

# OPPORTUNITIES AND CONSTRAINTS TO THE DEVELOPMENT OF THE CONSULTING INDUSTRY

By  
Engr. Bayo Adeola

## 1 INTRODUCTION

The consulting industry is indeed very wide and can cover just about anything under the sun and beyond. Being a conference of engineers, I have therefore restricted this paper to the Engineering and Construction Industry, although some of the issues may cover other industries. Even with this restriction, the scope of coverage is still very wide as engineering and construction cover virtually all facets of life. It is almost safe to say that if it is not made by nature, then it is made by the engineer.

The practice of consulting engineering has not always been with us. It emerged with the industrial revolution. Before then, the same practitioners designed, raised funds, constructed and manufactured products and marketed them, and the distinctions between researchers, consultants, scientists and contractors were blurred. With the advent of the industrial revolution, several new products hitherto unknown to man, and promising to do ‘magic’ came into the market. The general public was unable to distinguish between genuine products and fakes, and a group of specialist with advanced knowledge in these areas emerged to advice the public for a fee. Thus the practice of paying for technical advisory services commenced.

Since this humble beginning, this industry sector has grown to an over \$250 billion per annum industry covering engineering infrastructures, manufacturing, energy, space, telecommunication and just about anything else. According to the Engineering News Record, the top 500 design firms in the United States of America had a turnover that steadily increased from \$50 billion in 2002 to \$90 billion in 2009 before declining to about \$80 billion in 2010. Similar volumes of work are being carried out by consulting firms in Canada, Europe, Japan and Australia, all of which constitute the traditional consulting engineering countries. In the recent past, however, the eastward shift in the economic centre of gravity of the world has also affected the consulting engineering industry and engineering consulting firms are emerging from China, India, Turkey, the Middle East and South East Asia. In addition to the buoyant market generated by developments in their home countries, they are also exploiting the global market for the export of consulting engineering practice. Indeed, one is more likely to find designs from the emerging nations than those from North America and Europe in Africa today. Needless to say, Sub-Saharan Africa remains significantly behind in this explosion of engineering consulting services.

In a paper like this, it is necessary to put the consulting engineering industry in the context of overall national development. The primary source of knowledge expansion in the world is through science and research. These activities are carried out in universities and research centres of which there is abundance all over the world. The more developed a nation is, the more the number of such institutions and their sophistication. Outputs of such institutions provide fundamental insights into the nature of things and the potentials for the use of man. They are generally not understandable by the common man and not directly useful to him. Engineers study the output of these institutions, and having understood them, design products that are directly useful to man based on these principles. These designs are then produced at prototype levels by entrepreneurs, and those found successful are produced on a commercial

scale through construction and manufacturing.. The end products are consumed by the public as infrastructures, manufactured goods and services. The chain of the delivery of development thus starts with science and research, is followed by design activities, prototype manufacture, full scale manufacturing and construction and finally consumption. In the consumption phase of product life cycle, they need to be maintained and ultimately replaced.

The consulting engineering practice thus basically fills the gap between science and research and manufacturing and construction. It is a gap that the developed and emerging economies have recognised and strongly developed.

The engineer therefore needs to acquire a range of skills to be able to properly function at any particular phase of the development spectrum he chooses to practice in. If he wants to be in science and research, a tertiary degree and work opportunity in a first class university is required. Without this exposure, he would be a mediocre. If he wants to work as an engineering consultant, he needs to have a blend of adequate theoretical and practical knowledge to design functioning products. If he wants to be a manufacturer or contractor, he needs to understand the production processes.

The business units for carrying out consulting engineering practice today varies very widely from a sole proprietor with staff strength of less than five persons and turnover of less than N10.0 million per annum to a publicly quoted company with tens of thousands of staff and turnover in billions of dollars per annum.

### **1.1 Primary Objectives of Consulting Engineering Practice**

From the brief introduction to consulting engineering practice above, two primary objectives may be identified as follows:

- Professionalism
- Profitability

Professionalism implies that the consulting engineer derives considerable pleasure from defining, analysing and providing solutions to the myriads of engineering challenges as the core activity of his professional practice. It requires a very high degree of technical competence which is constantly upgraded through continuous learning throughout ones professional life. The quality of a professional practice is not so much in its physical assets as in its human and intellectual ones. If the engineer would rather be more theoretical, he should go to science and research; and if he would rather be more practical, he should go to manufacturing, construction and maintenance.

