

# CHALLENGES AND OPPORTUNITIES IN SCIENCE, TECHNOLOGY AND ENTERPRISE DEVELOPMENT FOR SUSTAINABLE INDUSTRIAL GROWTH IN GHANA

Fourteenth Colloquium of  
the Faculty of Science  
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CHALLENGES AND OPPORTUNITIES IN SCIENCE,  
TECHNOLOGY AND ENTERPRISE DEVELOPMENT FOR  
SUSTAINABLE INDUSTRIAL GROWTH IN GHANA

A PAPER PRESENTED

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# EXECUTIVE SUMMARY

This paper is an update of earlier works by the same author as presented in the reference section.

The presentation is divided into 5 parts:

1. Introduction
2. Pathways in Science, Technology and Economic Development: professional practice linkages
3. Typology of Ghana's industry and private sector
4. Higher Education, Enterprise Development and the Informal Sector
5. Agenda for growth

In the **Introduction in Section 1**, the main issues discussed in Reference No.1, **Research, Science and Technology in Enterprise Development and Industrial Growth in Ghana** are summarized.

**Section 2** discusses the inter-relationships between Science, Technology, Industry and Socio-economic development. Characteristic features of the separate head topics and the challenges and opportunities they portend at each stage of the development process are indicated to present professional practice pursuits for S&T experts.

**Section 3** presents enterprise characterisation by size and by activity, further supported by results of a National Survey on Characteristics of Businesses and Occupations in Ghana.

**Section 4** discusses Enterprise Development especially the predominating phenomenon of the informal sector in the context of contemporary higher education roles and claims as centres of S&T activity. An attempt is made to gauge the resulting impacts on the country's industrial and socio-economic development.

The concluding **Section 5**, titled **Agenda for Growth**, embraces more closely but briefly the original request by the organizers of the colloquium to speak on **The Role of the Private Sector in Creating Opportunities for Science in National**



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**Development.** However, the attributes of a model provider of S&T products and services are explored to highlight the potential S&T expert who can successfully enter into partnership with private sector operators for the realisation of the expected enhanced growth rates for accelerated national development.

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# 1. INTRODUCTION

This colloquium, coming so soon after the First National Forum on Harnessing Research, Science and Technology for Sustainable Development of Ghana, held at the International Conference Centre, Accra, from March 15th to 19th, 2004 encourages me to amplify, explain further and contextualize better, some of the following key statements I made and ideas I espoused within the constraints of the planned period of the forum when I spoke on

## **Research, Science & Technology in Enterprise Development and Industrial Growth in Ghana (1).**

The highlights are summarized as follows:

Technical change and incremental progress in technology are recognized drivers of rapid industrial and socio-economic development.

To manage technology for accelerated industrial development requires a mastery of the innovation process.

Innovation is the successful exploitation of new ideas, products, materials, techniques and processes in businesses, in manufacturing or in services.

That Technology is applied science is a myth. It is only from a simple perspective that Science may be perceived as theory where Technology is its practice. The root function of Science is to understand nature better and Technology is to expand what humans can do.

The enterprise is the centre for industrial innovation and agent of economic expansion and growth. Industrial innovation in Ghana is achieved more through technology transfer in new investments or expansions than through R&D from Universities and research institutions.

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Sub-Saharan Africa is the world's poorest continent. It is the only region of the world to have grown poorer in the last 25 years despite the explosion of technology and trade that has boosted incomes in other regions.

Seventy per cent of Ghanaian enterprises employ less than 5 people. 40 per cent of Ghana's Gross National Income (GNI) is attributable to informal sector activities compared with 18% in European OECD countries. The informal sector is a predominant phenomenon in the country's socio-economy.

Major constraints to enterprise development and industrial growth at the national level include:

- Business practices
- Bureaucracy; complexity and non-transparency of regulations
- Business registration and approvals
- Corruption
- Limited application of scientific technology to country's natural resources
- Public sector attitudes

At the firm or enterprise level, the constraints include:

- Informal nature of businesses
- Limited managerial skills; limited training
- Lack of trust and respect among Ghanaians
- Inadequate investments in productive enterprises
- Inadequate agricultural and industrial research and extension support
- Low labour productivity
- Lack of raw materials; abundant in nature but unavailable for industry
- Access to credit

Income for businesses is derived from trade with other businesses and economic units in the same country or in other countries, in the same region or beyond. Government revenue is derived largely from taxes on business and their employ



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eyes' incomes, and their transactions. Increasing trade with more businesses in more countries improves incomes at home.

