

THE ROLE AND IMPLICATIONS OF TECHNOLOGY AND INDUSTRIAL BASE IN THE DEVELOPMENT DYNAMICS OF SAUDI ARABIA

Anis-ur -Rahmaan

School of Environmental Design
King Abdulaziz University
Jeddah, Saudi Arabia

ABSTRACT. The purpose of this paper is twofold. First, to analyse the historical role and implications of technology and industrial base in the development dynamics of various social systems in general, and that of Saudi Arabia in particular; and second, to attempt to anticipate the role and implications of technology and industrial base on the future socio-economic and physical development of Saudi Arabia.

Substantively, the paper is comprised of three parts. Part one deals with the introductory and the interacting aspects of technology, industrialization and development. Part two attempts to assess the role of technology and industrialization on various consequential aspects of development in Saudi Arabia in the light of empirically substantiated concepts prevalent in various countries of the world; it also goes into conceptual dilemmas and implications of technology and industrialization, encountered during the process of development. Finally, part three highlights the salient conclusions and recommendations of the study.

1. INTRODUCTION

The term "development" as employed in this paper covers the entire gamut of socio-economic and physical changes by which a social system "moves away from a condition of life widely perceived as unsatisfactory in some way toward some condition regarded as 'humanly' better. These changes may be gradual or mutational" [1]. Also, as further pointed out by Goulet, the term "simultaneously designates two realities: a terminal *condition* and a *process* by which successive approximations to this allegedly desirable condition are made."

Although the development phenomenon is dependent on a number of parameters which are not only changing at differential rates but are also at great variance in different geographic and cultural settings, yet the two most significant factors which provide the greatest impetus to the process of development are technological advancements and industrialization. Both the factors should, however be reckoned as the "means" rather than the "goals" of development. In other words, technology and industrialization are linked with development by "cause" and "effect" relationship. As illustrated by figure 1, they set into motion the interacting development processes of (a) structural changes in the employment pattern, (b) urbanization and (c) inter-regional disparities. These interacting processes are regulated and modified by the conceptual dilemmas which have their roots in the cultural orientations of different social systems.

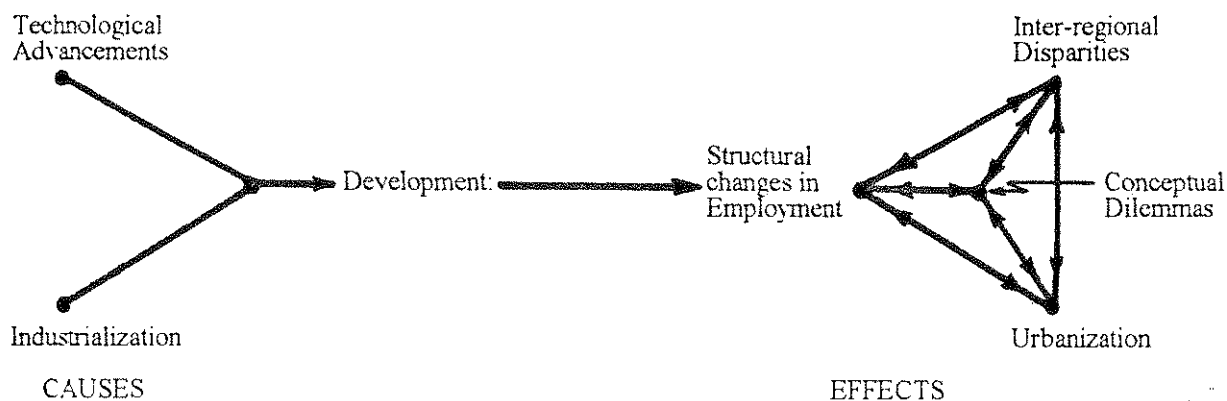


Figure 1: Functional Flow-chart for the study of the role and implications of technology and industrialization on development dynamics.

2. THE CONSEQUENCES OF THE DEVELOPMENT PROCESS

The development process, being multifaceted and highly complex phenomenon, has been variously interpreted by the social scientists. As a consequence, different professions measure the nature and the extent of development within their disciplinary confines. This section attempts to assess the role of technology and industrialization on the three consequential aspects of development (figure 1) in Saudi Arabia in the light of internationally substantiated concepts pertaining to these aspects; and also outlines some of the resultant conceptual dilemmas.

