



CRITIQUE OF THE CONTRIBUTION OF THE MANUFACTURING SECTOR TO THE SUDANESE ECONOMY

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ABSTRACT

Purpose: To investigate the contribution of the Sudanese manufacturing sector to the Sudanese economy and assess its role as a driver for achieving sustainable development in the Sudan.

Design/Methodology/Approach: This paper reviews and analyses the contribution of the manufacturing sector to the Sudanese economy based on the comprehensive industrial survey carried out with the assistance of United Nations Industrial Development Organisation (UNIDO) and United Nations Development Program (UNDP) in 2001. It then goes on to assess the role that this sector can play in improving its contribution to the Sudanese and regional economy and achieving sustainable development. Evidence from global industrial views, international economic reports and experience of other countries in similar situation as the Sudan was used to support arguments.

Findings: The Sudanese economy is agriculturally-based. The contribution of the manufacturing sector to the Sudanese economy is small. A heavy injection of industrialisation of the economy is essential in order to improve the trade balance and help the country out of the poverty zone. The paper argues that building a competitive manufacturing industry as an important element of sustainable development plan for the Sudan is a shared responsibility of good governance, quality education and well-guided investment.

Originality/Value: The paper reviews and gives critical assessment of the role of the manufacturing sector in driving the Sudanese economy, which is seriously lacking in the literature. Additionally, the paper introduces building a competitive manufacturing industry in the Sudan as an important ingredient to boost the industrial sector as a whole, hence, improve the economy, create jobs, fight poverty and move a step towards achieving sustainable development.

Keywords: Sudan; Industry; Manufacturing; Education; National Development Plan; Sustainable Development.

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INTRODUCTION

The Sudanese economy can only be categorised as agricultural economy. The industrial base of the country is still at its infancy, although the increased discovery, extraction and economic exploitation of oil over the last two decades have increased the relative importance of this sector. However, the secession of the southern part of the country in 2011 (see map of Figure 1) carried away with it almost three quarters of the existing oil fields at the time, which were designated to the newly formed independent state of South Sudan, rendering this sector less prominent than it was for the Sudanese economy unless new discoveries and investment are urgently injected into it. Additionally, recent activities in the petroleum, motor vehicle and heavy machinery industries have covered only a small part of the local market and are yet to make any contribution to the global market. As such, their impact on the economic structure of the country is hard to notice.

However, the Sudan is not unique in this unfortunate situation as many other developing countries, particularly in Africa, are yet to find a development path that takes them outside the poverty zone and opens the gates of sustainable development in front of them. The current global economic downturn may, ironically enough, present these countries with a golden opportunity to play some crucial role in recovering the required balance to the global market. This is because the biggest multinationals and industrial companies, feeling the pinch of the economic downturn, are now seeking refuge in exploiting resources and cheap labour well beyond their traditional market zones and exploring every opportunity to mitigate business risks and reduce their base costs through restructuring and off-loading cost to suppliers and strategic risk-sharing partners. However, in expanding globally, these companies would be looking for places with developed infrastructure, skilled labour and appealing investment opportunities.

The Aerospace Industry is one good example in hand for such global expansion. It is predicted that the air transport market will grow by about 5% annually, generating an estimated demand of around 25,000 new aircraft for the next 15 years (Airbus, 2009 & Statista, 2016). With this growth, there would be a huge pressure on airport capacity and control systems would be stretched as never before creating more opportunities for the aviation industry in general. This expansion will not be geographically limited as the market is growing globally and



FIGURE I The Map of the Sudan and South Sudan

Source: Reproduced from Enough Project, 2016

consequently, creating more and more opportunities worldwide. As illustration to this, there are currently more than 400 main aircraft component suppliers all over the world, including some developing countries (Dafa'Alla and Hussein, 2009). For the Sudan to take advantage of this window of opportunity, it needs to urgently improve infrastructure, build capacity and have a clear strategy for the future in place.

This paper critically reviews the contribution of the manufacturing sector to the Sudanese economy, discusses opportunities, assesses current obstacles and makes recommendations for improving the sector and enhancing its role in and contribution to the Sudanese economy.

REVIEW OF THE MANUFACTURING SECTOR IN THE SUDAN

Sudanese Manufacturing Landscape

The manufacturing sector in the Sudan is very small in size and mainly dominated by small-scale industries. Historically, large-scale industrial establishments were limited to the manufacturing of food products and beverages and with an approximate share of 55% of the gross manufacturing output and 56% of the manufacturing employment, this category still represents the main activity of the Sudanese manufacturing sector with a contribution of 64.6% of the total manufacturing value added per capita (Dissman, 2004). The sugar production and grain mills are the main activities in this category followed by vegetable oil. The Kenana Sugar Factory (KSF) was built in 1976 to add to the older three factories in Gunaid, Khashm Elqirba and Maloot and gave a real boost to the manufacturing sector in general and the food and beverages category in particular. With an annual production capacity of over 400,000 tonnes of white sugar in addition to molasses, dairy products, animal feeds and more recently (June 2009) Ethanol as biofuel, Kenana is currently the largest integrated sugar company in the world (Kenana, 2016). Additional two factories in Asalaya and Sinnar were added later on to make the Sudan the second largest sugar producer in the African continent after the Republic of South Africa. On the other hand, the 1960's and 70's witnessed the flourishing of the large-scale textile industry with the Sudanese Textiles Factory in Khartoum North, owned by the International Gulf Establishment, reaching the peak of its production. Unfortunately, this factory was forced to shut down due to unreliable power supply on the one hand and disruptive industrial relationship between the workforce unions and management on the other.

