

KNOWLEDGE-BASED ECONOMY

5.1 INTRODUCTION

A knowledge-based economy is defined as “an economy that is capable of knowledge production, dissemination and use; where knowledge is a key factor in growth, wealth creation and employment, and where human capital is the driver of creativity, innovation and generation of new ideas, with reliance on information and communication technology (ICT) as an enabler”. Moreover, there is a positive correlation and mutual interaction between the “knowledge society” and the “knowledge-based economy”. In addition, “knowledge” has become a critical requirement for enhancing competitiveness of countries in the twenty first century.

Theory, experience and present international practices affirm that contemporary global drivers of economic growth are different than in the past. More than ever before in human history, the economy is now dependent on the knowledge factor for growth. To respond positively to these developments and ensure enhancement of competitive capacities of the national economy, it is essential for economic policies to pay attention to knowledge; i.e., to innovation and its utilisation in all sectors, the new role of technology, entrepreneurship, education, lifelong learning, sharpening the skills of the workforce, and moving from hierarchical to horizontal management structures, along with benefiting from more efficient electronic transactions and communication networks.

The Eighth Development Plan focussed on fundamental developments that laid the basis for heading towards a knowledge-based economy. These included starting implementation of the first five-year plan of the National Science, Technology and Innovation Policy; adopting the National ICT Plan, the National Industrial Strategy, and the Strategy and Plan for Giftedness, Creativity and Supporting Innovation; establishing the Knowledge Economic City in Medina, and the Technology Zone of the Saudi Organization for Industrial Estate and Technology Zones in Dammam; proceeding with preparation of a new strategy for higher education (AFAQ); and advancing privatization.

The Ninth Development Plan adopts the drive towards a knowledge-based economy through focussing on education, which disseminates knowledge, paving the way for knowledge transfer and accumulation and thereafter knowledge generation, and utilisation of knowledge in various economic and social sectors, particularly in production and service activities. Through these endeavours, the Plan seeks to enhance the comparative advantages of the economy, add to it new competitive advantages, diversify it, and increase its productivity and competitiveness, as well as create appropriate employment opportunities for citizens.

This chapter presents an analysis of the current conditions and the key issues and challenges facing efforts to move towards a knowledge-based economy. In addition, the future vision, overall objectives, policies, and targets adopted by the Ninth Plan for seeking a knowledge-based economy are outlined.

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5.2 CURRENT CONDITIONS

5.2.1 Dissemination of Knowledge

From kindergarten all the way to post-university education, education is the principal means for dissemination of knowledge in society. As a result of the drive towards knowledge societies internationally, interest in children education, particularly pre-school education, mounted, as evidenced by the launch of several global programmes. In the Kingdom, statistics compiled by the Ministry of Education point to some progress, with the number of children enrolled in kindergartens increasing from 28 thousand in 1980 to 103.1 thousand in 2008.

General education constitutes the foundation for the capacity building required by the drive towards a knowledge-based economy. The chapter on human resources in this document addresses the current condition of general education in the Kingdom. King Abdullah's programme for education development (Tatweer) has been launched, with the aim of addressing issues at all levels of education needing

further attention, such as: quality of education; teacher training; curriculum development to focus on science, technology and mathematics; expansion of skill-development activities, particularly analytical thinking and hands-on skills; initiative; innovation; entrepreneurship; languages; and future and emerging sciences.

Higher education is one of the most important stages of the build-up towards a knowledge-based economy. The chapter on human resources development points out certain issues requiring development that have a direct impact on dissemination of knowledge, namely:

- Smallness of number of Master and PhD students and size of research-and-development (R&D) activities. The number of students enrolled in Master programmes increased from 5312 in 1994 to 9768 in 2006, and in PhD programmes from 1203 to 2410. During the same period, the number of Master-degree graduates increased from 615 to 1291 and PhD graduates from 163 to 228. These are small numbers by international standards; a failing that reflects negatively on R&D.
- Dearth of intermediary institutions linking higher education with production and service activities, such as business and technology incubators, science and technology parks, and venture-capital companies. The number of incubators in the Kingdom is five only, whereas the average number of incubators in developed countries is estimated to be six per million people.

5.2.2 Knowledge Transfer and Indigenisation

The Kingdom aims for transfer and indigenisation of knowledge, and thereafter its generation internally through several channels including transfer of technology by private-sector companies and their partnerships with leading foreign companies, and cooperation with outstanding international scientific institutions to establish research universities and centres in the Kingdom. In this regard, King Abdullah University for Science and Technology and a number of private universities have been launched.

