The Political Economy of Muslim Countries

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Edited by

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For Derin and for Nusret Emre: the greatest treasures and the biggest supports in our lives.

TABLE OF CONTENTS

CHAPTER ONE

THE GLOBAL POLITICAL ECONOMY OF ISLAM

AHMET SALIH İKİZ*

Introduction

It is likely that our earliest human ancestors categorized the natural world into two: things they could control and those they could not. While they were able to use certain objects for hunting or for controlling the environment for agriculture, they could not do anything about natural conditions, such as earthquakes, climate or the weather. Most probably, they would stare at the outline of a mountain that they proclaimed as the invisible supernatural power designing and controlling the environment around them. This at least is Orhan Hançerlioğlu's explanation of the belief in the existence of Gods (Hançerlioğlu 2000). This helps to explain early shamanist beliefs in the spirituality of mountains, water and other natural objects and its later transformation into beliefs in human-formed gods, such as in ancient Greek mythology. In his well-known discussion of Anatolian Civilizations, Ekrem Akurgal offers amazing examples of this transformation in different civilizations from the Hattis to the Karia (Akurgal 2014). In the last 2500 years, religions have offered us explanations for the origins of humanity through monotheistic religions like Christianity and Islam and others like Hinduism and Buddhism. David Hume, in his Natural History of Religion, says that a universal characteristic of humanity is that we more or less preserve a belief in an invisible authority that controls every aspect of our life, although this takes many different forms and levels of practice; Hume presented dialogs between theists and sceptics about the origins of the world and humanity (Hume 2016).

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In this chapter, my intention is to consider Islam's involvement in the study of politics and economics, with a special focus on the Islamic approach to economic dynamics.

The Concept of Political Economy

Political economy is both a branch of economics that analyses the economy politically and a branch of the political sciences that investigates the influence of economic variables on politics. Its definition is thus based on a combination of various disciplines closely related to the civilized form of human nature. For some authors, such as Deliarnov (2006), political economy is a political approach to economic analysis. It also includes the responsibility of politicians to preserve the wealth of a nation by guiding the economy effectively (Rosdi 2015).

Key issues in political economy include the stability of macroeconomic indicators, economic growth, inflation level, income distribution and the balance of payments. In a normative approach, political economy solely discusses the possible outcomes of policy choice sets for resolving a country's economic problems. It thus considers the different social impacts of governmental ideologies. Some authors define the process of political economy as considering different aspects of various social sciences. For Shamsulbahriah Ku Ahmad (1990), political economy is a vast field encompassing not only economic and political aspects but also sociology, political science and history. Thus, not only the social sciences but also economic, political, cultural and psychological sciences and law are involved (Rosdi 2015).

Most of the definitions in the field are produced by economists due to the influence of economic variables on stability of economic performance: national development is determined by economic and political stability. Policy makers in governments, therefore, have to follow mainstream economic theories to maintain political stability. In the Muslim world, however, the term "political stability" has different connotations than in Western countries.

Increasing research in political science on economic performance has also led to a definition of political economy from the viewpoint of political science that highlights the effects of political choices on economic performance. A nation state and its economy are to some degree sensitive to each other. Very basically, economics is focused on distribution of scarce resources in an effective manner, and political science is devoted to the rationale of individual and nation state relations.

Islamic political economy is a designated area of political economy with special reference to Islamic codes and values and the implementation of Islamic rules in the Muslim world. It aims to determine the framework of the economic value system in accordance with the behavioural norms of individual Muslims. The Islamic economics paradigm aims to create an Islamic economic system with distinct rules and institutions. It is devoted to a politically-oriented systemic understanding as ordained in the Islamic order. The formation is based on the welfare and justice of the *ihvan*, in the Islamic world. It therefore has different foundations from a Western capitalist typology of political economy based on the efficient functioning of market mechanisms. Thus, the teleological foundations of Islamic and Western ideological political economy differ. Comparing Christian writing with Islam, religious written rules in the Quran and Hadiths are much more formal and determined than the former.