However, the last two decades have witnessed a big injection to the heavy industry in the Sudan with the introduction of the manufacturing of heavy military and civil machinery, motor vehicle industry and significant expansion in the petroleum industry from extraction to refinery. Most notably is the construction of the Khartoum Refinery Company (KRC) with a total output capacity of 5 million tonnes per year. The refinery started production in May 2000 to process Sudanese indigenous crude oil to cover the need of the Sudan for petroleum products (KRC, 2014). Needless to say, the recent secession of South Sudan in 2011 has interrupted the flow of crude oil to the refinery and hence set back its ambitious targets. Therefore, a new strategy to define the future place of KRC in the industrial map of the Sudan is urgently required. More recently, the Sudan has also entered the field of aerospace industry by building the Safat centre for the maintenance and manufacture of lightweight aircraft in Karari. It is interesting that, apart from the petroleum industry, all these new additions were established under the auspices of the military establishment and fully controlled by the military industrial administration of the Armed Forces. Perhaps the logic at the time was that the military establishment was the only qualified institution to lead and manage such huge projects in a country like the Sudan. However, the success of the petroleum industry, which was fully controlled by the ministry of energy, falsifies this assumption. Anyway, despite adding more than 15% to the manufacturing contribution to the Gross Domestic Product (GDP), these recent additions to the industrial sector have so far contributed only 3% to the overall manufacturing employment (Dissman, 2004). Nevertheless, they rank among the best in terms of compensation for employees, such as wages, supplements and social benefits *etc.* Therefore, though a step in the right direction, their full impact on the whole economy is yet to be felt.

A comprehensive national survey was conducted in 2001 by the ministry of industry with support from the United Nations Industrial Development Organisation (UNIDO) and United Nations Development Program (UNDP). The report on its findings, (Dissman, 2004), was published in

November 2004. It is the most comprehensive survey of the Sudanese manufacturing sector to date and was an excellent opportunity to gather the much-needed information on the Sudanese industrial sector. Hence, unless otherwise stated, the report has been used as a source of the industrial statistical data quoted in this paper. The survey covered 24,114 small (of less than 10 employees) and large (of 10 or more employees) industrial establishments employing 162,682 persons and spread throughout the country covering 19 out of the 26 states of the Sudan before the secession of South Sudan. *As the survey covered the whole Sudan before secession (see Figure. 1), the figures quoted herein were adjusted as appropriate in order to reflect the reality of the Sudan today. However, it was noted that the contribution of the three states that formed the new South Sudan, namely Equatoria, Bahr-el-Gazal and Upper Nile, in the overall number of industrial establishments was less than 2% (see Figure. 2), 97% of them are small scale industries, mainly in the food and beverages or clothing sectors. Their combined contribution to the overall GDP was around 1%. This contribution was found to have little impact on the overall percentages quoted in Dissman (2004). The petroleum industry was the exception as 42% of its establishments are located in the state of the Upper Nile alone. It has a significant effect on GDP and one of only two industries that have a positive trade balance. Note that the statistics pertinent to South Sudan were also reported in*

TABLE 1 The Sudanese Manufacturing Sector Classification as used in (Dissman, 2004)

| <i>Ser. No.</i> | <i>Category</i> |
|-----------------|---|
| 1 | Manufacture of food products and beverages |
| 2 | Manufacture of tobacco products |
| 3 | Manufacture of textiles |
| 4 | Manufacture of wearing apparel; dressing and dyeing of fur |
| 5 | Tanning and dressing of leather, manufacture of leather products and footwear |
| 6 | Manufacture of wood, cork, plaiting and related products, excluding furniture |
| 7 | Manufacture of paper and paper products |
| 8 | Publishing, printing and reproduction of recorded media |
| 9 | Manufacture of coke, refined petroleum products and nuclear fuel |
| 10 | Manufacture of chemicals and chemical products |
| 11 | Manufacture of rubber and plastics products |
| 12 | Manufacture of other non-metallic mineral products |
| 13 | Manufacture of basic metals |
| 14 | Manufacture of fabricated metal products, excluding machinery and equipment |
| 15 | Manufacture of machinery and equipment (not exclusive category) |
| 16 | Manufacture of office, accounting and computing machinery |
| 17 | Manufacture of electrical machinery and apparatus (not exclusive category) |
| 18 | Manufacture of radio, TV and communication equipment and apparatus |
| 19 | Manufacture of medical, precision and optical instruments, watches and clocks |
| 20 | Manufacture of motor vehicles, trailers and semi-trailers |
| 21 | Manufacture of other transport equipment |
| 22 | Manufacture of furniture (and office equipment) (not exclusive category) |

