

PART I:
Knowledge-based economy
and the digital divide



THE ROLE OF EDUCATION AND CULTURE IN BRIDGING THE DIGITAL GAP: A JOURNEY TO THE FUTURE

SHAWQI AL DALLAL

Ahlia University, PO Box 10878, Bahrain
Email:shaldallal@gmail.com

ABSTRACT

Purpose: Educational systems and culture are key drivers that shape the future of the Arab world. This paper highlights how bridging the digital gap could be achieved.

Methodology: In this work the interplay between the educational system and culture in the Arab world is examined. The digital gap between developing and developed countries is increasing at an alarming pace. This paper addresses how the Arab world can face the challenges resulting from this digital divide and proceed to implement a plan to close the digital gap.

Findings: This work highlights the main issues leading to the creation of the digital gap between developed and developing countries, and the role of the educational system in closing this gap is emphasised. It is shown that cultural issues are a determining factor in controlling this process, and that the move to the digital age requires a strategic plan in which education plays a decisive role.

Value: Education is a key factor in closing the digital divide between developed and developing countries. This process opens the gate wide to the world of knowledge creation and the knowledge economy.

Keywords: Educational system, Digital technology, Knowledge economy, Innovation, Science and Technology.

INTRODUCTION

Since antiquity, the human race has faced challenges of several dimensions. The rise and fall of civilisations has always been the outcome of complex circumstances where science, education, culture, and technology play a major role. Across history, the Middle East was always the cradle of great civilisations. During the past few centuries, however, the Middle East has witnessed a sharp decline in various disciplines affecting people's daily lives. This decline is deeply related to the region's incapability of coping with the emerging industrial revolution, and to the consequences arising from political issues resulting from World War 1 and World War 2. This aftermath situation is strongly reflected in the educational system in the Arab world, and has created cultural and social disorder that surfaced overall. A direct outcome of this situation is the emergence of a technological gap that transforms the Arabic world into a consumer society.

In this work, we examine the educational and cultural challenges that are facing developing countries in general and the Arab world in particular; we also propose a strategic scheme to bridge the technological gap. The emphasis will be on the role of educational and cultural issues in achieving the transformation of the society to a new horizon of prosperity.

THE EDUCATIONAL SYSTEM AND KNOWLEDGE CREATION

Education plays critical role in building capacity for a knowledge-based economy (UNESCO, 2015). It is driven by ideas aimed at fostering economic growth and promoting socio-economic transformation. Bridging the digital gap requires building the Information and Communication Technologies (ICTs) infrastructure to empower people taking part in the economy and contribute to its productivity (World Bank, 2016). Knowledge is a public good and can be obtained through trade, collaboration, technology transfer and joint research. Building capacity for the knowledge economy comprises four important elements; these include a highly skilled workforce, national innovation system, sound ICT infrastructure, and efficient institutional regime.

Human capital is an essential element in the economic prosperity and development of nations (World Economic Forum, 2016): it is the ingredient that enriches all aspects of modern life. An important question that arises is how education influences the human capital in the right way to achieve societal goals and contribute to its opulence (Asian Development Bank, 2010). Even though higher education emerged in the Arab world at the beginning of the last century, it was always lacking an ingenious strategic plan and a clear vision. Universities in the Arab World are rendered to institutions that focus on producing graduates with the

Bridging the Digital Gap

aim of satisfying the job market, rather than being armed with the crucial skills and critical thinking as necessary ingredients of basic knowledge creation.

Education is considered as a resource of human development required for economic and social transformation. Experience shows that education creates a conscious citizen and helps to develop the standard of living in a society. The focus on education as a societal capital relates to the concept of human capital that emphasises the importance of skills as a vital factor in production activities (Molz and Assenza, 2015).

The pressure exerted on higher education in many developing countries relies on the public and governmental perception of financial rewards, and on the belief that expanding education upholds economic growth. However, this belief remains paradoxical. Despite the huge investment in some Arab countries on education, there is little indication that economic growth is produced. A solution of this paradox involves examination of the educational system itself and its integration in a global national strategic plan that copes with all variables in our modern world. The failure of the educational system in universities to adhere to disciplines of academic freedom, research organisation, and structured programmes, are just a few of the challenges to be met. Universities, at the top of the educational pyramid, are encouraged to have joint ventures with industries and other institutions in a well-defined strategic plan. This process may lead to the creation and implementation of new knowledge and to the enhancement of economic growth. However, such vision will encounter serious difficulties, arising from the deeply embedded culture of an incapability of competing with more advanced countries.