Analysis of the dynamics of Islamic political economy has been constructed on a Western typology. Politics in the West has a long history of evolution from empires to nation states after the Westphalia order, which turned monarchies into democracies in today's Western world. Over several centuries, the former mass of people obeying a monarch were transformed into citizens with equal rights in governance, leading to the inclusion of civil rights for all economic transactions. Historically, capital accumulation after the establishment of states led to political economy and the role of government being reorganized. As they are marginal to this study, I won't discuss Christian values further. Instead, I will argue that political economy did not evolve in the same way in Muslim countries. Although monarchies in both the Orient and Occident have similar roots, the penetration of the bourgeoisie into production modes was completely different in each case. The Western bourgeoisie enabled civil society to atomize into independent, free-willed citizens whereas the Muslim world developed monolithic states dependent on vassals, especially in the Ottoman Empire. At this point it is also important to mention that Muslim monarchies made great use of Orthodox Islamic schools, such as the Hanafi, as a tool in social life whereas there were very few discourses based on Alevi schools of governance. Various Turkish authors in the 1960s explained Islamic backwardness by the historic lack of civil society in these countries that prevented individual rights emerging, which are crucial for a well-functioning democracy. Divitçioğlu (2015) claims that an Asiatic mode of production prioritized state-led infrastructure in society rather than an individual-based society. The main outcome was weaker democratic standards than in the West, which led İdris Küçükömer to ask whether people in these societies really wanted democracy (Küçükömer 2010). Considering economics as the distribution of scarce resources, then rather than using liberal market mechanisms as in the West, these countries redistributed state resources for rent-seeking activities. The classic Marxist theory of economic and social structures is therefore not easily applicable to the Muslim world. Not only do both worlds have different historical backgrounds, but also the Christian West had a very strong class system whereas Muslim countries lacked such an elitist fragmentation. For example, almost all high officials in the Ottoman Palace originated from poor families drawn from around the empire.

The particular form of establishment in the Muslim world affected its political economy. Until the beginning of the nineteenth century, the Muslim world was dominated by the Ottoman Empire due to the exogenous role of the Caliphate, the Islamic religious leader for all Muslims. Although it did not organically bind all Islamic groups, such as Alevis, it was a prominent figure in the Islamic world. The role of the Caliphate was also strongly related to the Ottoman's hegemonic military power, which also explains why Western academia long associated Islam stereotypically with the Ottoman Turks. The Caliphate was abolished in 1924 by the founders of the Turkish Republic.

Muslim Countries

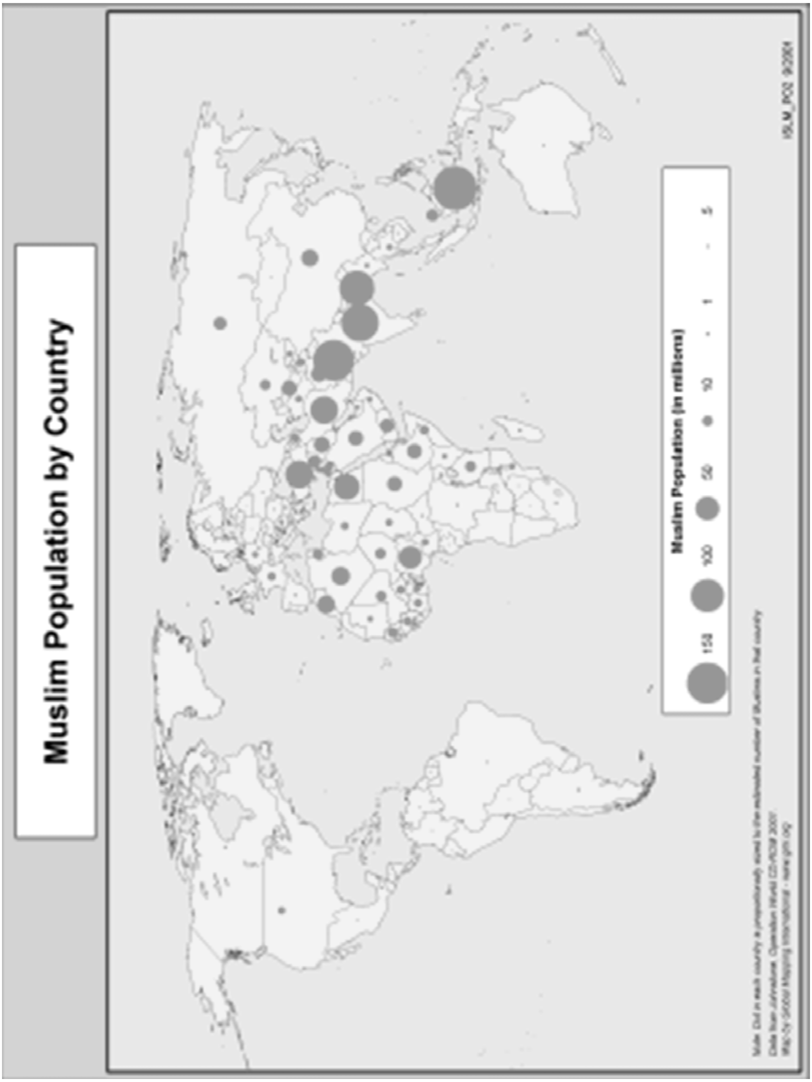
The role of religion in Islamic societies has long been discussed regarding whether it serves as a cultural value or a way of daily life. The former approach encourages more secular interpretations while the latter suggests more orthodox explanations. Similar conceptualizations are offered regarding the Christian world, which is characterized by strong economic growth and development. That is, the different development paths reflect the different dynamics associated with each civilization's particular cultural and social codes. A situation analysis is also required for Muslim countries that have suffered low economic growth and backward welfare compared to the West.