Profitability, on the other hand, requires that the consulting engineer makes enough money not only to be able to take care of himself and his family, but more importantly to have the surplus to invest and grow his business. Without profit, there would be no means of attracting and retaining the critical staff essential for the consulting engineering business and providing them with the facilities to carry out their work. Profitability requires that the consulting engineer masters the basics of business management along with his professional discipline. There must be marketing skills to prospect for and get jobs, project management skills to execute them, general management skills to employ and keep staff, and finance and accounting skills to measure and make profit.

Although I have been asked to present a paper focussing on the challenges in this industry, while another speaker presents the opportunities, this division is rather difficult to achieve, as challenges and opportunities are indeed two sides of the same coin. What constitutes a challenge in one context indeed presents an opportunity in another. To align with the presenter's brief, however, I will adopt the 'challenges' approach in developing the opportunities in the consulting engineering industry with the focus on Nigeria.

## 2 PROFESSIONALISM

### 2.1 Quality of Education

The challenge of good quality of education remains with us and affects all facets of our life and not just consulting engineering. Despite the fact that the number of tertiary institutions in the country has grown from just about 12 in the early 1970s to over 160 today, the number of first class quality universities has indeed fallen from 6 (all the universities then were world standard) and it is difficult to rate any one as world quality today. The quality of the faculty has also significantly worsened, with first class graduates, lecturers and professors seeking greener pastures abroad. The infrastructures have become obsolete and overstretched that very little quality learning is possible. The result is the lack of an inspiring environment for the development of quality education.

This sounds like a broken record – continuously repeating itself. But then we have no choice; as long as the problem remains, the complaints shall not cease. There is a Yoruba adage which says that '*B'ina o ba tan l'aṣ Ṙ, eṣe ki'tan l'eekeanna*'; translated: for as long as lice remain in the clothes, so shall there be blood in the finger nails.

### 2.2 Work Place Opportunity for Development

Consulting engineering does not, however, develop in the university. The platform for its development is the work place – consulting firms. The challenges of the work place opportunity may be categorised into three:

- Number and size of consulting firms to employ and retain staff
- Variety and range of projects available for broad and meaningful experience
- Complexity of projects available for experience

The first to be addressed is the number and size of consulting firms in Nigeria. ACEN membership today is about 300 firms employing at best an average of 10 graduates each with a total of 3,000 employees in the whole industry. This is the size of a single medium size consulting firm abroad and maybe even Accenture, KPMG or PricewaterhouseCoopers in Nigeria. The standard industry mix is to have a few large firms employing at least 500 persons each, a larger number of medium size firms employing between 100 and 500 staff, and an even larger number of small firms employing less than a hundred staff. In the Nigerian situation, the largest firms employ less than a hundred staff. The table below compares the industry strength in Nigeria with some developed and less developed countries. It is easy to see the strong correlation between consulting industry presence and degree of development.

Table 1

Country	Population	MA in FIDIC	Number of Firms in MA	Number of Employees
USA	275 million	ACEC	5,000	500,000
UK		ACE	650	100,000
South Africa	40	CESA	480	22,000
Nigeria	165	ACEN	300	3,000
Kenya		ACEK	50	
Canada		ACEC	500	100,000

The member firms and engineers employed divided by 36, the number of states in Nigeria, results in 8 consulting firms with 80 consulting engineers per state. With the firms not being evenly distributed, at least twelve states do not have any resident consulting engineering firms. Needless to say, the extremely low density of firms and their severely limited capacities do not provide the required work place experience opportunity for most engineering graduates. The number of new employees into the industry is less than 10%, that is, 300 new staff per annum, while the university turnout of engineering graduates is in tens of thousands.

Compounding the miniscule industry size, or perhaps due to it, is the very low range of products offered. The scope of coverage of consulting engineering is very wide as already stated above. Nine subgroups are identified in Engineering News-Record as listed below and each subgroup can be further divided into much larger subsectors.