King Abdul-Aziz City for Science and Technology adopted technology transfer as one of its objectives. This objective is being achieved through a variety of means. In 2008, KACST drew a roadmap for implementing the Indigenisation of Strategic and Advanced Technologies Programme, which is one of the most important in technology transfer and development.

In addition, companies such as Saudi Arabian Oil Company (ARAMCO), Saudi Basic Industries Corporation (SABIC), and the companies of the Offset Programme, particularly in the field of electronics, are carrying an important technology-transfer-and-indigenisation activity. ARAMCO has worked on transfer and indigenisation of technology in the oil industry, establishing two R&D centres for that purpose. SABIC also has made similar efforts in the petrochemical technology transfer, expanding its SABIC Industrial Complex for Research and Development in Riyadh.

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5.2.3 Knowledge Production

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Production of knowledge is carried out through R&D and innovation activities. The first five-year plan for Science and Technology envisaged implementing programmes and projects worth SR7.9 billion in 2008, which constitutes a significant development in financing knowledge production activities. Moreover, in 2006-2007, the number of research centres at Saudi universities increased, with the establishment of seven research centres of excellence for environmental studies, medical genome sciences, oil refining and petrochemicals, renewable energy, materials engineering, biotechnology, and research on dates and palm trees. In addition, 32 training programmes were implemented within the framework of a project for innovation and excellence. Furthermore, several private-sector companies have realized the importance of R&D centres or units, and started to establish such centres, which would in due course lead to raising the knowledge content of their products and services.

5.2.4 Utilisation of knowledge

A knowledge-based economy is based on utilisation of the outputs of the knowledge system to create new products and services through innovation. Although, according to the Global Innovation Index, innovation in the Kingdom is still a significant challenge, a springboard for development of innovation has been put in place. For example, national industries have developed significantly over the past three decades, and now have strong bases of knowledge upon which to build towards the new economy, particularly with the adoption of the National Industrial Strategy, and its implementation mechanism that espouses knowledge-based economy, and the Strategy for Giftedness, Creativity and Innovation.

5.2.5 Favourable Environment

Dissemination, transfer, and production of knowledge require a favourable environment that provides the following five key elements:

❑ *Information and Communications Technology (ICT) infrastructure*

ICT performs two essential roles: providing the infrastructure to store, accumulate, transfer and disseminate knowledge; and constituting in itself a knowledge-based production and service sector. In both aspects, the Kingdom has made concrete progress towards a knowledge-based economy. The chapter on ICT reviews the current conditions, characterised by moving from dealing with information to dealing with knowledge, through, for example, use of expert systems, characterization of information, data and information mining, and knowledge management systems; as well as having ultra-advanced computers, such as distributed and parallel computers, which began to be used in King Abdullah University of Science and Technology. In addition, there has been a remarkable increase in the number of fixed and mobile telephone, internet and broadband subscribers to levels appropriate for moving towards a knowledge-based economy, particularly if the current rates of development are maintained.

❑ *Intellectual Property*

Intellectual property rights secure ownership of industrial, scientific, literary, artistic, and other outputs of intellectual activity. The Kingdom has achieved significant progress in protection of intellectual property rights, which was a requirement of WTO membership and is important for attracting foreign companies. Intellectual property in the Kingdom is classified according to two categories: industrial intellectual property, including patents, trademarks, industrial designs; and literary or copyrighted intellectual property. For example, the rights of inventors are protected through the patent law, which was issued by Royal Decree No. M/38 of 1989. By the end of 2008, a total of 1918 patents and 515 industrial designs were granted.

❑ *Regulations and legislation*

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In adaptation to local, regional and international developments, regulations and laws that affect dissemination, transfer, production and utilisation of knowledge need to be developed.

❑ *Support Services*

Knowledge support services are important for establishing and developing a knowledge society and a knowledge-based economy. Though such services are being provided at a good level, there is room for improvement. The most important of these services include:

- a. Services providing digital content, such as libraries, databases, and websites have been developed in the Kingdom, with numerous major libraries, as well as with support from King Abdullah Initiative for Arabic Content, which was launched in 2007, and other initiatives.
- b. Specifications and standards services provided by the Saudi Standards, Metrology and Quality Organization.

- c. Laboratories in several institutions, such as the Ministry of Commerce and Industry, the Saudi Arabian Oil Company (ARAMCO), and King Abdul-Aziz City for Science and Technology.
- d. Scientific societies that play an important role in supporting and organizing knowledge activities and initiatives, which in 2007 numbered more than 75, distributed among the universities.