2.1 Structural Changes in Employment

Industrial development invariably brings in its wake structural changes in the economically active population of a social system. Fourastie [2], a French economist, has provided a very lucid explanation of the shifts in the occupational structure of a society. He has advocated that the current era of industrialization is a "transitory period" in the history of mankind during which societies transform from "primary" (agriculture based) to "tertiary" (service occupation based) civilization.

Diagrammatically, Fourastie's thesis (figure 2) is illustrated by the percentage shifts of the economically active population to the three sectors of economy, viz., primary, secondary and tertiary. Fourastie has divided the transitory period into three stages according to the job generation capacity of the three sectors of economy. During the first stage of "take off" industrial job generation is great, which absorbs the labor force rendered surplus in the primary sector, increasing the total share of the economically active population in the secondary sector from less than 10 percent to about 35 percent. The second stage of "expansion" is characterized by fast technological progress which reduces the job creating capacity of the secondary sector, and brings sharp increases in the tertiary sector employment with a continued decrease in the employment capacity of the primary sector. The third stage of "achievement" is marked by very fast technological progress, resulting in a decline of the secondary sector's relative role as a generator of added employment, and continuation of growing employment trends in the tertiary sector with respective employment decreases in the primary sector.

Jackobson & Prakash [3] have investigated the occupational shifts and urbanization patterns in eight developed as well as developing countries. Their study revealed that Fourastie's conceptualization of three sequential stages of transitory period was valid in all of these countries, although their temporal occurrence and the rates of growth and decline of employment capacity were different in each country depending on the level of prevalent technology. Also, in none of the countries under study, the third stage of 'achievement' had clearly begun.