- |                      |                         |
|----------------------|-------------------------|
| 1. Building Services | 6. Industrial/Petroleum |
| 2. Manufacturing     | 7. Transportation       |
| 3. Power             | 8. Hazardous Wastes     |
| 4. Water Supply      | 9. Telecommunication    |
| 5. Sewer/Waste       |                         |

A disproportionately high percentage of ACEN members are engaged in mainly building services and highway design. Since the country itself has a very poor record of developments in power, manufacturing, rail and air transportation, industrial/petroleum processing, hazardous waste management and others, there is very little competence in the society in these areas. The consequence of this is that work place experience has been limited to building services and highway design, the two areas where there are opportunities.

The third dimension of the quality of the work place experience is the complexity of projects available from which to learn. The current practice in the country today is to outsource any project that seems to offer any engineering challenges from abroad. In Lagos State for instance, the first and only cable stayed bridge in the country has been designed in Germany without any opportunity for local learning. The design of Atlantic City has been done in Lebanon without local input. The Trade Free Zone in Lekki is being designed by Chinese companies. All the complex designs on the Lekki Toll Road have been done by foreign companies. While I do not have the data, the probability is that the same phenomenon is taking place in all the 36 states and the Federal Government.

The main argument for this is that there is no local competence to carry out these complex projects that are urgently needed. But this is a self defeating argument, a 'catch 22' situation: you cannot have the project because you do not have experience; yet you cannot have

experience without the project. Somebody needs to fund the acquisition of expertise, and this should be of interest to not only the practitioners but also to government. Unless government invests short term in the acquisition of local expertise, they are going to forever be dependent on foreign expertise with the resulting high cost of works, sometimes substandard installations and often inappropriate technology.

### **2.3 Conferences, Workshops and Technical Reading**

In addition to formal education and work place experiences, the third means of acquiring professional competences is through professional conferences and workshops and reading of professional books and journals. One of the major consequences of the poor quality of our tertiary institutions and professional firms is the absence of a thriving environment for technical and professional discussions required for the development of a vibrant and strong consulting engineering industry. Big and complex projects such as those presently going on in Lagos State mentioned above, and failures such as the repair of the Third Mainland Bridge and the stadium roof in Abuja that would have provided considerable education are carried out by foreign consultants who hold such conferences abroad for the benefit of their own citizens. Important technical issues such as the impact of climate change, environmental challenges including desertification, gully erosion and oil pollution are not being discussed locally because there are no platforms for such discussion. Although ACEN and NSE have been trying to institutionalise training in their programs, these are still at the primary level and targeted at the entry level of the profession.

Even the little that is being done is not being adequately documented for learning purposes. To the best of my knowledge, the only recent effort at writing a technical book for professional education is that of Engr. Segun Oyenuga on the design of concrete structures. It is hard to find similar books on electrical and mechanical engineering or highway design. Our professional associations are struggling to establish their professional magazines as references for educational purposes. The result of this deficiency is the dearth of the opportunity for learning through reading.

### **2.4 Challenges of Expertise Acquisition in a Difficult Environment**

The poor quality of our educational institutions, the small sizes of our firms, the limited scope of services we offer, and the lack of a thriving opportunity for technical and professional discussions all combine to deprive the professional of the opportunity to really acquire competences and expertise, a critical input to the practice of consulting engineering. Indeed, perhaps the main reason for wanting to be a consulting engineer.

So, what should the existing firms do to survive?

Three classical options may be considered, the sink, float or swim options:

- a) Do nothing, continue to complain or exit the profession
- b) Optimise the existing situation and do the best you can
- c) Fight to change the situation and either succeed or fail

Most of the existing consulting firms have adopted the first option. Although they have been in practice for several years, the quality of their expertise is really limited to the design of low rise buildings, whether structures or services. They have not been able to raise their

performance beyond this level due to the lack of opportunities described above. Because of this low level of expertise, ease of entry of new consultants into their domain is easy. After working under a senior for a few years, the junior mops up all the senior has to offer except age, and at the next opportunity, resigns and starts his own company. Others try their hands at construction. Although not their preferred area of practice, perhaps there would be returns to make ends meet. Others go even farther afield and become bankers, traders, or anything else. This is clearly not the preferred option. This is the sink option.