□ ***Awareness, enlightenment and information***

The Ministry of Culture and Information is the government agency responsible for visual, print, and audio media. It provides its services through radio and television broadcasting networks, as well as through printing, publishing and distributing books. Despite developments in radio and television services, there is still a crucial need for increasing the proportion of audio-visual programmes and materials related to transfer, production and utilisation of knowledge. In turn, this requires development of cultural and information policy to meet requirements of the knowledge society.

5.2.6 Projects Enhancing the Knowledge-Based Economy

Under the Eighth Development Plan, several major public and private projects in various regions of the Kingdom were implemented. Paving the way to a knowledge-based economy, these include investment projects aimed at diversifying the economic base and achieving balanced development among the regions of the Kingdom, such as mining, ICT and petrochemical projects, the costs of which are estimated to reach around SR54 billion in 2009, in addition to projects for service delivery to existing industrial cities at a cost of SR2 billions. While enhancing the comparative advantages of the Kingdom, these projects also contribute to transforming such advantages into competitive advantages (Box 5.1).

Box 5.1: Most Important Supporting Projects for Building a Knowledge-Based Economy:

1. Economic cities under the Saudi Arabia General Investment Authority (SAGIA), namely:
 - King Abdullah Economic City in Rabigh.
 - Prince Abdul-Aziz Bin Musaed Economic City in Hail.
 - The Knowledge Economic City in Medina.
 - The Economic City in Jizan.
 - Establishment of two economic cities in Tabuk and the Eastern Region is being considered.
2. The Technology Zone in Dammam (Saudi Industrial Property Authority).
3. The ICT Park in Riyadh (High Commission for the Development of Riyadh)
4. The New Industrial Zones Projects that will be set up in various regions of the Kingdom to implement the Programmes of the National Industrial Strategy.
5. The e-Governmental Electronic Transactions Programme (YESSER).
6. The Riyadh Techno Valley and the Knowledge Oasis, within the Knowledge Centre Programme and the Knowledge Corridor Programme (Ruwaq) at King Saud University.
7. King Abdullah University of Science and Technology.
8. King Abdullah Scholarship Programme.
9. King Abdullah Programme for Development of Education.
10. King Abdullah Initiative for Arabic Digital Content.
11. King Abdullah Financial District in Riyadh.

5.3 ISSUES AND CHALLENGES

5.3.1 Education and Dissemination of Knowledge

To establish a learning pattern that develops analytical thinking, advances acquirement of practical skills, and promotes initiative and entrepreneurship, the system of education needs to address a set of issues ranging from curriculum development, lifelong learning, linking education with development, Arabization of knowledge, to privatization (Box 5.2). Such a learning pattern is crucially important for achieving a knowledge-based economy and a knowledge society, through development of the system of education, from early childhood education, which requires great efforts, all the way to post-university education, which requires expansion and more resources. In turn,

development of the system of education requires implementation of a national teacher-training programme, provision of the laboratories necessary for scientific and practical skill formation, and an ICT infrastructure in education.

Box 5.2: Main Education Issues in the Kingdom

- Arabization of knowledge: For the efforts and investments directed towards building a knowledge society to succeed, knowledge and scientific and technical information should be in Arabic, since language is the vessel within which knowledge develops. However, Arabization does not mean lessening interest in learning foreign languages; rather, that the issue of foreign languages proficiency should be dealt with independently of using them as a medium for learning.
- Curriculum Development: At all levels of the system of education, current science and mathematics curricula are deficient and need to be adapted to present and future needs of Saudi society.
- Lifelong Learning: There is a strong correlation between the number of years of learning and the capacity of the individual worker for acquiring and assimilating knowledge and technologies. Hence, lifelong education has become one of the most important requirements of moving towards a knowledge-based economy. Lifelong learning policies and programmes in the Kingdom need to be revised to increase their effectiveness in improving capabilities of the national workforce in all production sectors.
- Linking education with development: Education has the largest share in government budget allocations. As a result, the Kingdom made large strides in, for example, reducing illiteracy rates, increasing enrolment rates at all levels of education, and establishing universities and vocational and technical training colleges in various regions. However, effective solutions for aligning outputs of the system of education (supply) with labour market requirements (demand) are needed to rectify an imbalance that has led to unemployment among university graduates.
- Privatization of education: Privatization of education varies from one country to another. Indeed, there are several forms of privatization: private ownership, finance, management, services, or total privatization. However, to maintain values, heritage and particularities of society, educational policies and objectives remain the responsibility of the State. Hence, in addition to supporting, regulating and monitoring private education, in accordance with precise principles and a clear and firm strategy, privatization of education programmes should be adopted in specific educational stages.