Whether Islam is compatible with Western standards of democracy and economic development is a question for many researchers. However, Erdem Demirtaş criticizes the stereotypical arguments of writers like Huntington, that democracy and Islam are incompatible since Islamic values and norms are not dependent on public sovereignty as they are in the Western world (Demirtaş 2014). In addition, Demirtaş also argues, based on generalization from a few observations, that Western countries' secular independent values evolved gradually whereas those of Muslim countries did not. Even though the Western evolution of democracy created liberal economic societies, this seems not to have worked for the Muslim world. Consequently, the implementation of neoliberal economic policies in Muslim countries governed by authoritarian regimes during the 1970s had harmful side effects, such as high unemployment, low income and poverty for the masses.

While Islamic countries have dominated in Asia and Africa, the popularity of Islam is also rising elsewhere. Yet, besides a few oil-rich gulf countries and Turkey, most Muslim countries have serious socio-economic problems due to poor economic performance. Such problems are the main reasons for social and political unrest in the Arab region since 2010.

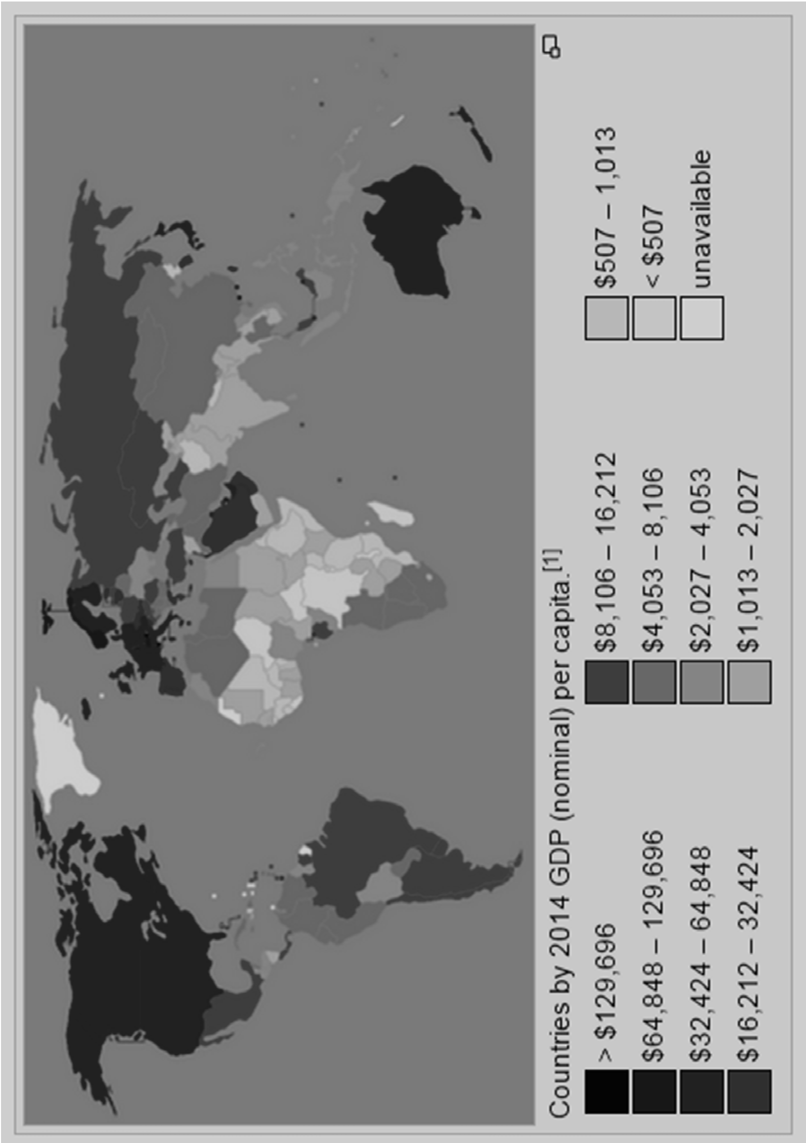
As can be seen from Figure 1, Muslims are mainly concentrated in Africa and Asia. Like Christianity and Judaism, Islam spread out from the Middle East, although the latter two religions lost their momentum after Islam became the dominant religion in that geographical area. Thus, former Ottoman colonies and the wider Arab world have the main Muslim countries, although increasing numbers of Muslims live in Europe due to recent migration trends. The rapid population growth of those newcomers and escapees from the ongoing unrest in the Middle East has also increased the size of Muslim minorities in Europe and North America.