Ghana's private sector, through the platform of the Private Enterprise Foundation (PEF), is a champion of public procurement reforms, in partnership with Government and development partners.

In many countries, the public procurement system for works, services and goods and the disposal of public assets is used as a tool for national economic development. Through public procurement, every capable Ghanaian or his enterprise could have the opportunity to transact business with Government. The public procurement system accounts for 50 to 70 per cent of annual imports. Using conservatively 1998 import figures totaling US\$ 2.730 billion, the value of public procurement in that year alone was between US\$ 1.365 and \$1.911 billion.

The practices, procedures and methods used were reportedly suspect. It is doubtful if the public procurement system fostered competition, quality consciousness and value-for-money for enterprise development and industrial growth.

The Private Enterprise Foundation participated actively in the events that culminated in the passing of the Public Procurement Law (Act 663) in December 2003; PEF still plays a leading role in the post-enactment activities. For, good procurement systems contribute significantly to the attainment of key development goals such as growth of local enterprises and markets; reduced transaction costs; elimination of corruption; and ultimately poverty reduction.

Enterprise improvement and competitiveness enhancement do not depend only on capital investment. Also important are organization types and changes, the use of analytical tools and the skills of managers, supervisors and workers. Quality control, improvement and assurance, standardization and metrology all play critical roles in raising levels of enterprise efficiency and industrial competitiveness.

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The S&T community in Ghana is not known as a willing partner in private business promotion. Apart from a few individual and exceptional cases, the evidence suggests that graduates of S&T disciplines and their associations have shown little interest in a thriving enterprise culture, in creating and running businesses or in entrepreneurship. An encounter with leaders and representatives of such associations gives the impression that members are pre-occupied more with their individual career enhancement work that has had, unfortunately, little impact on activities for wider enterprise growth and industrial development.

## **2. PATHWAYS IN SCIENCE, TECHNOLOGY AND ECONOMIC DEVELOPMENT PROFESSIONAL PRACTICE LINKAGES (2)**

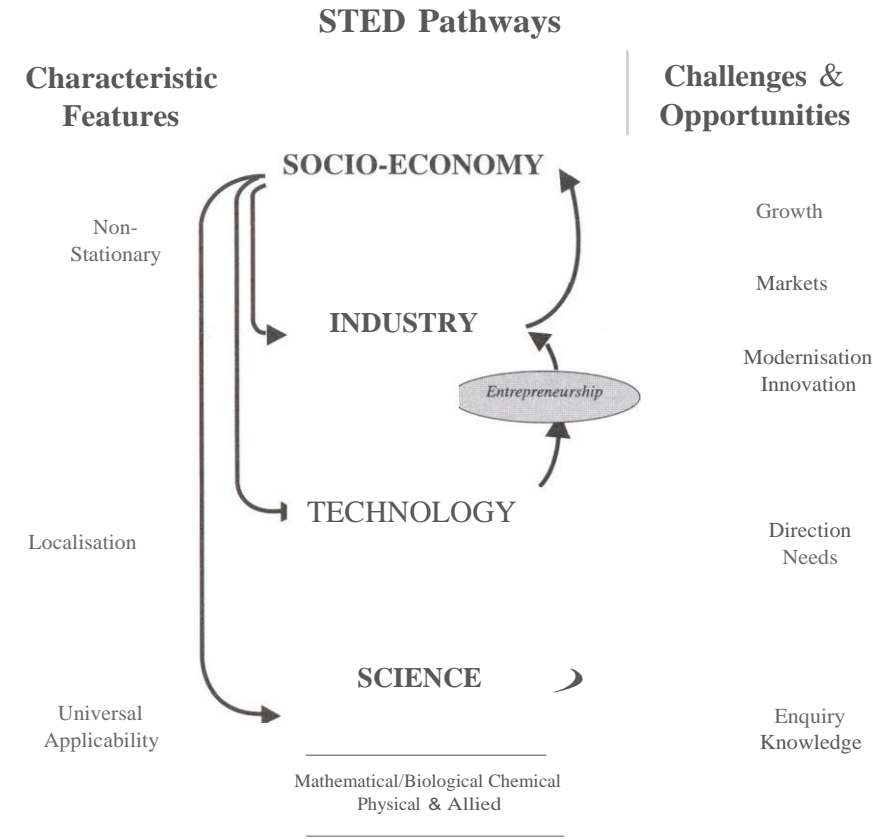
Figure 1 is a schematic representation summarizing the interrelationships between Science, at the foundation, Technology, Industry and ultimately the Socio-economy as a superstructure.