5.3.2 Transfer and Indigenisation of Knowledge

Knowledge is manifested in what is known as the knowledge content, which is an intangible asset that takes multiple forms in the both economy and society. Hence, indigenisation of the knowledge content in a knowledge-based economy amounts to formation of a national fortune. In the transfer and indigenisation of knowledge, the Kingdom faces many challenges related to knowledge content in products and services, as well as in exports and imports, in addition to the challenges related to digital content on the internet. Moreover, the challenges of attracting the best brains and benefiting from international cooperation are also important (Box 5.3). Meeting such challenges requires more efforts, as well as adoption of policies and measures to increase knowledge content in all activities and fields.

5.3.3 Knowledge Production Capabilities

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Knowledge is produced through scientific research, technological development, and innovation. All three need to be increased in all sectors, as long as their outputs are in conformity with the requirements of the national economy. This requires facing many challenges, notably: intensifying efforts to build the necessary capacity for absorbing and indigenising knowledge; increasing material and human resources for research, development and innovation; expanding applied research and innovation; cultivating knowledge that developed countries compete to possess but do not disseminate or exchange and motivating the private sector to produce such knowledge (Box 5.4).

Box 5.3: Main Challenges in Transfer and Indigenisation of Knowledge Content

- Knowledge content in products and services: Increasing knowledge content in products and services and measuring such an increase are of great importance. Many countries seek to implement measurement programmes in various development sectors. Hence, to achieve higher added value in products, increase productivity and enhance global competitiveness, there is a need for raising the knowledge content in goods and services in the Kingdom.
- Knowledge content in exports and imports: The United Nations Industrial Development Organization (UNIDO) World Industry Report adopts a number of indicators to measure the extent of progress towards a knowledge-based economy, including the share of high and medium technology exports and imports in total exports and imports. These indicators need to be reviewed in order to identify the criteria for upgrading the knowledge and technical content in exports and imports.
- Knowledge digital content: This refers to the quality and quantity of knowledge available in Arabic on the internet. At 0.4% of the total on the internet, this content is still miniscule. King Abdullah's Arabic Content Initiative, launched in 2007, is an important step in addressing this issue. King Abdul-Aziz City for Science and Technology is undertaking the implementation of this initiative. However, there is a need for doubling the efforts being made to increase the Arabic digital knowledge content.
- Enlisting brainpower: Most developed countries, as well as countries aspiring to development, adopt policies to attract brainpower, particularly in science and technology. Policies for recruitment of foreign manpower as well as Saudization policies, should be designed to enhance the knowledge and technical contents of the economy. Seeking to attract the best brains from all over the world, King Abdullah University of Science and Technology is playing an important role in this regard. Recruitment and Saudization policies should therefore be developed in line with a vision set to meet the requirements of the transition to a knowledge-based economy.
- International cooperation agreements: Transfer of knowledge is one of the important benefits that countries seek through bilateral or multilateral cooperation agreements, which identify the nature of knowledge and technologies to be transferred, who is going to transfer it, the agreed-upon time frame, and the financing of the transfer process. The Kingdom should enhance the benefits derived from cooperation agreements with various countries, as well as with regional groupings, such as the European Union, and international organizations, such as the United Nations.

Box 5.4: Main Challenges in Building Capacity for Knowledge Production

- Building the necessary capacity to assimilate and indigenise knowledge, through developing knowledge-based human resources, establishing specialized institutions, strengthening scientific technological development and innovation, providing an appropriate regulatory and administrative environment, and financing of all kinds.
- Expanding material and human resources for research, development and innovation, through increasing the number of institutions and laboratories, as well as scientific-research workers in universities, in addition to increasing the ratio of teachers' hours allocated to research to teaching hours.
- Focusing research, development and innovation on areas important to the national economy, with the aim of addressing the relative imbalance between basic and applied research, development and innovation; an imbalance that is manifested in the number of R & D units, number of employees and total funding. In addition, research and development programmes should be under contract with the production and service sectors, not merely geared to academic publication and career promotion.
- Basing production of new national goods and services designed for global competition on competitive models of research, development and innovation, usually built by local capabilities, rather than imported.
- Motivating the private sector (national and foreign) to increase knowledge production, along with expanding partnerships between the private sector and the national system of research and development, in order to increase knowledge production nationally.