Figure 1.



Source: http://bengalunderattack.blogspot.com.tr/2008/11/900-growth-of-islamic-population.html

Figure 2.



Source: http://www.domainmondo.com/2015/08/china-has-more-internet-users-than-us.html

Figure 2 identifies the current situation of the Muslim world from an economic perspective. Global wealth and production is heavily concentrated in the Western world whereas Muslim countries can be generally classified as developing or underdeveloped countries. Life expectancy, education level and other Human Development Index factors also show that the Muslim world is lagging in the world development league (UNDP 2017).

Islamic countries can choose between two different economic policy frameworks in order to reach the development levels of non-Islamic Western countries. The first is based on the tools of the Western economic system, in order to fully integrate the local economy into the global financial system, which is dominated by Western players. Adoption of this approach demands that there is no absolute requirement to run economic life in accordance with divine Islamic orders from religious sources such as the Quran. The main Western institutions of industrial development, banking and finance can be easily applied to Muslim countries, and the success of Western civilization is based on its progressive economic growth due to the adoption of appropriate policies. For example, a free market ideology and the tools of Western political economy must be used rather than to state interventionist Islamic economic policies. Such countries are fully integrated into the global financial system under Western economic practices. Most Islamic countries, including Turkey, can be classified under this model.

The second approach is much more interested in the interpretation of religious rules from the Quran for economic life. The Islamic way of life is applicable to every aspect of business transactions under superior divine rules: all economic policies must comply with Islamic codes and provisions. Thus, the main determinant of the global banking system – namely, interest rates as the price of capital – does not apply in the Islamic world. Furthermore, the state should intervene in and regulate all economic transactions in order to defend oppressed and poor citizens. Such Muslim countries' total rejection of the main classical economic functions of Western market mechanisms is deeply rooted in the Western world's imperialist system of exploitation. Various exploited parts of the world have implemented new Islamic economic policies in the revolt against Western imperialism. For them, this was a reaction to the modern world's new form of the Crusaders in the shape of financial capital. That is, Christian economic policies and the Western-dominated new world order harm Islamic countries due to their imperial roots devoted to exploiting other countries' resources.

These two main interpretations provide a versatile framework for analysing today's world, although the outcomes differ in many respects due to the historical evolution of societies in relation to changes in the Islamic way of life. That is, although there is only one set of Islamic rules and on holy book – the Quran – the teachings of Islam have varied across geographies, as in Ibn-i Haldun's well-known theory that human behaviour is affected by different physical factors according to geographical location. The mainstream practice of Islam *zikhr* has also been affected by its different sects.