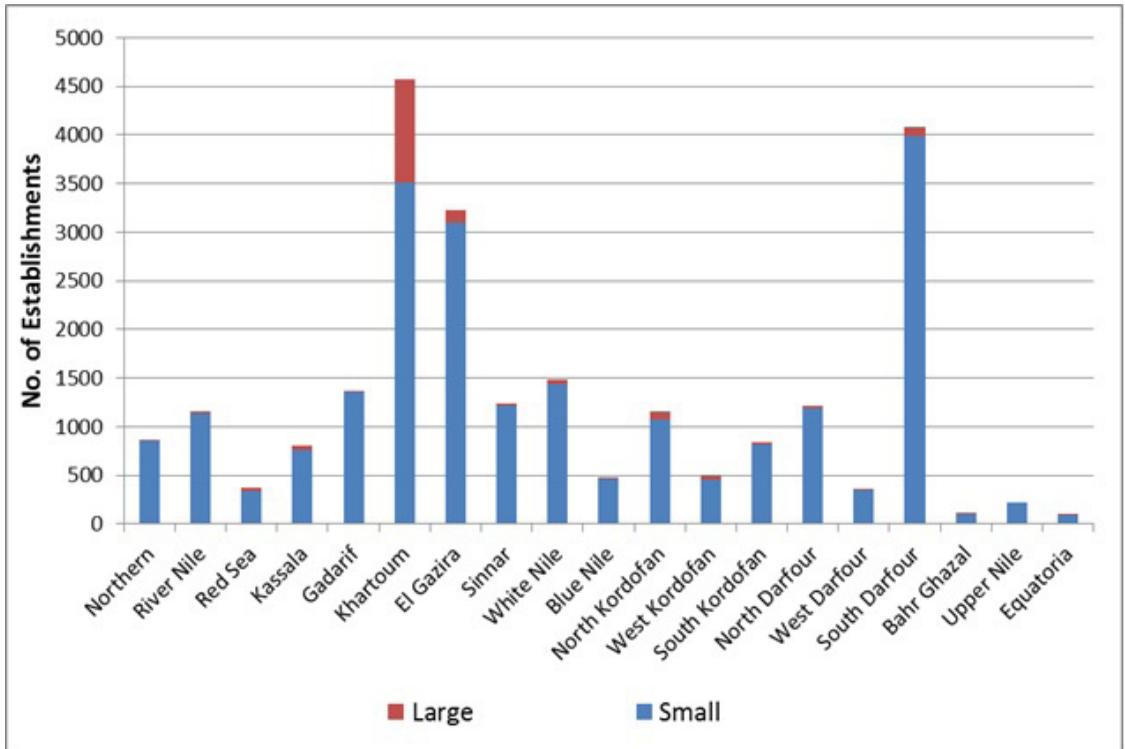


FIGURE 2 Sudanese Manufacturing Landscape

Source: Dissman, 2004

this paper where relevant in order to help academics and researchers in the field, who will continue to rely on data coming from the north, i.e. the Sudan, to address issues pertinent to South Sudan until the time comes when the official statistics institutions in South Sudan are well established and fully functional. However, in order to handle the huge volume of the gathered data and facilitate reporting, the 2001 survey also classified the manufacturing establishments in 22 categories following the international standard for industrial classification of all economic activities as defined in (United Nations, 1989). These categories are shown in Table 1. Figure. 2 shows the geographical distribution of the establishments included in the survey. The figure shows that the largest three states in terms of the number of industrial establishments, both in the small and large-scale categories, are Khartoum, South Darfour and Gazira states respectively. These three states have the lion's share as each of them has more than double the number of industrial establishments in any other individual state.

Contribution to the Sudanese Economy

The value added per capita of the Sudanese manufacturing sector, which is a measure of the contribution of the industry to the GDP, is only \$89.92 according to the most recent industrial statistics published by NationMaster (2012). This is very small relative, for example, to the corresponding average of the G7 countries of \$5,289.76 per capita and hence ranked the Sudan as number 147 out of the published 187 countries in the world. The Sudan, therefore, ranks in the group of "countries with low industrial production" and can be seen as a mainly

TABLE 2 Snapshot Summary of Manufacturing Sector Contribution to the Sudanese Economy

| <i>Item</i> | <i>Contribution</i> | <i>Comment</i> |
|--|---------------------|--|
| Total Manufacturing share of GDP | 9.5% | 1% from South Sudan. Low contribution |
| Value added per capita (total per annum per citizen) | \$90 | c.f. > \$5,000 for G7 - extremely low |
| Largest establishments (over 100 employees) | 68% | Largest contributor to value added |
| Small scale (less than 10 employees) | 16% | Relatively small contribution, but useful for Rural Development |
| Biggest contributors: Sugar + Grain Mills | 6.1% | Of GDP (c.f. 8.5% for all manufacturing) |
| Petroleum | 1.1% | Largely assigned to South Sudan |
| Motor vehicle | -1.4% | Due to imports of intermediate inputs |
| Medical appliances & Supplies | -38.3 mSDD | Negative value as Cost > 4 times output! |
| Contribution to employment market | 1.7% | Out of 9.7 million employees |
| Small scale industry share | 40% | Represents 93.14% of all establishments |
| Export share in total merchandise | 12.8% | Mostly raw materials. No higher value chain. Sugar & petroleum = 87.4% |
| Direct imports share in total merchandise | 21.1% | High dependency. Food (47%); Motor vehicle (17%); Chemicals (10%) |
| Labour compensation/employee/year (2001) | \$1,400 | Taking petroleum & tobacco, = \$1,200, or \$0.5/hr - extremely low |
| Manufacturing share of compensation in value adding | 14.1% | Low. Not rewarding |
| Material Intensity of total manufacturing | 56.2% | Very high. Material intensive production |
| Total manufacturing labour cost relative to output | 6.2% | Low. Cheap labour |
| Average return on investment | 8.5 | Almost 9 times the done investment |
| Tobacco industry | 1,500 | Attractive to private sector (in lack of strategic direction) |
| Average share of supplements to wages | 5.5% | Not rewarding |

agriculturally-based economy. In fact, according to the comprehensive industrial survey of 2001, the total manufacturing share in the Sudanese GDP is only 9.5%, of which 1% was contributed by the southern states (Dissman, 2004). Indeed, according to the most recent figures from the World Bank, the Sudanese industrial contribution to the GDP has dropped from 21% in 2000 to 3% in 2015 while the contribution of the manufacturing sector for the same period, partly affected by the secession of the South in 2011 and the subsequent loss of three quarters of the productive oil field, has dropped from 9% to almost nil (World Bank, 2017), confirming the relatively low and declining importance in the Sudanese economy. The survey also showed that the agro-food industry, dominated by sugar production and grain mills, is the biggest contributor to the GDP with a share of 6.1%. The next largest sector in output is the relatively young petroleum industry, contributing 1.1% albeit being relatively small employer. This is now largely assigned to the new state of South Sudan. The other sectors add very little to the GDP.