The transformation of a society to a productive and world competitor requires the overcoming of many challenges. These challenges should be met in a national strategic plan: only governments can provide the necessary wide scale resources to implement such a plan. A key element in a successful plan is knowledge creation, and this requires a dynamic view in the reform of the educational system, and the implementation of an innovative scheme to enhance the economic outcome. In the following section we shall discuss these issues and their implications.

REFORM OF THE EDUCATIONAL SYSTEM

Many elements may contribute to the welfare of an educational system. We have chosen four elements that we think are among the most influential. These elements are culture, employability, entrepreneurship, and research. Each of these elements will be discussed separately in the following sections.

CULTURAL IMPACT

Culture is a strong factor that shapes the behaviour of human beings; how they think; how they behave; and how they face challenges. Culture is normally developed at home and in the societal space. However, the role of the educational system is to filter out the cultural paradigm from embedded old-fashioned traditional ideas, such as excluding women from being an effective workforce in the society. The educational impact on culture must start at a very early age and grow with the individual in their progress towards higher education. Successful educational systems are those capable of planting in individuals the spirit and character of an enquiring mind and critical thinking. Unfortunately, many Arab Universities today discard philosophical departments from their educational programmes. We know that philosophy has always been the driver of enquiring minds, and a fertile source for contemplating all aspects of the universe in which we live.

EMPLOYABILITY AND ENTREPRENEURSHIP

Employability skills are a set of achievements that reflects personal attributes of an individual and promotes their opportunities to gain employment and to be successful in their career (Ghoshal, 1997). On the other hand, entrepreneurship is the capacity and willingness acquired by graduates to organise, manage a business venture towards making profit, and enhance the economic infrastructure (Yetisen et al., 2015). Employability and entrepreneurship are two different roads to achieving the well-being of individuals. Today, they have become one of the most important elements taken care of in the programmes offered by universities in certain Arab countries. However, these skills are controlled strictly by the economic drivers in each country.

RESEARCH IN HIGHER EDUCATION INSTITUTIONS

Research is the gate to knowledge creation: it could have a vital impact on the economy. Unfortunately, research in most Arab Universities is derailed from its main objectives, and, in most cases, serves only promotion purposes. Furthermore, research in many Arab countries suffers from the absence of a well-defined strategic plan that could serve as an umbrella to coordinate research and direct it towards the actual and future needs of the society. Research is also considered as a culture that develops with individuals, and is continuously enriched by experience, communication, and collaboration. Unfortunately, the culture of conducting research is not reflected in the decision making bodies in the Arab world, where it is considered as a short-term endeavour to solve a temporarily arising problem.

Scientific research in most Arab countries is conducted in higher education systems, rather than in the private sector as in industrialised countries. This approach has the consequence of widening the gap between education and applied research.

Table 1 shows the poor role of the private sector in financing research (2.9%).

Table 1: Scientific research sources of financing in Arab countries

<i>Sources</i>	<i>Expenses in million dollars</i>	<i>Expenses (%)</i>
State budget	840.9	61.5%
University Budget	217.3	27.8%
Private sector	12.6	2.9%
External funding	61.5	7.8%
Total	1132.3	100%

Source: UNESCO, 2009

There are few research centres in the Arab world. At the beginning they focussed on basic sciences, but shifted subsequently to diversified programmes such as agricultural and medical sciences. Most of these scientific centres are functioning through ministries of higher education, universities, or other governmental establishments. Egypt currently has the largest number of research centres, of which 219 research centres are under the auspices of ministries, and 214 centres are at universities. In Tunisia, there are 33 research centres, comprising 139 laboratories and 643 branch research units. In the Arab world there are also a few technological research cities, such as the Science and Technology Park functioning under the umbrella of the Qatar foundation.

