mortality, but these efforts must be sustained, enhanced and developed. In light of the great development and expanded use of ICT in various sectors, including health, it has become imperative for the Arab states to work harder to invest in these technical and knowledge-related developments to improve their healthcare systems and increase the efficiency of health sectors through better quality services and optimum use of resources, including e-solutions. The study produced

in conjunction with this Index aims to underscore this relationship between knowledge and health in the Arab region. Finally, it must be emphasised that “an index is intended for general guidance only and cannot be relied upon on its own for deducing a sufficiently reliable and adequate meaning for making a wise decision”.⁴¹ The true function of an index is confined to indicating the direction to be taken without prescribing how to reach the desired goal. An accurate understanding of the Index requires adequate examination of the reasons behind its production, the conditions of its production and the environment in which it has been incubated, as well as the impacts that remain after its completion. Some researchers have compared indices to the instruments on a car dashboard that provide the driver with continuous information and warnings but give no explanations as to what is happening or what to do about it. The knowledge and awareness of the driver themselves will determine the extent of their ability to interpret these signals and consequently to respond by choosing the most suitable course of action. In this regard, these researchers stress the significance of timely data and the importance of continued data updates and collection that would allow for analysis over time, given that the role of indices is not limited to “drawing an instantaneous picture” of a particular situation.⁴²

Endnotes

1. This conceptual section was produced based on a background paper by Ahmed Ouzzi (2015).
2. Stewart 1997.
3. Bukh et al. 2001.
4. UNDP and Mohammed bin Rashid Al Rashid Al Maktoum Foundation 2009, 2012 and 2014 (references in Arabic).
5. UNDP and Mohammed bin Rashid Al-Maktoum Foundation 2009 (reference in Arabic).
6. UNDP and Mohammed bin Rashid Al-Maktoum Foundation 2012 (reference in Arabic).
7. UNDP and Mohammed bin Rashid Al-Maktoum Foundation 2014 (reference in Arabic).
8. UNDP and Mohammed bin Rashid Al-Maktoum Foundation 2009 (reference in Arabic).
9. UNDP and Mohammed bin Rashid Al-Maktoum Foundation 2014 (reference in Arabic).
10. Mohammed Raouf Hamid 1999 (reference in Arabic).
11. Labib Al Taher and Elias Baydhoon 2007 (reference in Arabic).
12. World Commission on Environment and Development 1987.
13. World Bank 1999.
14. Labib Al Taher and Elias Baydhoon 2007 (reference in Arabic).
15. The latest 2012 report included 146 countries, 15 of which were Arab countries.
16. Nadir Fergani 2014 (reference in Arabic).
17. World Bank 2012.
18. Arab Planning Institute 2012.
19. Ali Al Hawat 2007 (reference in Arabic).
20. Refer to the chapter on "Pre-University Education Index" in this report.
21. Refer to the chapter on "Technical Education and Vocational Training" in this report.
22. UNDP and Mohammed bin Rashid Al-Maktoum Foundation 2014 (reference in Arabic).
23. Refer to the chapter on "Higher Education" in this report.
24. Refer to the chapter on "Information and Communications Technology" in this report.
25. Abdul Aziz bin Abdullah Al Sunbil 2002 (reference in Arabic).
26. Refer to the chapter on "The Economy" in this report.
27. Refer to the chapter on "Research & Development and Innovation" in this report.
28. Mohamed Adanan Wadie 2002 (reference in Arabic).
29. Renard 2001 (reference in French).
30. Mohamed Sabri Al Hout and Nahed Adly Shadly 2007 (reference in Arabic).
31. Yaman Mohammed Hafez Al Hamaqi (n.a) (reference in Arabic).
32. Hicks & Streeten 1979.
33. Drewnowski & Scott 1966.
34. The Regional Centre for Renewable Energy and Energy Efficiency 2015 (reference in Arabic).
35. In French: Plan bleu.
36. Energy efficiency in the construction sector in the Mediterranean.
37. The Arab Investment and Export Credit Guarantee Corporation 2013 (reference in Arabic).
38. Arab Planning Institute 2012 (reference in Arabic).
39. Arab Planning Institute 2012 (reference in Arabic).
40. UNDP 2009 (reference in Arabic).
41. Nakhleh Wahbe 2003 (reference in Arabic).
42. Demeuse & Blondin 2001 (reference in French).