Religion plays a crucial role in today's complex societies. Thus, religiously-inspired policies to reorganize societies, whether by rules and regulations or value judgments, have different effects on governance across countries. Religious studies in Muslim countries have fuzzy logical aspects due to Western secularist explanations of these social processes. That is, social science in Muslim countries is using a Western tool set to solve problems in societies with different dynamics. The cause-effect relations in Western civilizations regarding social movements have their own chronological solution patterns. Western civilizations have different social strata from Muslim countries while the Orient and Occident had different growth paths historically. As the modern social sciences were mainly developed by Western countries, Muslim countries are trying to apply remedies produced in different contexts. For example, modern Western economics is rooted in the classical approach of Adam Smith in the sixteenth century while interventionist Keynesianism is similarly rooted in the West. Even Marxist theory regarding the oppressed classes was developed in the Occident. European (i.e. Western) countries built on the industrial revolution for a long time, which was also one of the important pillars of economic theory, whereas the post-Fordism period in Western countries created the cultural and economic global reconstruction of today's world order. The foundations of Weberian economic theory were legitimized and developed their own terminology within economics.

Islam was initially restricted to the Arabian Peninsula for several centuries, before the collapse of the Roman Empire created a vacuum for new regional powers. The Ottomans then emerged in the region as its first Muslim rulers. However, they preserved Byzantium regulations and methods in ruling, such as taxation, governance and minority policies for six hundred years while creating a Pax Ottomania across three continents.

Even if we call Ottomans Muslims, the role of religion in daily life was not restrictive or widespread. For many governmental issues, decision making was pragmatically secular so Islam itself was not dominant in Ottoman governance, even though sharia law was obligatory for Muslims. Meanwhile, due to the long Ottoman presence in the Middle East and Arab world, economic development of the Muslim geography was significantly affected by the Ottomans. There are two contrasting arguments regarding this background.

The first focuses on the stabilizing impact of the empire, which the Turkish historian İlber Ortaylı called Pax Ottomania (Ortaylı 2006). He claims that the empire brought peace, stability and prosperity to the Middle East by ending long-standing tribal conflicts. Since the end of Ottoman rule in the region, the artificiality of the borders of subsequently created countries has provoked successive conflicts and increased political tension until today.

Daron Acemoğlu offers the contrary argument that the main reason for the Middle East's continued political instability and economic backwardness was the lack of organizational structure during the region's Ottoman regime (Acemoğlu 2013). He highlights the necessity for a well-functioning structure in public governance and the rule of law as key elements for economic development. However, the Ottomans instead relied on conquest-based land management while transferring surpluses to the empire's centre. This suppressed technological invention and did not increase public wealth.

In *Imagined Communities*, Benedict Anderson shows how history has been reconstructed in many countries, especially in the Arab World (Anderson 2006), including the fabrication of national heroes with fictional backgrounds. For example, national histories include military victories that are rewritten to emphasize a superior national identity. This process can even involve the vandalization of historical objects to generate new public figures. For example, in many Arab countries, the historical relics of former civilizations – even Islamic ones – are barely respected or are even demolished for the sake of creating a new identity. The obvious outcome is that such artificially constructed new national identities are weak and their ties to the past are severed. This in turn creates a fertile environment for a poor, ineffective and weak bureaucratic structure that prevents good governance in these countries.

Conclusion

One of the prominent factors in Islamic countries is the dilemma regarding practice and ethics. Being a Muslim is strictly defined within the narrow borders of practice: obligatory rituals in daily life, such as prayer, fasting, the *niqab* or a beard. One's faithful belief is constructed according to these demonstrations, which make you directly responsible for good-will. That is, your behaviour, respect for others' private space and obeying of rules are closely related to the ethics that characterize your relations with others. Yet, although corrupt behaviour, cheating and lying are strictly forbidden in the Quran, Muslim countries are among the most corrupt in the world. As Bernard Shaw once put it, Islam is the best religion while Muslims are the worst followers.

About the Author

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CHAPTER TWO

SUSTAINABLE SOCIAL ECONOMIC DEVELOPMENT

IBRAHIM GARBIE*

National industries are the cornerstone of the economies of Islamic countries, not only for poorer countries, as is widely accepted, but also for the oil and gas producers due to the current fall in oil prices, which was their main source of income. Sustainable development, which emphasizes the ability of people to satisfy their basic needs and enjoy a better quality of life, is not fully exploited in Islamic countries. The concept of social economic sustainability encompasses both 'economy' and 'standard of living'.

Unfortunately, few people know that sustainable social economic development involves social equity. Instead, sustainable development is generally used to balance between three key dimensions (or TBL – the triple bottom line): economy, society and environment. This chapter analyses sustainable social economic development and evaluates a sustainable social economic development index.