This is in line with the small contribution of 1.7% of the manufacturing sector to the overall employment market of 9.7 million employees, only 0.01% of them work for the petroleum industry. However, it is interesting that the petroleum sector has a very low percentage of manufacturing employment (0.5%) but, at the same time, is the second largest contributor in the whole manufacturing sector in terms of value added per capita (11%) after the food industry (64.6%). This indicates a capital-intensive industry. On the other hand, with a cost that is 4 times its output, the category of manufacture of medical appliances and supplies is the only category that shows negative value added per capita and appears to be in some trouble. Generally, most of the value added comes from the largest establishments of more than 100 employees, which contributes 68% of the total manufacturing value added per capita. The small-scale establishments of less than 10 employees contribute only 16% (Dissman, 2004).

Additionally, the Sudan's manufacturing industry is not very much exposed to export. According to the Survey, its export share in total merchandise exports is only 12.8%, with only 11 out of the 82 manufacturing sub-categories involved in export activity. Also, most of the exports are raw materials. No higher value chain-reflecting industry's weakness. The bulk of manufacturing exports (87.3%) comes from two main players, the sugar industry with 45.7% and the petroleum industry with 41.7%. This explains the down effect of the secession of the south on the Sudanese economy that has suddenly lost the majority of its petroleum export value. The only exporting industry in the group of small establishments is the vegetable oil producers with 0.1% of the total manufacturing exports. In fact, while the small-scale industry represents 93.14% of the total number of the Sudanese manufacturing establishments and employs 40% of the total manufacturing force, it produces only 18% of the manufacturing gross output. This shows that small-scale industry can indeed contribute significantly to the local economy, but is not yet a suitable driver to fund National Development Plans (NDP). Nevertheless, a strategic push towards small-scale industry is important in order to uplift rural economy and halt migration from rural to urban districts, which is now galloping at an estimated annual rate of 2.54% (Index Mundi, 2017).

On the other hand, opposite to exports, the Sudanese industry is much more dependent on imports. The survey showed that the share of manufactured imports of the industry in total merchandise imports is 21.2%. The biggest contributors to this figure are the food production, motor vehicle assembly and the chemical industry, with shares of 47%, 17% and 10% respectively. The petroleum industry imports only about 0.3%. These percentages take into account only the direct imports of the manufacturing industry. If the indirect imports, which enter as raw materials and semi-finished goods through other sectors of the economy, were considered, the real import content of the manufacturing sector is expected to be even higher. Hence, when the net contribution of manufacturing sector to the economy of 21.2% of imports and 12.8% of exports is considered, the net effect on the trade balance would be negative by about \$200 million. The only two categories that have a comparative advantage to the trade balance are the leather and petroleum industries. Deducting the 3.2% of the trade balance share coming from the petroleum industry as a result of the secession of the South will add to the negative trade balance. More recent figures from the Sudanese Ministry of Finance shows that the export share has been gradually dropping to reach 0.04%, while the imports increasing to 30.4% by the year 2014, increasing the manufacturing trade balance deficit even further (Taha, 2016). The leather industry represents only 0.6% of the exports share, hence has a relatively little impact. The motor vehicle industry, on the other hand, has the most negative contribution to the trade balance of -1.4%. This industry seems to be disadvantaged relative

to other categories because it has one of the highest import content in intermediate inputs to production. However, it has an indirect positive effect on the economy as a whole by satisfying some of the local demand, and hence reducing the need for importing more vehicles, as well as contributing to the employment market. Yet, a bigger impact on the economy would have been more visible if it could manage to export its product. However, this will require more local component manufacture to address industry's trade imbalance and less protectionism, improved management, lean practices and aggressive marketing techniques to improve its competitiveness.