The characteristic features of each component of the scheme as well as the intervening challenges and opportunities at each stage of the process are identified and listed.

The application of scientific principles to local resources to satisfy expressed needs redefines Technology separately and distinctly from Science, whose applicability is of a universal nature.

Technology, by itself, does not create an Industry unless it is adopted by an Enterprise. Research, Science and Technology institutions are classified, in economic terms, as Industry or Business Support Institutions, part of the Trade Support Network.

Figure 1: STED Pathways



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To successfully mobilize industry for real social and economic growth requires the installation of a program which harmonizes the material requirements of the populations with the activities of a holistic and integrated supply system that recognizes production, processing and marketing as interdependent functions. One of the greatest challenges in Ghana to advances in industrial development is the serious shortage of highly qualified and experienced personnel in the technology and management areas of the economy. The absence of an independent, self-sustaining, and respected corps of professionals to provide leadership that influences priorities of political administrations is one factor possibly responsible for the present state of industry.

Such persons, if they exist, should normally find the necessary challenge in *private* industry.

Creative industrialization is another challenge; it is a culture borne out of research and supported by social, legal and economic institutions. It involves original work from the conception of ideas through laboratory and scaling-up studies to market introductions. The culture of creative industrialization is understandably alien to African and Ghanaian socio-economic practices, so it is easier for industries with external linkages to find solutions to the challenges of changing conditions than for the native industry to create modern plants from traditionally inspired product ideas based on local materials. Creative industrialization demands skill and commitment that only a few highly trained and experienced professionals can boast of. Apart from the limited numbers of personnel of the right caliber, creative industrialization is considered a high-risk activity, financial support for which is extremely difficult to procure from conventional sources (3).

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### 3. TYPOLOGY OF GHANA'S INDUSTRY AND PRIVATE SECTOR

Figure 2 presents a diagram that even though not drawn to scale, captures pictorially the characterization of Ghanaian enterprises and industry by size and activity.

According to the latest industrial census figures (2003), about 93 percent of Ghanaian businesses are small enterprises employing 29 or a fewer number of persons. Over 70 percent of these are micro-enterprises employing less than 5 persons. Most small and micro-enterprises operate in the informal economic sector. Many of them offer their promoters survivalist or subsistence non-entrepreneurial self-employment; such enterprises are not growth-oriented.

For national accelerated economic growth, we need to nurture more enterprises, which even if they do start small, are modern and technology efficient with a potential to grow to medium and then to large-size classification within a reasonable and predictable period. Such enterprises must be assured of a well-functioning national Industry Support Network made up of financial and non-financial elements, including research, extension, quality control, quality assurance, standardization, environmental, metrology and other S&T services.

Figure 2: Enterprise Characterisation By Size And Activity  
(Not to Scale) (4)