One question should be asked at the outset. Which should come first: sustainable economic development or sustainable social development? The answer is both in that achieving sustainable economic development enables sustainable social development to occur at the same time. For this reason, the concept is named 'social-economic sustainable development', replacing 'social equity' which represented the four objectives (life, freedom, equity and human rights) in Islamic countries generally and the Arab Spring revolutions specifically. Yet, although the two names are different, in practice they are implicitly the same and should be considered

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as representing one overarching definition. Academicians, economists and industrialists prefer to use social economic while politicians, socialists and communities generally use social equity.

This chapter discusses and evaluates the meaning of economic sustainable development and social sustainable development in terms of the requirements to achieve them within the infrastructure of national industries in Islamic countries with the aim of showing how to update these industries to create value for their communities regarding social economic life and well-being.

The study of social economic sustainable development in national industries must involve the whole range of pillars, drivers, performance indicators and units. The concept, which aims to meet the needs of the present without affecting the ability of future generations to meet their own needs, still needs more attention from academicians, practitioners and economists as well as politicians, socialists and communities. Social economic sustainable development is and will be a crucial issue for present and future generations.

To achieve social economic sustainable development, national industries must change their existing products or at least develop them; reengineer processes and reconfigure production systems through competitive manufacturing strategies; and introduce continuous performance evaluation and flexibility in organizational management (structure) to ensure long-term productivity and associated social well-being. However, to do this, national industries face many challenges, particularly those related to impacts outside their direct control, including supply chain management and standard measures or benchmarking of sustainable development performance. National industries also have to work with a great level of transparency to create a good relationship with society.

The main objective of this chapter is investigating the sustainable social economic development index in national industries based on an assessment tool created and developed by Garbie (2014). The next section discusses the background of sustainability and/or sustainable development. The following section presents the two pillars with their drivers and performance indicators. Sustainable social economic development assessments are then illustrated before considering a single national industry and/or different industries within one industrial estate or different industry sectors in the whole country. The last section offers some conclusions.

Background of Sustainable Social Economic Development

There have been many studies of sustainable economic and social development. In particular, Veleva et al. (2001) and Veleva and Ellenbecker (2001) suggested a new framework with major and minor indicators for raising company awareness while Glavic and Lukman (2007) presented sustainability terms, definitions and interconnections for understanding and better communication while moving toward sustainable development. Sustainable engineering has been recommended as a new course in engineering departments (Davidson et al. 2010). Hasna (2010) analysed sustainability information in print media journals, magazines and textbooks to outline the development of sustainability science. A detailed discussion about sustainable manufacturing shows the importance of sustainable manufacturing as one of the most important issues regarding sustainable development (Garetti and Taisch 2012). Liu et al. (2011) reviewed the challenges, perspectives and recent advances in support of sustainable production operations decision making through sustainable design, sustainable manufacture and sustainable supply chain management.

Bi (2011) discussed the requirements of industrial organizations while clarifying their limitations and bottlenecks while Martains et al. (2011) adopted a group reporting initiative to evaluate the efficiency of sustainability performances in a group of manufacturing companies. Rosen and Kishawy (2012) showed the importance of integrating sustainability with manufacturing across different objectives (function, competitiveness, profitability and productivity) while Rosen (2012) identified the key requirements for engineering sustainability, including resources, processes, increased efficiency and reduced environmental impact.

Lozano (2012) provided a brief analysis of sixteen of the most widely known initiatives to embed sustainability into company systems while Winroth et al. (2012) suggested a framework for a sustainability index in manufacturing systems without identifying current status and benchmarking values. Garbie (2013; 2014), who designed a general framework to estimate sustainable development by suggesting existing and target values, also investigated sustainability awareness and optimization (Garbie 2015a, 2015b). He then proposed a sustainability index based on the two dimensions of the TBL (Garbie 2015c, 2015d) and an SD of industrial estates (Garbie 2016a, 2016b).

Components of Sustainable Social Economic Development

This section presents an analysis of two of the TBL pillars (economic and social) in terms of issues and performance indicators.

Drivers of Sustainable Economic development

Many drivers promote sustainable economic development, including business and finance, employees, customers, development expenditure, production operations and suppliers.

Business and finance

It is very important to increase the business and financial returns of industrial or manufacturing enterprises. To ensure that appropriate and timely decisions and plans can be made, the main performance and indicators to monitor a business are sales and profit. Therefore, these companies have to focus on developing this driver.