Employment and Labour Satisfaction

It is worth noting that the Sudanese manufacturing average labour compensation per employee, such as wages, supplements, benefits, *etc*, for 2001 was about \$1,400. This average value has an upwards bias due to the exceptionally high averages for the petroleum and tobacco industries, which stand well above the others at 18.44 and 3.02 times the total manufacturing average respectively. Excluding these two categories, the overall average will come down to \$1,200 or less than \$0.5 per hour. This is extremely low when compared to the value of \$23.15 per hour of the United States(US) civil employee in 2002, a reasonably close time to the Sudanese national survey, reported by (High Beam, 2002). Likewise, the industrial average share of compensation of employees in value adding of 14.1% is low, while the material intensity of total manufacturing of 56.2% is relatively high. These figures indicate cheap labour and material intensive production. On the one hand, the figures are good News to investors as the average cost of labour to the industry is low. Indeed, the total manufacturing labour cost is only 6.2% of the gross output on average, while the average rate of return on investment in fixed assets is as high as 8.5. This means that the return rate is nearly 9 times the done investment. A very rewarding value, indeed! On the other hand, the figures could also be interpreted as that manufacturing sector may not be that rewarding for its employees. And, the low average share of supplements to wages and salaries in employees' compensation of 5.5% does not help improving the low morale resulting from low wages either. The fact that the highest labour productivity is in the high-waged petroleum industry reinforces this view. However, it should be emphasised that the high productivity of the capital-intensive petroleum industry is a reflection of a combination of high wages, high oil prices, material intensity, modern technology and good management. Interestingly, tobacco industry (private sector) is among the largest in average labour compensation while ranks at the 10th position in the manufacturing sector with a contribution of no more than 0.14% to the GDP. This large labour compensation is not surprising considering the rate of return on investment of 1,487.12 of the tobacco industry, which is the largest by far among the whole Sudanese manufacturing sector. This, in turn, also explains the private sector interest in this industry and reflects the lack of strategic direction in the absence of appropriate state oversight of the overall economy. It is also interesting to note that the public sector pays the largest compensation per employee in the large establishments sphere followed by mixed public and foreign ownership. The private Sudanese with foreign partners and the pure Sudanese private sector come third and fourth respectively, while the pure private foreign ownership lies at the bottom of the list. This shows that safeguarding employees' interests requires a level of public "policing" or monitoring of foreign investment. These issues can only be tackled by drawing a well-thought industrial strategy and effective related industrial policy, which are lacking in the Sudan (Dafa'Alla *et al*, 2017).

DISCUSSION

The above analysis, which is summarised in Table 1, shows that the Sudan is still far away from having an effective manufacturing sector. The table shows low contribution to the GDP and employment market, extremely low value added per capita, small share to exports and high dependency on imports. Also, the share of compensation in value adding is low and material intensity of total manufacturing is high. These are all signs of weak manufacturing sector, which is reflected in non-rewarding average share of supplements to wages. Recall that all the developing countries that managed to get out of the poverty trap and significantly improved the standard of living of their citizens, such as the South East Asian countries, have adopted a clear industrialisation path as part of their development models. The Sudan will not be the exception. Therefore, the present industrial output of 8.5% of the GDP is not enough. To put it in context, compare this to the 14% contribution of the industrial sector to the GDP of The Emirate of Dubai. Though Dubai is considered as a financial, rather than industrial, centre, yet it has current industrial strategy in place to grow the industrial sector by Dh18bn (approx. \$5bn) by 2030, creating 27,000 jobs, with export forecast to rise by Dh16bn (approx. \$4.4bn) (Abdel-Razzaq, 2016). Likewise, the corresponding figures for the industrial and manufacturing contributions to the GDP for the sub-Saharan Africa during 2015 are 24% and 11% respectively and for the whole world are 28% and 15 % respectively. Indeed the averages for the low Income countries alone are 21% and 8% (World Bank, 2017). Hence, the impact of the industrial sector in the Sudanese economy today is next to non-existent. This is in line with the findings of Taha (2016) in his economic evaluation of the transformational industries in the Sudan. Therefore, the Sudanese industrial sector is weak and indeed deteriorating steadily during the last two decade.

Hence, to get out of the poverty zone, the Sudan needs to adopt an integrated sustainable NDP, in which industry represents the pivotal point. A big dose of industrialisation to the Sudanese economy is urgently needed. And, as argued by Dafa'Alla (2016) developing infrastructure and improving other sectors, such as services and tourism industries, will also be required. The African continent economy, against all the odds, is growing. In fact, despite the current world recession, Africa is still expected to enjoy an average of over 4% real GDP growth per year over the next few years, compared with 3% average annual growth for the world as a whole (World Bank, 2016). Therefore, the regional demand, where the Sudan can, in principle, play a role, will remain strong. Also, as argued above, the globalisation of the industrial sector is driving major players to seek partners where the labour cost of manufacturing is relatively cheap. Research is another area, which is going global in order to reduce cost and fully utilise the global pool of talented researchers and academics. There is a real chance for the developing countries to complement or join such activities and benefit from training and technology transfer opportunities. Dubai, for example, in anticipation of such opportunities, has already assigned Dh700m (approx. m\$190) to invest in research and development by the year 2030 as part of its industrial strategy (Abdel-Razzaq, 2016). Hence, the Sudan should follow suit by actively seeking to maximise its gain of such opportunities. This can be achieved by developing its own capability and improve quality to be considered as preferred supplier for targeted components' manufacture, if not risk-sharing partner.

The Sudan may find a lot of comfort in the success of the South East Asian development model, which the Sudan is aspired to replicate some of its aspects. However, the model stands on the four pillars of quality education, self-reliance, heavy industrialisation and good governance. And, for it to succeed, it needs to be transferred to other countries as a package. The Sudan has a good experience with self-reliance in developing its own motor vehicle,

aerospace and petroleum industries. However, the industrial strategy as pivotal point of a comprehensive national industrial development plan is still sketchy. Quality education and good governance, on the other hand, are the real concerns for the whole of Africa as shown by Dafa'Alla *et al.* (2016a&b). Indeed, Dafa'Alla *et al.* (2016a&b) have identified quality education as the root cause of the lack of development not only in the Sudan but Africa in general. They presented strong correlation between accessibility to and quality of education system on the one side and sustainable development indicators, such as human development, ability to innovate and economic competitiveness, on the other and concluded that education that builds capacity and fosters innovation is a means to catching up with lost opportunities, building an “innovation-based economy” and realising the African dream. Likewise, Dafa'Alla and Hussein (2010) argued that the main barriers to the implementation of any NDP in Africa would be the corruption, political instability and lack of investment. In fact, tackling these three issues is a prerequisite for economic success, as attracting investment requires political stability with a strong anti-corruption drive. It is therefore not surprising that the leading South East Asian countries, Singapore, Taiwan and South Korea, have all scored more than 50, the mid-point of the Corruption Perception Index (CPI) of 2016 published by Transparency International (2016). Indeed, with an impressive score of 84 out of 100, Singapore stands tall at number 7 in the world.