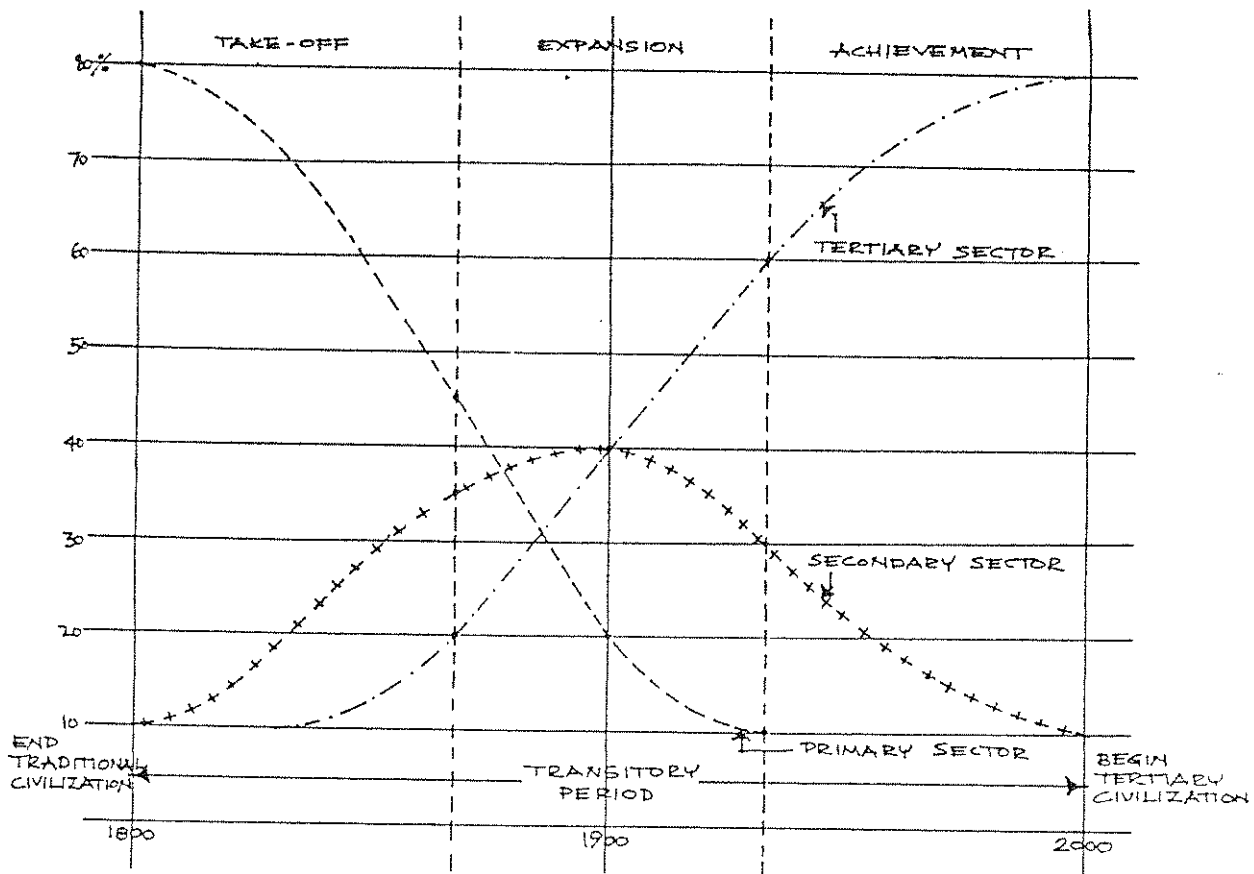


Figure 2. Percentage shifts of economically active population during Fourastie's "transitory period"
 Source: Fourastie, op. cit. (translated by Jakobson)

A fulfilled time series analysis of structural changes in employment in the three sectors of economy in Saudi Arabia is not possible due to lack of data. However, table 1 provides an idea of the fast structural changes in employment of these sectors in Saudi Arabia during a rather short period of about fifteen years (1974-1989/90). The percentage of economically active population during this period decreased from 42.4 to 10.8 in the primary sector, and increased from 44.5 to 66.4 in the tertiary sector in Saudi Arabia. In case of secondary sector, the percentage increased from 13.1 to 29.2 during the 1974-85 period and declined to 22.8 in 1990. A comparison of the relative shifts in economically active population in the three sectors in Saudi Arabia with those in Fourastie's Scheme clearly manifests that: (a) the secondary sector in Saudi Arabia is highly capital intensive; (b) the country is passing through a period of industrial expansion; and (c) is heading towards tertiary civilization. The fast growth of tertiary sector in Saudi Arabia is not only indicative of the fast pace of urban development but is also due to the extension of health, educational and other service facilities to the rural areas. In the process of rapid transformation, Saudi Arabia has even by-passed the long route composed of time consuming sequential steps which took European countries centuries to traverse [4].

2.2 Urbanization

Second consequence of development which occurs concomitantly with the structural changes in economically active population is "Urbanization". The dynamics of physical environment can perhaps be best explained in terms of temporal changes in the level of urbanization [5] which appear to have the following salient characteristics: (a) Urbanization generally follow a rising S-curve [6], (b) Urbanization is largely irreversible and any attempt to reverse or delay the process will only lead to a scattering of meagre resources [7]; (c) Urbanization curve closely follows the

Table 1. The Trends of Structural Changes in Employment in the Primary, Secondary and Tertiary Sectors in Saudi Arabia During 1974 - 1994/95.

Sectors	Years	Percentages of Economically Active Labor Force						
		1974 (1394) (ii)	1974/75 (1394/95) (ii)	1977 (1397) (iii)	1979/80 (1399/1400) (iv)	1984/85 (1404/1405) (v)	1989/90 (1409/1410) (vi)	1994/95 (1414/1415) (vii)
Primary*		42.4	41.6	33.0	19.6 (20.0)	15.5	10.8	(10.9)
Secondary**		13.1	14.1	14.8	26.7 (17.5)	29.2	22.8	(23.6)
Tertiary***		44.5	44.3	52.2	53.7 (56.5)	55.3	66.4	(65.5)
Total		100	100	100	100	100	100	100

Source: (i) 1974 population census; (ii) & (iv) Third Development Plan 1980-85, p.37; (iii) Labor Force Statistics in Saudi Arabia, 1977; (iv) & (v) Fourth Development Plan 1985-90, p.32; (vi) & (vii) Fifth Development Plan 1990-95, p.121.

* Agriculture, Mining, Crude Oil and Natural Gas.

** Manufacturing & Construction.

*** Transport, Storage and Communication, Trade, Community and Social Services, Finance and Government.

Note: Figures given in parenthesis in columns (iv) & (vii) are estimated rather than actual percentages of employment in various sectors according to the Third and Fifth Development Plans respectively.

tertiary sector curve [8]; and (d) During the initial period of low level urbanization, growth occurs in distinct nodes, whereas, the medium level urbanization is accompanied by metropolitan development, and the high level urbanization is characterized by further growth of metropolitan areas and their aggregation [9].