Employee productivity

Employee productivity has to be monitored while the employees themselves have to be motivated in various ways since different people are motivated by different things. The main performance indicators of employee motivation include value added (money) per employee, productivity, employment costs in relation to income sales, and access to skilled personnel.

Customers

Customers are the target for any industrial or manufacturing enterprise since they are the resource that helps the company to be successful by providing revenue. If customer satisfaction and loyalty is ignored then customers may be lost, which will reduce company revenue. Two performance indicators used to evaluate the customer driver are rate of customer complaints and number of new customers per year.

Development expenditure

Research and development (R&D) increase the creativity of products and services while helping enterprises compete and remain in the market.

The two main indicators for this driver are the ratio of new products to existing ones and the percentage of annual budget devoted to R&D.

Production operational management

A production operation is the major driver of sustainable economic development for industrial and manufacturing enterprises. This includes activities related to manufacturing production, such as the efficiency and maintenance of machines and equipment, performance ratings and utilization of labour, delivery precision and industrial enterprise design; and logistic systems.

Suppliers

Suppliers play a major role in the success of global enterprises by providing raw materials, equipment and so on. Suppliers' delivery precision is thus very important for its customer's (the manufacturing firm's) satisfaction. Table 1 presents the major drivers of sustainable economic development along with their major quantitative and/or qualitative performance indicators.

Drivers of Sustainable Social Development

Many other drivers promote sustainable social development, including health and safety; education and training; labour management relations; diversity and equal opportunity; and human capital development.

Health and safety

The provision of health care services and the promotion of health are equally important. Both require a healthy environment with clean air and water, a safe food supply and adequate housing. This investment in health benefits must cover the entire population generally and industrial and manufacturing companies specifically to ensure that all employees have good medical insurance in order to maintain the human capital of these enterprises. Three major performance indicators assess employee health: number of accidents, absence due to injuries or related illness and elimination of hazardous work places.

Education and training

Education is a right for all people living in Islamic countries so lower level education (up to high school) at least must be free. Regarding higher education (e.g. universities), scholarships must be available for active and outstanding students. While most education in Islamic countries (whether lower or higher level) is free, unfortunately the quality is low and governments in some Islamic countries ignore this sector. Consequently, this sector needs huge capital investment, more private universities, outsourcing, or other solutions. The performance of industrial and manufacturing companies depends on education levels, training hours and participation ratios in improvement groups. Training hours provide a performance indicator for improvement in human capital and skill levels.

Labour–management relations

In the industrial field, labour–management relations (LMR) study the rules and policies that govern and organize employment. However, more important is how these rules and policies are established and implemented and how they affect the needs and interests of employees and employers. Two primary indicators must be included in evaluating LMR: proportion of temporary workers and proportion of employees that are shareholders. However, the first indicator is not recommended or accepted in Islamic countries due to the societal security of keeping employees in their positions permanently, since most companies treat such employees as second or third class in terms of salaries and medical insurance. Therefore, these employees show low commitment. Instead, the second indicator must be adopted in Islamic countries with a goal to increase employee ownership in industrial and manufacturing companies up to a maximum of 49%. This will encourage employees to maximize productivity, preserve equipment and resources, avoid absenteeism and increase their commitment as part owners of their company.

Diversity and equal opportunity

Understanding equality means understanding the differences between each employee’s cultural, social and intellectual contribution to the workplace. This is an excellent driver in social sustainable development. Our understanding of diversity, which includes gender, ethnicity, etc., is the issue of how to manage people from different cultures in industrial and manufacturing companies and academic institutions. Cultural values are not born in people but adopted from a society. The power of companies, academic institutions and public departments with diverse workforces depends on how they manage their cultures. Managing a culture is not difficult so long as the organization's values, beliefs and actions are clear and well-understood. There are four primary performance indicators to assess diversity: equal opportunity, male to female ratios, cross-functional teams for improvement, and discrimination levels.

Human capital

Human capital represents the value of enterprises to the community. Industrial and manufacturing companies are found in specific regions, leading to the generation of many permanent and casual jobs. Human capital describes the features of social organization, such as networks and cooperation for mutual benefit. Building human capital is not easy as it requires several decades to generate it domestically and/or through outsourcing. There are several indicators for monitoring human capital in organizations: ratio of wages or salaries to local minima; number of new employees per year' employee satisfaction rates; support for employee physical activity, healthcare and medicine; employee turnover; levels of responsibility and competence; clarity of job descriptions; and promotion opportunities for all employees.