The Economist noted that Africa's economy has grown much faster since 2000, but fears regarding corruption have risen too (Economist Intelligence Unit ViewWire, 2008). Likewise, Transparency International noted that 20 out of the 48 (41.7%) Sub-Saharan countries ranked in its CPI2016 survey scored less than 30 out of 100, a level that, according to Transparency International, indicates “rampant corruption”. Another 19 scored between 30 and 50, indicating that country's experts and businessmen perceive corruption as a “serious challenge” (Transparency International, 2016). Only five countries, Botswana, Cape Verde, Mauritius, Rwanda and Namibia scored more than 50. With a score of 14 out of 100, the Sudan, joint with Yemen, was ranked at 173, the fifth from bottom, followed by Syria, North Korea, South Sudan and Somalia respectively; all of them have their own substantial internal problems. These CPI2016 figures have not changed in any statistically significant manner for a few years now. Using the four indicators of safety and rule of the law, participation and human rights, sustainable economic opportunity and human development, the more specific Ibrahim Index of African Governance (IIAG) for 2016 ranks the Sudan at 49 relative to the 54 countries in Africa, followed by the Eretria, Libya, Central Republic of Africa, South Sudan and Somalia respectively (Ibrahim, 2016). It is also noticeable that all countries that scored below 25 out of 100 in the CPI2016 and below 40 out of 100 in the IIAG2016 (Ibrahim, 2016) have identifiable internal political, social or economical problems, indicating a strong positive correlation between internal conflicts, good governance and public satisfaction on the one hand and corruption and human right abuses on the other. It should, also, be reiterated here that one should not dismiss such widely available information in the public domain out of hand as it is instrumental in shaping the world's perception of the country and hence influence the flow of foreign investment.

Finally, competitive manufacturing is a highly technological as well as capital and labour intensive industry. Therefore, flourishing manufacturing sector requires supportive efficient infrastructure and good quality education. These, together with securing a renewable, clean and environmentally friendly source of energy, represent a prerequisite for sustainable development. Once they are in place, the manufacturing sector will help the Sudan to diversify its economy, create job opportunities and should, therefore, play its role in putting the country on course towards achieving sustainable development.

RECOMMENDATIONS

- It is essential to develop a solid Industrial Strategy (IS) for the Sudan through wide consultation with stakeholders and agreed by consensus to make it resilient to political instability. The industrial strategy should be stemmed from a comprehensive NDP and supported by Industrial Policy (IP) in the form of a set of regulations and legislations that sets the scene for an investment-attractive climate in the country. A well thought industrial plan is also required as a vehicle for the implementation of the strategy.
- As part of the industrial strategy, a significant injection of industrialisation to the Sudanese economy, with particular focus on higher value chain products for export, is required in order to improve the trade balance and lift the country out of the poverty zone. A competitive manufacturing sector is one key element of this dose. This is due to its enormous capacity of reducing dependency on imports, enhancing exports and above all, creating jobs, hence can have a significant impact on the economy as a whole in a relatively short time. However, it is by no means the only one. Developing infrastructure and improving other sectors, such as services and tourism, *etc.*, are also required.
- From economics viewpoint, good governance is required in order to establish the correct path for sustainable development, draw effective national plans and legislate for supportive policies and regulations to monitor and guide fair and strategic public and foreign investments as recommended in the “Employment and Labour Satisfaction” section above. However, regulation is only one of the means by which the society ensures that its values and priorities are reflected in the NDP. It is equally important for investors to see the implementation of these regulations in practice before they have full confidence in the system. This means achieving political stability and creating a true investment-attractive climate.
- Additionally, a competitive manufacturing is a high technology and capital-intensive industry. And, for the Sudan to gain the required expertise, it needs to gradually, but steadily, build its capacity, embark on heavy investment in building infrastructure, research and development, technology transfer, training initiatives as well as securing the right environment for sustainable development that allows local talent to flourish and contribute towards building real competitive manufacturing sector in the Sudan. This requires a complete overhaul and upgrade of the current facilities and a fresh look at the bases for establishing new ones.
- It is worth noting here that training is key in technology transfer and is seriously lacking in the developing world. There is still a huge gap between demand and supply for qualified technical cadre to support expansion in the industrial sector in general and manufacturing in particular. Also, and more importantly here, a strong drive towards education quality, rather than quantity, is required to support sustainable development in general and industry in particular. High quality education and rigorous training are required to improve skills and nurture innovation. Recall that investment in people and in technological learning empowers the ability of the society to sustain development through the creation of new knowledge and diffusion of appropriate technologies, which are important determinants for building capacity to sustain development (Al-Roubaie, 2013). Simply, as Dafa'Alla *et al.* (2015, 2016a&b) argued, quality education is the basis for all forms of development and the key to building “innovation-based economy”.
- Also, in order to meet tough industrial requirements, technical education should pay special attention to all levels of training, from vocational training for skilled labour to middle ranked technicians through to engineers. Training for management and marketing staff is

also equally important. Remember, as Brace *et al.*, (1999) put it, technology cannot be contained in a machine or a piece of software, it has an element of motivation and personal “know how”. Likewise, technology does not automatically yield innovation; imagination and first class marketing skills are also required (Brace *et al.*, 1999).