The second option is to optimise the existing situation and do the best that you can. This is the float or swim option. Realising that floating can only be for a while as you eventually have to sink or swim. This option has two approaches:

- i. A business approach in which the firm gets a disproportionate share of the business available through marketing and is therefore able to build a modest competitive advantage from work place experience
- ii. A niche market approach in which the firm develops comparative advantage by building above average competence in a particular field and is therefore able to get steady patronage

The few firms in ACEN that are doing well today have adopted one or the other of these two approaches. The first option does not increase the overall volume of work, and its primary purpose is not the acquisition of expertise although this results from the volume of work available. Often, access to work still does not essentially derive from the competences developed in the process but on the business relationship established. The second option is focussed at developing new competences and thus increasing the volume of work if only marginally. Successfully done, they become identified with this area of expertise and competition tends to be much less.

The approach of identifying a competitive niche and acquiring expertise that can provide competitive advantage is one area in which ACEN members have not paid adequate attention. This is the area in which initiative, drive, vision and personal ambition of key players can be optimised and is the area in which ACEN members can make stronger demand of themselves. We have not created niche markets enough for ourselves in ICT and oil and gas, two thriving areas of the Nigerian economy. Facilities Management, Domestic, industrial and hazardous waste treatment are other areas with great potentials. The irony is that non-engineers from other professionals are doing this.

This is not an easy option as it takes conviction in the viability of the sector, more than above average knowledge and competence in the sector. It requires clarity of vision, time and energy, passion, and a firm belief in the potential of the sector. It requires some investment during incubation before success is eventually attained. The good thing is that properly conceived and managed, it most often results in success, even if a modest one. But the price of incubation and development has to be paid. It is the lack of courage at paying this price that often prevents the adoption of this option.

The third option is to fight to change the system. This is the ultimate challenge. It requires visionary leadership and aggressive pursuit of the vision by the industry. More on this later in the paper as it relates to both professional satisfaction and profitability.

### 3 PROFITABILITY

#### 3.1 Consulting Engineering Practice Is a Business

The first and perhaps the most important point in discussing profitability is to realise that consulting engineering practice is primarily a business and as such must make money, albeit with the constraints of professional satisfaction described above. If it does not make money, it will not survive and professional satisfaction will not be realised as is the case with most practices in Nigeria.

The primary equation for profitability is indeed very simple:

$$\text{Profit} = \text{Income} - \text{Expenditure}$$

Income comes from professional fees charged for work carried out. These are charged either as a percentage of the cost of works executed, or as man-month rates of deployed staffs multiplied by the duration of each staff on the project. Expenditures are incurred in staff salaries, office accommodation and equipment, operating costs for the projects being executed, training and other costs. The challenge of profitability is thus conceptually very simple, generate enough income, minimise expenditure, and ensure that the absolute amounts of income and profit are large enough for sustainable business practice.

While engineers are very good at resolving complex equations as would obtain in structural analysis, complex electrical circuits or thermodynamics, we have not paid adequate attention to this simple equation of profitability to our own detriments.

The viability of any business may be evaluated under the following four considerations:

- a) Macro-Economic Environment
- b) Industry Characteristics
- c) Business Strategy of the Firm
- d) Business Practice Competences of the Firm

#### 3.2 Macro-Economic Environment

The macro-economic environment of a country impacts on all businesses, and the major factors of the country environment must be evaluated to determine if a business will do well there, and how well it can do.

Nigeria has a population currently estimated at over 160 million people and a land area of almost 1.0 million square kilometres. Its GDP is about \$400 billion per annum which is about 60% of the GDP of West Africa. The economy has been growing at over 6.5% per annum in the last five years. The major economic activities include agriculture, oil and gas production and telecommunications. The manufacturing sector has been going through severe difficulties in the last two decades and is today dominated by India and Chinese owned companies. There is severe shortage of infrastructures including power, road, rail and inland waterway transportation, potable water supply, waste management system, and housing. Major recent policy impacts on the industry include the local content law which requires companies operating in the oil and gas sector of the country to be resident in the country; and the procurement law which seeks to regulate the procurement of goods, works and services in the country.