Jakobson & Prakash have further pointed out that the correlation between urbanization and the growth of tertiary sector is found to be closest in those countries which have been industrializing at a later point in time, particularly after the World War II due to the availability of more advance technology [10]. This observation has very aptly been borne out by the fast structural changes and the resultant physical manifestations in Saudi Arabia. Saudi society which had 60 percent nomadic population in 1950 and was just about 15 percent urban in 1963 has transformed into an urban society with about 75 percent urban population according to a 1987 estimate [11]. The Saudi Arabian Fifth Development Plan (1990-95) states that "within the short span of less than twenty years the Kingdom has become an urban society, with the level and quality of services to a great extent similar to, if not higher than, that in most advanced countries" [12].

The thesis, advanced by Jakobson & Prakash, that at high level of urbanization aggregative and diffusive tendencies of physical tendencies take over the nodal development, appears to be valid in case of Saudi Arabia. Although, due to fast structural changes in sectoral employment, the aggregative and diffusive tendencies of physical development appear to have dawned ahead of time with the resultant differential overlappings [13]. These tendencies appear to have further been accentuated due to the vastness of the country and its regional diversity. As a result, one can see the concurrent evolution and emergence of nodal, aggregative and diffusive tendencies of physical development in different regions.

2.3 Inter-regional Disparities

One of the typical characteristics of national development is that it accompanied by varying degrees of regional income disparities [14]. Williamson's study proves the hypothesis that regional inequality traces an inverted "U" over the national growth path, and that the historical timing of the peak level of spatial income differentials varies considerably with the resource endowment and

institutional environment of each developing nation. In other words, rising regional income disparities are typical of early development stages, while regional convergence is typical of the more mature stages of national growth and development. Two corollaries emerge from this study and are quite relevant in the context of Saudi Arabia: (a) the larger the geographic size of the national unit, the greater will be the degree of regional inequality; and (b) the faster the rate of national development, the faster will be the rates of regional divergence and convergence during the early and maturing stages of national development, respectively.

Although empirical studies of regional inequalities in Saudi Arabia are not available, given the huge geographic size of the country and the phenomenal rate of development, it can be safely assumed that the tendencies towards the increase of regional income differentials will have been most pressing in Saudi Arabia [15]. Acknowledging the existence of regional disparities, Saudi Arabia's *Fourth Development Plan* does recommended a regional development strategy to alleviate the regional imbalance. The Plan points out that historically regional imbalances in Saudi Arabia resulted from the scattered nature of population settlements and from the concentration of natural endowments. It states that regional disparities are caused not only by natural imbalances but also by the place of development, by the pattern of rural-urban migration and by cost considerations. In an effort to alleviate the regional disparities, the objectives of the *Fourth Plan* regional development strategy are based on three key elements:

- (i) pursuing balanced development, interpreted to mean the encouragement of development in all regions and the extended provision of basic services;
- (ii) proceeding with the economic diversification of the regions in accordance with their productive potential and requirements; and
- (iii) strengthening the coordination of agencies and programs at the regional level (and below) and enhancing efficiency in the provision of services" [16].

The tendencies of regional income divergence appear to have been arrested by the development of two free-standing towns in the north, new towns intown and village cluster centers all over the Kingdom, coupled with liberal long term interest-free housing loans, liberal subsidies and loans for industrial and agricultural development, and for the sedentarisation of nomads in the northern and southern regions.

2.4 Conceptual Dilemmas

The foregoing three sections clearly manifest that the process of development brings about changes in the employment structure, situs of the population and regional incomes. Nevertheless, these transformations from homogeneity to heterogeneity or from traditionalism to modernism are differentially received or resisted by different social systems due to their varied cultural orientations. The cultural interface with the development process leads to a number of interacting conceptual dilemmas, such as, equity-efficiency measures and anti-urban and pro-urban attitudes which are diametrically opposite to each other. For instance, equity-efficiency measures, apart from being opposed to each other, are inherently inter-related. This contention is borne out by the fact that equity could be achieved through efficiency measures and vice versa. The same applies to the strategies of balanced and imbalanced economic development.

Likewise, the institutional and sectoral outlooks and developmental emphases may also be diametrically opposite. For instance, Ministry of Planning, in pursuance of its goal of maximizing GNP, would allocate more development funds to the centers of productivity; whereas the Ministry of Municipal and Rural Affairs would lay more emphasis on the centers of population concentration. The venue of the two centers, depending on the stage of development of a country, could be congruent, overlapping or entirely different.