In the following we highlight some of the challenges that will be facing the Arab world in the coming few decades:

Energy Sources

Energy is the source of all human activity. The economy of Bahrain and the Gulf Corporation Council (GCC) countries, for example, relies mostly at present on gas and oil. The future perspective is that is that these resources will be depleted in the coming few decades. This can be seen to be catastrophic in all GCC countries if no new sources of energy are envisaged. GCC countries can set a plan to diversify their income, but that will not solve the problem of energy. Furthermore, for political reasons, the Arab world is prohibited from acquiring nuclear technology. In this case, the only way out of this dilemma is to develop systems of renewable energy, and a number of ideas have been proposed to develop this energy sector. In addition to solar cells, that normally require certain skills and know-how, other sources that

are derived from the local environment can be considered. As an example, energy can be extracted from the temperature difference between the surface and deep regions under the ground. This technique is highly promising in this part of the world, but requires a lot of research work and investment.

Water Management

Water resources that are potentially useful include uses in agriculture, industry, household, environment, and recreation activities. The majority of humans use fresh water: desalination is one the main sources of fresh water in the GCC countries today. However, desalination requires a lot of energy, and therefore water management is one of the most auspicious options to satisfy future needs. This can be achieved by constructing a network of storage facilities benefiting from the abundant rain in the rainy season.

Transportation System

The roads in the GCC countries in general, and in Bahrain in particular, are reaching their ultimate capacity. The growth in the number of vehicles on the road is a source of pollution and has a dramatic impact on the environment. This problem requires societal organisation and investment in an effective common transport system and associated infrastructure. The advancement of technology and the advent of electric cars will ultimately reduce traffic pollution; however, this also requires new sources of energy.

These are just few of the challenges that GCC countries will face in the near future. Other challenging problems are food security, and medical security. All the above challenges can be solved in the framework of digital technology.

Emerging Technologies: Nanotechnology and Advanced Materials:

Nanotechnology is an emerging field of research with an immense potential in a wide range of applications, including energy, transportation, telecommunication, household, aeroplanes, arms, and spaceships (Drexler, 1992). Many regional countries are considering nanotechnology as a strategic goal that could shape their economy in the future. The GCC countries, with the economic resources available today, can be key players in the landscape of nanotechnology in the future.

Another important development in the last two decades is the emergence of new advanced materials that may shape the future of science and technology in certain applications. Among these materials are metamaterials with potential applications

in invisibility, and particularly in military systems (Kshetrimayum, 2004).

For all of the above issues, digital technology can play a vital role, with education being the real driver of all these activities.

THE ROLE OF LANGUAGE IN KNOWLEDGE CREATION

National language is a fertile source of knowledge creation. Looking at the world map of developed countries, we discover that all these countries are adopting their own national language at all stages of their educational system. This is the case in all European countries, Japan, China, India, and Brazil. The national language can boost the thought of the human mind and enhance its creativity. Only a few Arab countries have realised the importance of the Arabic language in higher education. Syria has the most successful experience in this regard: its graduates have proved to have a high standard of professionalism and knowledge.

RESEARCH SYSTEM IN THE ARAB WORLD

The interest in science and technology in the Arab world was kindled after the Second World War, when most gained their independence. Universities took a new role in developing science and technology from the 1960s onwards. The oldest universities in the Arab world are Cairo University, Baghdad University, and the University of Damascus; these were established in the early 20th century. Other universities in the Arab world are relatively recent. Jordon University, for example, was founded in 1962, and its attached research centre, the Royal Scientific Society in 1970; however, it only adopted a science and technology in 1995. Saudi Arabia set its own science and technology national policy as recently as 2003. Today, many Arab countries possess no national policies or strategies for science and technology. Nevertheless, all Arab countries have sectorial policies, such as those for agriculture, water resources, and the environment.

HOW LONG WILL IT TAKE TO CATCH-UP WITH INDUSTRIALISED COUNTRIES

An important question is how many years are required to catch up with industrialised countries? It is very difficult to make such an estimation since this is a dynamic process. By the time developing countries have raised the level of their educational system, developed countries will have raised their system at a faster rate. However, we can compare the actual level of education in developed countries now and estimate the number of years required to reach the current level of education in developed countries. Table 2 shows that it will take at least three decades for South Asia, and almost a quarter of a century for sub-Saharan Africa to catch up with the current level of industrialised countries in average years of schooling. On

the other hand, Central Asia and Eastern Europe will take less than 10 years to do so. It is also interesting that, in general, it will take fewer years for females (16.8 years) in developing countries to catch up with their counterparts in developed countries than males (17.2 years); this is mainly due to the higher growth rate in females' years of schooling in the past 60 years. This is especially true in Central Asia, where it will only take 4.2 years for females to catch up with the current level of education of their counterparts in industrialised countries, compared with 12.7 years for males in Central Asia to do the same. On the other hand, it will take longer for females than males in South Asia and sub-Saharan Africa to catch up with their counterparts in industrialised countries due to the high level of gender disparity in these regions.