This macro-economic environment should imply great opportunity for consulting engineering business as virtually all infrastructures are needed. The major areas of interest to the consulting engineers should include Oil and Gas, Telecommunication, Roads and Highways, Rail Transport, Waste Management, Urban Infrastructures and Building Services. Given the infrastructure deficit, there should be opportunities for all categories of consultants, small, medium and large scale practices.

While these opportunities exist, the political and administrative environments are strong mitigating factors against the development of this industry. Very frequently, as much as 70% of the budget of the Federal and State Governments is spent on recurrent expenses (excluding infrastructure maintenance), leaving very little for the development of capital infrastructures. There is no national policy for the development of engineering capabilities and capacities as obtains in India and China. Indeed, there is the mis-informed notion that it is the responsibility of the Nigerian Engineers to persuade the government to build national capabilities and capacities in this industry. The result of this is lack of appreciation of consulting engineering practice as national assets, and the preponderance use of foreign based consultants for all projects of decent size and complexity.

The macro-economic environment may thus be described as being in conflict with itself. While a large quantum of infrastructures are needed, which should consequently be favourable to the development of consulting engineering practices, the political and administrative environment inhibit the growth of the sector through the lack of investment in local capacity and discouragement of the few existing practices. Any prospective entrant to the industry must be aware of this and have the strategy to survive in the environment.

### **3.3 Industry Characteristics**

According to Michael Porter, the viability of an industry may be evaluated by considering four factors: supply characteristics, demand characteristics, ease of entry of new players and alternatives available in the market.

The supply base of consulting engineering service in Nigeria is indeed very wide. It includes government sponsored companies from China, multi-national companies from Europe, North America and Middle East, and other countries with developed consulting practices such as South Africa. At the bottom of this list are the local consultants, mostly members of ACEN. With this large number of suppliers, competition is very keen, and the emergence of industry leaders from the local practitioners has been difficult.

The demand base of consulting engineering services in Nigeria should ordinarily be wide and include the Federal and State Governments, the Oil and Gas Industry, the Telecommunication Industry, the Manufacturing Industry and Housing Construction Industry. However, most state governments have not established a standard policy for the use of consulting engineering practices, and as already stated above, a significant percentage of their budget is used for recurrent expenses and little is available for capital projects. Indeed several of them have an 'anti-consultant' attitude. Until recently, oil and gas and telecommunication were mostly dependent of foreign based consultants and multi-national companies and the local consultant has had very little penetration of this industry. Manufacturing has been in the doldrums for sometime now with several of the factories and warehouses converted to

churches. Opportunities in the housing sector have been limited to Lagos and Abuja and a few state capitals with enough revenue.

The effect of all these is that a potentially large demand base has shrunk significantly and it is safe to say that the supply far exceeds the demand. This compounds the large supply base discussed above and makes the industry highly competitive.

The third factor is the ease of entry of new players into the industry, that is, how easy is it for new consulting firms to be formed. The requirement for the registration of a consulting engineering practice in Nigeria today is the registration of the individual engineer and his firm by COREN in both the individual and firm membership categories. An average engineer working in a consulting engineering firm is usually able to obtain COREN registration in about 4 to 6 years. On being registered by COREN, he registers a firm and starts by running his practice on a part time basis while he continues in employment. Thereafter, he requires only a business opportunity to resign from his firm and establish his own company. Very little capital is needed, and he can indeed grow organically from the fees from the projects. There is very little lost in terms of complexity of projects available to him as his former firm was not much larger than his new practice. Even foreign firms find it easy to enter the Nigerian market as both government and private clients are ever so willing to cooperate in using his services and ensuring that he is paid.

This extremely easy entry to the industry compounds the existing large supply base and low demand of services. The industry gets even more competitive still.