- Additionally, customers today are quite knowledgeable and extremely demanding. They insist on independent verification of the product’s quality and supplier’s credentials. To satisfy these requirements, industrial establishments have to encourage their staff to obtain internationally recognised professional qualification, such as Chartered Engineer (CEng), Incorporated Engineer (IEng) and Engineering Technician (Eng Tech) statuses offered by the British Engineering Council or European Engineer (EurIng) status offered by the Federation of the European National Engineering Associations (ENEA) or any other equivalent internationally recognised award. There are also equivalent qualifications for technicians and skilled labour, such as City & Guilds certificates. For the Sudan, this should be a priority before launching its own brand.
- Finally, regular appearance at international stages, such as Industrial Exhibitions and international conferences, raises the Sudanese industrial profile, highlights capability and improves networking. This, in turn, attracts foreign investment and improves the chances of collaboration with global industrial players.

CONCLUSIONS

Despite the recent additions in the fields of heavy machinery, motor vehicle assembly, aerospace and oil industries, the Sudanese economy can only be described as agriculturally based. The industrial contribution of 8.5% to the GDP and 1.7% to the employment market as per the Comprehensive Industrial Survey of 2001 is significantly small. More recent figures from the Ministry of Finance are even more pessimistic. A heavy injection of industrialisation of the economy is essential in order to improve the trade balance and help the country out of the poverty zone. A competitive manufacturing sector is a key element of this dose.

Building a competitive manufacturing sector requires heavy investment in infrastructure, research and development, technology transfer and training. Additionally, flourishing industrial sector in the Sudan requires clear development plan, good governance, supporting legislations, creating a true investment climate in the country and securing the right environment for sustainable development including renewable, clean and environmentally-friendly source of energy.

The education system and institutions should play their role in providing the right quality of education and training to meet the industrial requirements at all levels from skilled labour and technicians through to engineers, marketing personnel and managers. External training and international qualification are also important to satisfy customer’s requirements of independent verification of product’s quality and supplier’s credentials.

In summary, this paper argues that, building a flourishing competitive manufacturing sector in the Sudan to complement its sustainable development ambition is a shared responsibility of good governance, quality education and well-guided investment. This should all be within the framework of implementing a well-thought industrial strategy stemmed from a comprehensive NDP, supported by relevant effective industrial policy and delivered via a carefully designed industrial plan.

Specific recommendations to improve the manufacturing sector contribution to the Sudanese economy were made.

REFERENCES

- Abdel-Razzaq, J. (2016), 'Dubai Ruler launches 2030 Dubai Industrial Strategy'; An article published in The Big 5 Hub website @ <https://www.thebig5hub.com/news/2016/june/dubai-ruler-launches-2030-dubai-industrial-strategy/>, accessed on 27/06/2016.
- Airbus (2009), 'Global Market Forecast 2009–2028'; Airbus Report, UK.
- Al-Roubaie, A. (2013) 'Building Knowledge Capacity for Sustainable Development in the Arab World'; International Journal of Innovation and Knowledge Management in Middle East and North Africa (IJKMMENA), Vol. 2, No.1, pp. 7–20.
- Brace, G., James-Moore, M., Broughton, T. and Raja, V. (1999), 'Artificial insemination breeds sterile technology – Innovation needs people'; TTI conference, Melbourne.
- Dafa'Alla, A.A., (2016), 'Prospects for the Aerospace Industry in the Sudan'; World Journal of Science, Technology and Sustainable Development (WJSTSD), Vol. 13, No. 3, pp. 234–248.
- Dafa'Alla, A.A. and Hussein, E.S. (2009), 'Building an Efficient Air Transport System in the Developing World: Challenges and Opportunities'; Proceedings of the 1st Sudanese Diaspora Conference on technology Transfer, Brighton, UK, 24–25 Jan 2009, entitled *The Role of Diaspora in Technology Transfer and Achieving Sustainable Development in Sudan*, Edited by Allam Ahmed, Published by WASD, ISBN 978-0-9551771-6-3 (print) & 978-0-9551771-7-0 (ebook), 2009.
- Dafa'Alla, A.A. and Hussein, E.S. (2010), 'Towards Building an Efficient Air Transport System in Africa'; Article in *Achieving Sustainable Development in Africa: Science, Technology and Innovation Trajectory*, edited by Allam Ahmed & Sonny Nwankwo for Africa Book Series, published by Inderscience, UK, ISBN 978-1-907106-07-1, ISSN 2042-602x, 2010.
- Dafa'Alla, A.A., Hussein, E.S. and Adam, M.A.A., (2015), 'Critical Review of the Education System in the Sudan from Independence to Date'; Proc. 2nd Sudanese Diaspora International Conference, University of Sussex, Brighton, UK, 11–12 June 2015, entitled *Reconnecting Universities with the discourse of Sustainable Inclusive Growth in Sudan*, Edited by Allam Ahmed, Published by WASD, UK, ISBN 978-1-907106-36-1, 2015.
- Dafa'Alla, A.A., Hussein, E.S. and Adam, M.A.A. (2016a), 'Education in Post-Independence Sudan: A Critical Assessment'; Int. Journal of Sudan Research, Vol. 6, No. 1, pp. 1–19, 2016.
- Dafa'Alla, A.A., Hussein, E.S. and Adam, M.A.A. (2016b), 'Impact of Education Quality on Sustainable Development in Africa' Article in *Managing Knowledge and Innovation for Business Sustainability in Africa*, edited by Allam Ahmed for Palgrave Studies of Sustainable Business in Africa Series, Published by Palgrave MacMillan, UK, 2016.
- Dafa'Alla, A.A., Hussein, E.S. and Adam, M.A.A. (2017), 'Towards an Effective Industrialisation process in The Sudan'; The International Journal of Sudan Research (IJSR), Vol. 7, No. 2, 2017, pp. 85–102.
- Dissman, Bruno, consultant of UNIDO with support from the Technical Committee of the Industrial Survey (2004), 'Report on the Comprehensive Industrial Survey, 2001'; Published by the Central Bureau of Statistics, Federal Ministry of Industry, The Republic of Sudan with Support from United Nations Industrial Development Organisation (UNIDO) & United Nations Development Program (UNDP), Nov 2004.
- Economist Intelligence Unit ViewsWire (2008), 'Growing More Corrupt'; Article @ http://www.economist.com/agenda/displaystory.cfm?story_id=12448676&fsrc=rss, Accessed 17/10/2008.
- Enough Project, (2016), 'Sudan and South Sudan'; an article @ <http://www.enoughproject.org/conflicts/sudans>, Accessed 24/05/2016.
- High Beam (2002), 'Average compensation \$23.15 an hour'; Brief Article in Labor Month in Review, Published by High Beam Research @ <http://www.highbeam.com/doc/1G1-94129172.html>, Accessed 26/10/2016.
- Ibrahim, Mo, (2016), 'Ibrahim Index of African Governance'; published by Mo Ibrahim Foundation @ <http://mo.ibrahim.foundation/iiag/>, Accessed 23/10/2017.
- Index Mundi (2017), 'Sudan Urbanisation'; Published @ <http://www.indexmundi.com/sudan/urbanization.html>, Accessed 21/10/2017.
- Kenana (2016), 'Kenana Sugar Company website'; Published @ <http://www.kenana.com/broadband/kenana1.htm>, Accessed 06/06/2016.
- Khartoum Refinery Company (KRC) (2014), 'KRC website'; Published @ <http://www.krcsd.com/English/about.asp?levelNo=54&id=209>, Accessed 06/06/2016.