Table 2: Years to catch up with the current level of industrialised countries

Region	Male	Female	Total
Central Asia	12.7	4.2	7.6
East Asia and the Pacific	18.6	12.9	15.6
Eastern Europe	6.2	5.3	5.6
Industrialised countries	0.0	0.0	0.0
Latin America and the Caribbean	14.5	14.0	14.3
Middle East and North Africa	11.6	10.6	11.5
South Asia	26.9	29.7	29.3
Sub-Saharan Africa	22.8	25.1	24.2
World	17.2	16.8	17.0

Source: Asian Development Bank, Manila 2010

CONCLUSIONS

The educational system is a key factor in determining the future of developing countries. It is the road to knowledge creation and can effectively enhance the pace of development. It can have also a decisive role in the transfer of technology and its implementation. An important aspect of any educational system is to evaluate the role of language in knowledge creation, and set a plan to focus on the national language as a source of promoting thoughts and contemplating new horizons of advancement. Research systems in the Arab world are still suffering from cultural drawbacks that are a direct reflection of the shortfall of the educational system to achieve its objectives.

Looking into the future, research work must be oriented to find solutions to a number of challenging problems, such as energy, water resources, transportation,

and other vital fields related to the welfare of human beings. Research must also be focussed on new emerging fields of technology that will shape the future of the human being in the coming decades, and particularly nanotechnology. The digital age is a key factor that can serve as an umbrella to bridge the gap between the present and the future.

REFERENCES

- Asian Development Bank (2010): Human Capital Development, Manila ADB.
- Drexler, K.E. (1992): Nanosystems: Molecular Machinery, Manufacturing, and Computation. New York: John Wiley & Sons. ISBN 0-471-57547-X.
- Ghoshal, S. (1997): The Individualized Corporation: An Interview with Sumantra Ghoshal, *European Management Journal*, Vol. 15, No. 6, pp. 625-632. doi:10.1016/S0263-2373(97)00046-7.
- Kshetrimayum, R.S. (2004): A Brief Intro to Metamaterials, *IEEE Potentials*, Vol. 23, No. 5, pp. 44-46. doi:10.1109/mp.2005.1368916.
- Molz, M. and Assenza, G. (2015): Two paradigms of higher education, Modernist and Transformation, 19 February 2015, working paper No. 1, version 21.
- UNESCO (2009): Scientific research sources of financing in Arab countries, UNESCO Report 2009, Paris, 541pp.
- UNESCO (2015): Rethinking Education, towards a global common good, Paris, UNESCO.
- World Bank (2016): Digital Dividends, World Development Report 2016, Washington World Bank, Geneva.
- World Economic Forum (2016): The Human Capital Report, Switzerland.
- Yetisen, A.K., Volpatti, L.R., Coskun, A.F., Cho, S., Kamrani, E., Butt, H., Khademhosseini, A. and Yun, S.H. (2015): The University Entrepreneur, *Lab Chip*, Vol. 15, No. 18, pp. 3638-60. doi:10.1039/c5lc00577a. PMID 26245815.

BIOGRAPHY

Prof. Shawqi Al Dallal, a Bahraini national obtained his BSc in Electrical Engineering from Baghdad University and DEA, Doctorat d'Ingenièrre, Doctorat d'Etat from Universty Piere et Marie Curie - Paris, France. Chairman, Dept. of Physics; Dean, College of Science (Bahrain University: 1985-1995). Dean of Graduate Studies and Research, Acting Dean of the College of Medical and Health Sciences, Ahlia University, 2010-present).

Al Dallal

Founding member and Chairman of Bahrain Astronomical Society (1991-present, 6 times). Founding member and Vice president of Arab Union of Astronomy and Space Science (1998-present). Prof. Al Dallal organized twelve regional and international conferences, and participating in more than seventy regional and international conferences. Teaching a wide spectrum of courses in Physics and Engineering. Published over 116 papers in reputed international journals in the fields of Advanced Materials, Energy, Astronomy and Astrophysics, and Nanotechnology and his book “Encyclopedia of Astronomy and Astrophysics and Space Science”, and other books on Astronomy and a textbook on Laser Physics.