The fourth consideration is the alternative sources of professional services. Again, there is no shortage of alternative supplier of consulting engineering services to clients, and two can be easily identified. The first alternative source consists of the engineers employed in government services who are desirous of practicing their profession and discourage government from using external consultants. This group of engineers set up consulting departments within government and offer the services without fees, being paid staff of governments. The second alternative consists of large contractors who obtain projects on a 'contractor finance', 'design and build' or 'turn-key' basis and either seek consultants abroad, set up consulting services within their companies or employ low cost free lance consultants to carry out the projects. Under the illusion of saving money, clients are often too willing to adopt these alternatives.

Reviewing the four considerations above, it can be concluded that the consulting engineering industry has a large supply base, limited demand, very easy entry conditions for new players and alternative sources of the services offered. This is not an easy industry to play in as all these factors suggest a highly competitive industry with low remunerations, two features that can be easily observed in the Nigerian consulting industry.

### **3.4 Business Strategy of the Firm**

The first two considerations above, the macro-economic environment and the industrial characteristics constitute the background environment in which the consulting firm must operate. There is very little that the individual consulting firm can do about these. Changes can only be effected through collective efforts of professional associations such as ACEN. However, the remaining two considerations, Business Strategy and Business Practice of the firm are the direct responsibilities of the firm, significantly within control.

As discussed in paragraph 2.4 above, two business strategies that can respond to the macro-economic and industry characteristics described above are:

- A market strategy that allows a firm to attract a significant share of the existing market to itself and thus ensure business survival
- A market strategy that defines a niche market for itself and, acquiring differentiated expertise in this niche market, attracts patronage and ensures survival

The two other options of improved macro-economic environment and changing the industry characteristics are, as already stated, beyond the firm.

The business strategy of the firm is usually preceded by a study of the strengths, weaknesses, opportunities and threats (SWOT Analysis) facing the firm. In a way, this helps to define the firm's characteristics, drawing attention to the areas ready for exploitation and those for which considerable inputs must be made. A brief review of the two strategic options a firm might pursue is presented below.

#### Improving Market Share

Assuming an adequate level of competence (discussed in section 2 above) the major focus of a firm intent on growing market share would be aggressive marketing. Such a firm would need to study how to market professional firms, and there is an abundance of literature on this subject. If his core staff consists of technical experts with no skills in marketing, (a weakness in business development context), he would either have to train them to acquire these skills, or engage professionals into the firm for marketing purposes (a response to the weakness identified). The firm would also need to decide on how wide his scope of services should be. If he has a multi-disciplinary team of structural, electrical and mechanical engineers, (a strength for a broad based firm), then he could offer a broad range of services and his marketing would be designed to respond to this. On the other hand, if he has a narrow range of expertise, then he would be best to grow his company within this relatively narrow focus. Otherwise he would have to recruit additional key staff to fill the gap.

The firm would also need to consider the business structure in which the additional staff recruited would function. Traditionally, the consulting engineering firm grew on the sole proprietor and partnership business models. In the past few decades, however, they have evolved into mostly limited liability companies, and in a few cases, publicly quoted companies. The business model will have to consider how to attract and retain the senior engineers required to deliver on the increasing volume of projects without loss of quality, and opportunity for ownership is a major factor in this consideration. Given that the technical staffs are the most critical assets of the consulting engineering firm, as owner/founders retire, the replacement has been more by management/staff ownership rather than individuals.

A broad based firm would have a mixed portfolio of projects which may vary from simple to very complex projects. It would also have a broad mix of staff varying not only according to disciplines, but also according to experience and expertise. With a relatively large staff, human resources management, accounting and finance, organisational structure and behaviour and similar large company concerns become very important. A robust administrative structure separate from the technical focus of the business becomes important. The biggest international consulting engineering firms today operate in this realm, with staff

strengths in excess of 5,000 and branches spread across the globe. In the Nigerian context, a short term objective would be to grow a couple of firms with about 200 staff.

### Playing in Niche Markets

The second strategic option considered is to play in niche market. Niche markets can be created through speciality of discipline, focus on a particular market segment, or focus on a particular region. There are several areas in which speciality can be acquired, and examples include acoustics, ELVS and fire prevention design in building services, hydraulic structures, analysis and design of complex structures, vibrations in machines, control systems, foundations and numerous others. The first challenge in this approach is to acquire above average expertise in any of these disciplines. The second challenge is to design and implement 'target marketing' to the potential clients. Usually, clients using these services are knowledgeable and therefore discerning, and considerable efforts might have to be put in to 'break in' into this relatively exclusive market.