5.3.4 Transforming Knowledge into Products

Education, training, and research and development transform wealth into knowledge. For the knowledge circle to be completed economically, knowledge should be transformed into wealth. In order to achieve this, the Kingdom has to resolve several issues, notably: support and increase of investment in knowledge activities in both the public and the private sectors; development of giftedness and creativity and expansion of their programmes; quantitative and qualitative expansion of intermediary institutions to interface education and R&D with production activities and services; and promotion of private sector participation in knowledge transfer, indigenisation, dissemination and

exploitation (Box 5.5).

Box 5.5: Main Challenges in Transforming Knowledge into Products

- Investment in knowledge activities: Public and private investments in application and use of knowledge need substantial support, particularly in view of persistent challenges in relation to economic diversification, productivity and competitiveness. Despite advances made, economic returns on investments are still relatively low because of the weakness in their knowledge content.
- Giftedness, creativity and innovation: Growing interest in developing talent, creativity and innovation has been manifested in the adoption of a National Strategy for Fostering Giftedness, Creativity and Innovation, the establishment of the King Abdul-Aziz and His Companions Foundation for Giftedness and Creativity, and the establishment of the King Abdullah University of Science and Technology. Nonetheless, more efforts are needed to enhance the thrust of the drive towards a knowledge-based economy, and achieve excellence in universities and higher-education institutes, as well as of scientists, technologists and innovators.
- Intermediary institutions: Institutions that interface education and R&D with production and services sectors play an important role in transferring the results of R&D to production lines and services and transforming knowledge into wealth. The Kingdom has begun to provide numerous forms of such institutions. Some are at universities, such as liaison offices; others at production sites, such as employment, training and qualification offices. Some are independent, such as “technology licensing organizations”. Others link R&D and educational establishments spatially or geographically with production activities and services, such as technology parks, knowledge cities of various kinds, centres of excellence, centres of technology transfer, and technology incubators, in addition to venture capital banks, funds and firms of all kinds. Nonetheless, more needs to be done. This brings into highlight the need to accord increasing attention to these institutions to finance the process of link-up between innovation and production lines.
- Participation of the private sector: Increased private-sector participation in knowledge transfer, indigenisation, dissemination and accumulation, and in particular investment, is one of the main issues of the knowledge-based economy, particularly within the context of state efforts aimed at effecting private-sector led development. For the private sector to be able to carry out this task, it needs to develop radically its knowledge and technological base with support from the state.

5.3.5 Knowledge Management

Knowledge management has become a common worldwide practice. Among the issues and challenges that need to be addressed under the Ninth Plan are:

- Devising a roadmap for the knowledge-based economy by the relevant authorities.
- Coordinating among the numerous national knowledge-based economy initiatives.
- Adopting knowledge-management systems.
- Providing a variety of incentive packages for investment in knowledge-related activities.
- Applying quality standards, such as ISO 9000 and ISO 14000, in government agencies, in order to improve quality of work.
- Adopting digital indicators for assessing progress towards the knowledge-based economy and the knowledge society, and measuring this progress periodically during the Ninth Plan, through collaboration among the Central Department of Statistics and Information, King Abdul-Aziz City for Science and Technology, and the Ministry of Communications and Information Technology.

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5.3.6 Knowledge And Community

Moving towards a knowledge-based economy requires promoting the interest of citizens in knowledge and its sources, and increasing awareness of the importance of teamwork and team spirit, for without them, modern knowledge production would be difficult. In addition, a strengthened sense of the mission of the Kingdom, and increased awareness of its weight regionally and globally would accelerate the drive towards the hoped for objective.

5.4 DEVELOPMENT STRATEGY

5.4.1 Future Vision

By 2024, the economy of the Kingdom will have made great strides towards becoming knowledge-based, relying on a society that provides individuals with quality education, skills and experience, and will have begun to approach the levels of developed countries in this respect.

5.4.2 Objectives

- Promoting human development, dissemination of knowledge, and expanding available opportunities for community members to acquire knowledge, skills and experience.
- Strengthening efforts to transfer knowledge and its indigenisation in all economic and social sectors.
- Upgrading knowledge-production capabilities in all economic and social fields.
- Raising the level of knowledge content in production and service activities in the public and the private sectors
- Providing the needed technical, administrative and organizational environment, as well as the ICT infrastructure.
- Reducing the knowledge gap among regions, increasing awareness of citizens of the importance of knowledge, and increasing Arabic digital content.