Apart from these conceptual dilemmas, the attitudes about urbanization are also at great variance. Norman Uphoff has suggested that the various attitudes on urbanization and its relationship to national development can be summarized as follows:

- "(1) Urbanization is seen as an evil and its growth should be arrested;
- (2) Urbanization is a necessary evil; policy should be directed towards minimizing its negative effects;
- (3) Urbanization is a conditional good; policy should facilitate its positive effects; and
- (4) Urbanization is an unconditional good and should be accelerated" [17].

A deeper probe would reveal that whether a social system subscribes to one or the other of the above mentioned attitudes towards urbanization or resorts to a strategy of balanced or imbalanced economic development, depends on its equity-efficiency orientation. For instance, Japan, due to its efficiency orientation, holds the view that urbanization is an unconditional good [18]; whereas a social system which is highly equity oriented may see urbanization as an evil. Saudi Arabia, which operates under the Islamic Law and "follows the middle path" by subscribing to a balance between equity and efficiency measures, may perhaps oscillate between the attitudes No. 2 & 3.

3. CONCLUSIONS AND RECOMMENDATIONS

It is highly imperative to appreciate that the tertiary civilization would be different for different countries in terms of its timing, ways and means. It is a journey of hope and despair - hope for those who are prepared for it, and despair for those who will be caught unaware. Different countries will be taxiing from different directions, at different speeds with different types of technological equipments, in different states of preparedness, to take off for the civilization of the 21st century to get airborne. During the transitional period, the flight could involve physical jolts, mechanical breakdowns, financial crises and social upheavals.

The fast developing countries, such as Saudi Arabia, are progressively developing faster due to the availability of latest technologies. These countries, not only can be benefitted by the latest inventions, but also have before them, the full text of experience undergone by their developed counter parts. Based on the foregoing analysis of the dynamics of technological advancements, industrialization and development in the context of Saudi Arabia, following inferences can be drawn and recommendations made:

1. The extent, nature and timing of technology transfer is of great significance. For instance, technology can be used both to exploit or conserve natural resources; to design with or against the nature; and to augment or deplete the cultural values. Whereas technology transfer is something to be encouraged, the transference of concepts developed in the context of an entirely different set of socio-economic value systems and climatic conditions is highly undesirable and should be jealously guarded against [19].
2. Unlike technology, which has universal and timeless application, industrialization is relatively more space specific and has a somewhat limited temporal perspective. Industrialization should indeed be viewed as a phase in the developmental process. It acts like a one-way bridge between "primary" (traditional) and "tertiary" (post-industrial) civilizations. Traditional societies, once they cross over this bridge, get transformed into urban societies; and there is no empirical evidence that a nation after having become urbanized has ever retrogressed towards its earlier stage of traditional civilization. Saudi Arabia, currently, appears to be well on its way to the tertiary civilization; and even the relative share of employment in the industrial sector appears to be receding (table 1). It is therefore suggested that only the installation of high-tech and environmentally safe industries should be encouraged in Saudi Arabia.

3. Environmentally sensitive and labor intensive industries such as textiles, leather processing and tanning should be established collaboratively as "joint ventures" in friendly countries like Egypt, Pakistan and Bangladesh, where manpower is cheap, instead of importing labor force from abroad and establishing such industries in Saudi Arabia.
4. Northern and southern regions of Saudi Arabia have not only been contributing to the regional income divergence, but have also been losing population to the central region. Their potential should be capitalized by establishing industrial activities which are best suited to their human and physical resources, such as a series of capital intensive livestock farms and meat processing and packing factories. The innovative method of "dry-lot farming" [20], which is being used in some industrialized countries, appears to be very promising. Apart from capitalizing the potential of Bedouins by helping them to modernize the traditional occupation of their fore-fathers, it will promote an "import substitution" activity, as every year Saudi Arabia imports hundreds of thousand of cattle for sacrifice during Hajj season, in addition to daily consumption [21].
5. As Saudi Arabia continues its journey towards tertiary civilization the emphasis is going to shift progressively to the service oriented activities which will call for additional recreational facilities; highway oriented services such as motels, restaurants and service stations; development of resort places for domestic tourists; and establishment of tourists' corridors for international pilgrims who visit Saudi Arabia for Umra and Hajj. Most of these services are either foreign exchange saving or earning activities.

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