- NationMaster (2012), 'Manufacturing, Value Added statistics – Countries Compared', Industrial Statistics published by NationMaster, Published @ <http://www.nationmaster.com/country-info/stats/Industry/Manufacturing%2C-value-added/Current-US%24-per-capita>, Accessed 23/10/2017.
- Statista (2016), 'The statistics Portal', Published @ <http://www.statista.com/statistics/269919/growth-rates-for-passenger-and-cargo-air-traffic/>, Accessed 06/06/2016.
- Taha, A.T.S. (2016), 'Economic Aspects of the Transformational Industries (TI): An Evaluation Study of Sudanese (TI) during (2005/1005 up to 2013/2014)', Applied Economics and Finance, Vol. 3, No.3, ISSN 2332–7294, E-ISSN2332-7308, Published by RedFame Publishing, URL <http://aef.redfame.com>.
- Transparency International (2016), 'Corruption Perception Index 2016', Published @ https://www.transparency.org/news/feature/corruption_perceptions_index_2016, Accessed 06/06/2016.
- United Nations (1989), 'International Standard Industrial Classification of All Economic Activities, Revision 3 (ISIC, Rev.3); Statistical Papers, Series M, No. 4 Rev.3, United nations Publication, Sales No. E.90.XV11.11, New York, Published @ <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=2&Lg=1>, Accessed 06/06/2016.
- World Bank (2016), 'Global Economic Prospects', A World Bank Group Flagship report, Published @ <http://www.worldbank.org/en/publication/global-economic-prospects/summary-table>, Accessed 06/06/2016.
- World Bank (2017), 'World Development Indicators: Structure of Output', Published @ <http://wdi.worldbank.org/table/4.2>, Accessed 18/10/2017.

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BIOGRAPHY

Dr. Adil A. Dafa'Alla (Ph.D; C.Eng.; Eurlng) has graduated in Mechanical Engineering from the University of Khartoum, Sudan in 1981. He then did his postgraduate studies at the University of Manchester Institute of Science and Technology (UMIST) in England, where he was awarded his Ph.D degree in 1988. Currently, Dr. Dafa'Alla is a specialist member of the Aero Data for Loads Group at Airbus UK Ltd. Prior to his employment at Airbus in 1996, Dr. Dafa'Alla has a vast academic and industrial experience. As part of his quest for continuous development, Dr. Dafa'Alla has become a Chartered Engineer (C.Eng.). The C.Eng. Designation is granted by the British Engineering Council, and recognised worldwide. It is a proof of high standard of professional experience and conduct. Dr. Dafa'Alla followed that up to become Eurlng, the European sister of the C.Eng., granted by the European Federation of the National Engineering Associations (FEANI). His current research interest covers aircraft safety aspect as well as airport capacity planning issues. His research activities are reported in a number of journals and conference papers in addition to many technical reports. Coming from a Sudanese background, Dr. Dafa'Alla also has a special interest in topics related to industry, education and sustainable development in Africa. He is an active member of the World Association for Sustainable Development (WASD) and Associate Editor of the Journal of World Review of Science, Technology and Sustainable Development (WRSTSD) since its inception in 2003.