5.4.3 Policies

- Adoption of mechanisms leading to increased dissemination of knowledge bases, thereby enabling knowledge transfer, and thereafter indigenisation, production and exploitation, as part of the drive towards a knowledge-based economy, through the following measures:
 - Providing education opportunities, improving enrolment rates, and reducing dropout rates at all levels of education, as well as enabling education to meet requirements of development and assimilate new knowledge.

- Developing graduate studies and increasing enrolment in them, as well as linking their work and outputs to the knowledge economy.
- Promoting giftedness, innovation and leadership.
- Developing Saudi manpower training programmes attuned to modern knowledge and technology.
- Developing educational curricula to keep up with knowledge developments.
- Arabizing science and technology and increasing Arabic digital content.
- Introducing product development skills in curricula, developing entrepreneurship, and teaching technologies.
- Working towards expanding knowledge transfer and knowledge-indigenisation capacities in all economic and social activities, through the following measures:
 - Entering into contracts to import, transfer and invest in knowledge, in addition to maximising knowledge transfer and indigenisation benefits from international cooperation agreements and programmes, and directing bilateral cooperation committees towards focussing on knowledge transfer.
 - Motivating the private sector to enter into partnerships or agreements to buy the outputs of major knowledge corporations.
 - Encouraging importation of goods and services with a high knowledge content.
 - Effective implementation and follow up of technology transfer provisions in the Economic Offset Programme.
- Achieving significant increases in public and private knowledge-generating activities, through the following measures:
 - Increasing funding for scientific research and technological development in universities and research institutions in all

government sectors.

- Motivating and supporting the private sector to expand its research, development and innovation activities.
- Encouraging establishment of research complexes, where small and medium enterprises could be incubated.
- Improving the knowledge content of goods and services produced in the Kingdom, with the aim of enhancing productivity and competitiveness, through the following measures:
 - Strengthening the science and technology system and entrenching its linkages with the production and service sectors.
 - Encouraging the private sector to move towards knowledge-based, high value-added activities.
 - Directing economic cities and development corridors towards increasing knowledge activities.
 - Establishing intermediary institutions to interface education and R&D with the productive and service sectors; such as incubators, technology parks, centres of excellence and industrial solidarity centres (centres for collaborative R&D and technology transfer for a specific industry).
 - Developing policies and funding channels for supporting the drive towards a knowledge-based economy and increasing investment in knowledge transfer and knowledge generation.
 - Providing more incentives to joint ventures and foreign direct investment in knowledge transfer and indigenisation.
- Providing an appropriate environment (technical, structural, systemic, financial, and administrative) for knowledge management, through the following measures:
 - Optimum use of ICT.
 - Providing institutional and regulatory environment appropriate to informatics, benefiting from successful

international experience.

- Developing a knowledge management infrastructure.
 - Adopting indicators to measure progress in moving towards a knowledge-based economy.
 - Improving the administrative and regulatory environment for knowledge exchange.
- Raising the knowledge level of members of the community, through the following measures:
 - Reducing the knowledge gap and the digital divide among all regions and among various social strata.
 - Preservation of the Arabic language and utilizing it in developing a knowledge society.
 - Cultivating the interest of citizens in, and increasing their awareness of, the importance of knowledge and its impact on their advancement and that of their society.

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5.4.4 Targets

- Continuing to increase funding for R&D and innovation to 1% of GDP by the end of the Ninth Plan; in line with the Science and Technology National Policy (STNP), with an aim to reach 2% of GDP by 2024.
- Doubling enrolment rates in preschool (kindergarten) education.
- Encouraging the private sector to expand its spending on R&D and innovation, to have its share of total such expenditure reach 23% by the end of the Plan.
- Increasing the number of (male and female) students who benefit from “giftedness and creativity” initiatives, to reach around 14 thousand annually by the end of the Plan.
- Upgrading the quality of science and mathematics education in the entire educational system and increasing the number of their teaching hours by the end of the Ninth Plan.

- Increasing private sector participation in education at all levels.
- Increasing industrial value added by the end of the Plan to around one and a half the 2009 level, in line with the National Industrial Strategy.
- Increasing the proportion of technology-based industrial products from 30% to 45% of total industrial production by the end of the Plan.
- Increasing the ratio of industrial exports from 18% to 26% of total exports by the end of the Plan.
- Developing specifications and standards systems in all areas.

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