Table 2 presents the major drivers of sustainable social development with their major qualitative and/or quantitative performance indicators.

Assessment of Sustainable Social Economic Development (SD)

This section illustrates the assessment of sustainable social economic development (SD) in an industrial/manufacturing enterprise, in industrial estates and regions, and at national level based on industries. It is divided into three main subsections that show how to model and assess social economic SD in the following contexts: in manufacturing enterprises; in industrial estates or regions; and at a country level based on industries.

Sustainable Social Economic Development index in industrial/manufacturing enterprises

The following presents a framework for assessing sustainable social economic development in an industrial/manufacturing enterprise through the two main pillars – social and economic.

The major purpose of designing this framework is to present the drivers of each pillar within a framework to assess or evaluate manufacturing firms that are planning to measure their existing level of social and economic sustainability.

The drivers of each pillar were chosen and filtered after reviewing various sources. This framework was designed to be modifiable to match the proposed sustainability assessment techniques (Garbie 2013, 2014). Then, indicators for each driver were determined with appropriate qualitative and/or quantitative measuring units according to their effectiveness on that pillar. The proposed sustainable framework is based on determining the existing performance and the target value for each indictor.

This procedure assists industrial/manufacturing enterprises in understanding the difficulties with an existing manufacturing system and defining objectives towards sustainable social-economic development. It is also used to increase the knowledge of industrial/manufacturing companies about sustainability. The proposed framework and the matrix for each pillar are shown in Tables 3 and 4.

The mathematical model for measuring the sustainable development indexes was created by Garbie (2013, 2014). It contains a set of equations to calculate the sustainable development index of each pillar by assessing each driver separately. The following equations will be used to estimate the sustainability indexes and the mathematical model for measuring the sustainable social economic development will be illustrated as follows. The sustainabile development (SD) for each driver is estimated using Equation (1).

$$SD_j = \prod_{m=1}^{m_j} \left(\frac{T_{m_j\_\max}}{E_{m_j}} \right)^{Y_{m_j}} \tag{1}$$

Where:

$SD_j =$ SD index of major driver *j*

$Y_{mj} =$ exponent of the change towards sustainable development for indicator *m* in each driver *j*

$T_{mj\_\max} =$ maximum value of indicator *m* towards sustainable development

$T_{mj\_\min} =$ minimum value of indicator *m* towards sustainable development

$E_{mj} =$ value of indicator *m* regarding the existing status

$m_j =$ number of indicators of driver *j*

$$Y_{m_j} = \log\left|T_{m_j\_\max} - E_{m_j}\right| \tag{2}$$

The sustainabile development (SD) for each pillar is estimated using Equation (3) and modified in Equation (4)

$$SD_i = \sum_{j=1}^{n_j} w_j \; SD_j \tag{3}$$

$$SD_i = \sum_{j=1}^{n_j} w_j \ (\prod_{m=1}^{m_j} \frac{T_{m_j\_\max}}{E_{m_j}})^{Y_{m_j}} \tag{4}$$

Where:

SD_i = SD index for pillar *i* (economic or social)

w_j = relative weight for each driver *j*

The framework includes a matrix that reflects the relative weights representing the relationship between all drivers of sustainable development manufacturing enterprises. These relations also indicate the importance of each driver relative to other drivers. The relative weight of each driver can then be measured using an analytical hierarchy process (AHP).

n_j = number of drivers in the pillar *i*.

The social-economic sustainable development [*S-E(SD)*] is estimated by Equation (5) and modified as in Equation (6), and is shown

in Figure 1.

$$S-E(SD)_{Industrial\_Enterprise} = \sum_{i=1}^{2} w_i \ SD_i \tag{5}$$

$$S-E(SD)_{Industrial\_Enterprise} = \sum_{i=1}^{2} w_i \left[\sum_{j=1}^{n_j} w_j (\prod_{m=1}^{m_j} \frac{T_{m_j\_\max}}{E_{m_j}})^{Log\left|T_{m_j\_\max} - E_{m_j}\right|} \right] \tag{6}$$

Where:

S-E(SD) = sustainable social-economic development of an industrial/manufacturing enterprise

w_i = relative weight for each pillar *i* (social or economic)