Another segment of niche market is to focus on particular markets such as oil and gas, telecommunications, International Aids organisations, International Financial Institutions, State and Federal Governments and the Organised Private Sector. Each market usually has its own peculiarities as to administration, procurement processes and procedures, business practice and similar issues. Again, considerable efforts and time might be required to 'break-in' into any of these market segments, to stay in after the first break.

The strength of the existing staff of the firm would have to be evaluated against these potentials. Where there are technical experts in the firm already, the challenge becomes the creation of an organisational structure that emphasises niche market development. Because of the relatively high level of expertise required, the business unit leaders are often not technically junior to management, and the 'freelance and independent' tendencies of these experts would need to be managed. A loss of a particular expert to the firm might mean a total loss of that business unit.

Emerging new fields of practice include Sustainability Management, Climate Change Management, Renewable Energy, Environmental Disaster, among others. These are potential areas of niche markets for the consulting engineer. They, however, need considerable expertise, clear vision for their development and exploitation, and a marketing strategy for penetration and development.

Whatever strategic option is eventually decided upon by the firm, there would be the need to develop a complementary business plan to implement this strategy. Clearly articulated visions and missions are key. The core business objectives and deliverables including volumes of sales and revenue must be defined; the methodology for implementation including key staff, technology and marketing procedures and processes must be carefully thought through.

In most of our consulting engineering practices in Nigeria, this critical requirement of business success is often done very poorly, and in several cases not done at all. We tend to live from day to day hoping for the best.

### **3.5 Business Practice Competences of the Firm**

This is the last of the business considerations in this paper and it addresses the day to day operations of the firm. No matter how good a strategic plan is, poorly implemented, it will not be worth more than the paper it is written on.

A firm must be run properly on a day by day basis for profitability. The classical human resources prescription is to employ the best staff, train them well, pay them decently, demand exceptional performance from them, reward them when they perform and dismiss them if they cannot cope and replace them with more competent people. This is at the core of performance, especially in an industry that depends on technical expertise for its performance.

Unfortunately, the consulting engineering industry in Nigeria is severely challenged in this respect. It is usually not able to compete for the best staff as other more rewarding industries such as oil and gas, telecommunications and banking attract them. With weak recruits, even more rigorous training is required, and this should normally come from the work place experience, conferences, workshops and books. As discussed in section 2.3 above, there is no vibrant environment of conferences and workshops and work place experience is severely limited. With low income, even those who stay are dissatisfied and are more often than not looking for greener pastures with the resulting negative impact on staff retention. Few companies have staff retention of more than five years on the average apart from the partners.

Investment in a good office environment and contemporary equipment and technology is required for efficient delivery of professional services. Although physical assets are not generally considered as critical to consulting engineering practice, the little that is needed still must be provided and can be quite expensive for small firms. The full complements of information and communication equipment need to be provided along with document processing equipments such as printers and photocopiers.

Consulting engineering firms also need to have efficient processes and procedures for the consistent delivery of quality work. Managerial skills are required on several fronts including proposal writing, clients' management, report writing, human resources management and secretariat services among others. Project Management training and ISO certification are becoming standard industry assets without which the consulting firm is not considered as being adequately efficient.

A critical managerial skill needed by consulting engineering firms is financial management. As stated in section 3.1 above, profit is the difference between income and expenditure. Income derives from fees, and a thorough understanding of fees estimating is required. Expenditure is the cost of doing the work and the dominant item is staff salary and remunerations. For too long, we were dependent on the percentage fees model. This did not relate income to expenditure and most projects were indeed being carried out at a loss with this model. The recent practice of man-month based fees estimating has a more direct relationship with expenditure and should lead to better financial management.

Another major financial challenge is cash flow. The old fees structure was that you were not due for any fees until the completion of the preliminary design phase, and often did not collect any fees until the completion of the final designs. Even this was usually delayed until the client was ready to go to the construction phase. The real implication of this is that we are creditors to the project without any interest payment. This situation often imposed severe stress on the cash flow of the firm, with a huge amount of receivables but little cash for operations. Frequently, the clients defaulted on payments.

#### **4 CHALLENGES OF CONSULTING ENGINEERING PRACTICES IN A DIFFICULT ENVIRONMENT**

In this paper, we identified two critical components of the consulting engineering practice. The first is the demand of professional satisfaction which requires that considerable expertise be acquired and deployed in the provision of solutions to engineering problems. We postulated that the consulting engineer faces considerable challenges from the poor quality of education in our universities, the grossly inadequate work place experience for the practitioners, and the dearth of conferences, workshops and professional journals for the acquisition of the necessary competences to practice and enjoy his profession. The prevailing environment does not augur well for professional development and consulting engineering practice is severely challenged.

The paper identified three options in response to this difficult environment, the sink, drift or swim approaches. The sink approach is to do nothing but complain or exit the profession. The drift approach is to run a mediocre practice that gives neither satisfaction nor profit. The swim approach is to optimise the little opportunities available and excel in spite of the odds.

The second consideration is for the practice to make profit so that the practitioners can sustain the practice and live a decent life. In this area, we have examined four factors that must be considered by a practitioner in the industry. Two of them, the macro-economic environment and industry characteristics do not provide a positive environment for the development of a consulting firm in Nigeria. These two areas are totally out of the control of the consulting engineering firms or engineers and must be managed at the socio-political level.

ACEN is the only association in Nigeria with a focus on the consulting engineering industry, and it is the only organ that can attempt to address these challenges. Although COREN has statutory responsibility for the regulation of consulting engineering practice, this is only one of its assignments, and it has been unable to devote enough attention to consulting engineering practice development beyond the registration of firms. The leadership of ACEN has realised the challenges facing the industry and is making efforts to address them. However, there is so much to do, and ACEN's resources are severely limited.

The responsibility to grow ACEN and ensure that it is able to play its part rests mostly with the relatively successful firms and individual consulting engineers in ACEN. This would really be a 'giving back' issue as both the country and the consulting engineering industry would benefit from improved macro-economic environment and industry characteristics.

The remaining two issues discussed, the firm's strategic plan and business development competences, rest squarely on the firms and the senior engineers in the firms. It is the responsibility of the firm to develop a business success strategy given the constraints of the macro-economic environment and industry characteristics. It is also the responsibility of the firms to learn best practices in business management and apply these to their businesses. Two strategies for survival were identified in this paper, and there are probably a few more.

The paper also examined two models that have provided reasonable result in the Nigerian environment. The first is to set up a firm that successfully attracts a significant share of the existing market. The continuous flow of work provides the opportunity for the acquisition of expertise while at the same time providing profitability and consequently sustenance for the firm. This ability to attract a significant share of the market does not, however, usually endure beyond the tenure of the founder as there are very few firms that have succeeded their founders. Unecon Associates and Vason's Concept are shining examples. The second model depends on identifying a niche market and deriving comparative advantage from the exploitation of such market. Project Management and Telecommunications have been so used by CPMS and Telecom Answers in this model.

#### **4.1 The Future of Consulting Engineering Practice in Nigeria**

Nigeria is a huge potential waiting to be realised. There is so much infrastructure to provide, so many people to feed, educated, housed and provide health care for. The threat of climate change and the resulting desertification, flood control and gully erosion, deforestation and ocean surges are ever present. This future has to be provided for and sooner or later we will have a government that fully realises this and is willing and able to address the challenges.

The solutions to these problems are intricately and inevitably linked to science, engineering and technology. All other professions are important. We need the political will and dexterity of the politician, we need the critical reasoning of the lawyer to provide the legal framework and ensure justice, we need the economist to put production, labour and money in perspectives, we need banking and finance to provide the finance for development. However, while all these other very important disciplines provide the framework for physical development, the only one that directly provides these infrastructures is engineering. And until engineering is developed, development will be a mirage. Indeed, Engineering is Development.

Therefore, inspite of the gloomy picture that we have now, the medium to long term prospect of the engineer must be bright. And all of us here must be catalysts to its achievement.