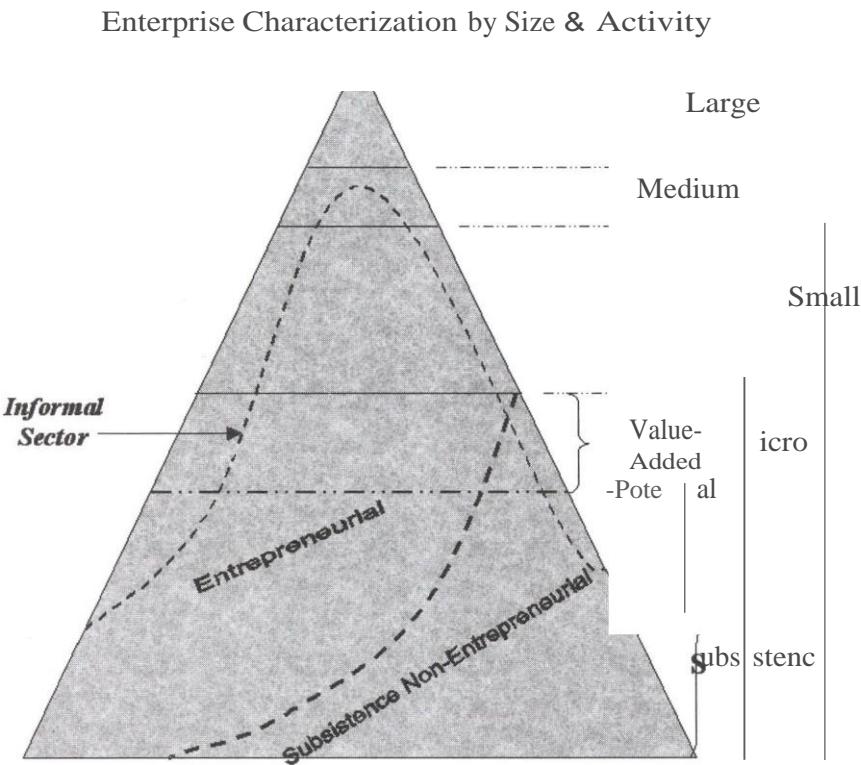


Table 1 presents a summary of the results of a 1996 national survey conducted by HRDA on characteristics of businesses and occupations. An analysis of the results reveals a graduation, with a good degree of overlap from the informal sector, best represented by the Producers, through Exporters, then through Manufacturers, and into the formal sector, best represented by persons employed in Policy and Regulatory (P&R) institutions in the Civil or Public Service.

Table-1: Characteristics of Businesses & Occupations, 1996 (4)

		Exporters (%)	Producers (%)	Manufacturers (%)	P&R (%)
1. Educational Background		10	38	3	0
	<i>Primary Education</i>	7	49	15	3
	<i>Secondary Education</i>	41	6	9	26
	<i>Technical/Vocational Education</i>	22	5	24	15
	<i>Tertiary Education</i>	16	1	47	50
2. Gender Distribution					
	<i>Male</i>	85	74	96	76
	<i>Female</i>	15	26	4	24
3. Status of Business					
	<i>Registered</i>	88	9	91	Na
	<i>Unregistered</i>	6	88	3	Na
4. Membership of TBAs		25	25	87	Na
5. Have other Occupations		4	80	1	10
6. 1995 Annual Income					
	<i>More Than ₵25m</i>	19	Nil	54	Na
	<i>₵5m- ₵25m</i>	25	4	21	Na
	<i>Less Than ₵5m</i>	29		16	Na
	<i>₵5m- ₵1m</i>		22		Na
	<i>₵1m- ₵100,000</i>		55		Na
	<i>Less Than ₵100,000</i>		13		Na
	<i>No Information</i>	27	6	9	Na

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## 4. HIGHER EDUCATION, ENTERPRISE DEVELOPMENT AND THE INFORMAL SECTOR

Higher education in Ghana has, in general terms, very weak linkages with micro-enterprise development, self-employment schemes and the informal sector. The reasons are obvious. Post-secondary education in the emerging nation-state of Ghana was not originally designed to fulfil self-employment objectives, but rather to supply a certain calibre of personnel to fill prescribed positions in the civil service. Later, a few private companies in the country, mostly subsidiaries of foreign firms or local branches of multinational corporations, converted some of the products of this educational system to their use through in-service training.

Therefore, until a few decades ago, post-secondary education in Ghana, without doubt, provided its beneficiaries with opportunities of employment in the formal economy with prospects of demonstrated satisfactory standards of living, job security, pension and a good social standing.

Formal education progressively refined the social behaviour of its beneficiaries and converted them, more or less, into rules-conscious individuals. In addition, the specialisation associated with higher education further narrowed the apparent effectiveness of the individual's contribution in the larger society.

The informal sector is a relatively unstructured system where success is selective and may be due more to the nature and conduct of business than to predictable or verifiable factors. The challenge of survival, in itself, does not encourage operators in the system to respect and apply rules and regulations consistently.

Most products of higher education are therefore not well prepared to operate in such a system. The transformation they have undergone inevitably reduced their capability to take risks in the current chaotic environment (4).

The educational system can be an effective instrument of change but it could



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also, under certain circumstances, promote the status quo. Change is certainly easier to accommodate in times of expansion and relative joy, than in times of contraction or depression or when conditions are static. Naturally in these times, there is less willingness, and possibly ability, on the part of older staff, who invariably constitute the leadership, to adapt or adjust.

By and large, and in rather general terms, higher educational institutions in Africa are attempted 'mirror images' of Western European or North American models but the contexts in which they operate sometimes differ substantially; these contexts have markedly influenced the effectiveness of higher education's contributions.

Higher Educational Institutions are unique aggregations of academic and professional skills, which collectively and individually harnessed should be important tools for accelerated socio-economic development. But over the years the seeming lack of mission of the academic approach in the face of worsening conditions has led to an erosion of their credibility in favour of more expedient approaches (5).

## 5. AGENDA FOR GROWTH

All strategies for sustainable economic development underscore the important roles of science, technology and investment. The application of S&T to production and organisations will increase firm level total factor productivity, enhance the country's competitiveness in international trade and improve the quality of local and inward investment. Accelerated economic growth is attainable but it would require bold, audacious actions including learning by doing and learning by investing (1)

Institutional reforms, especially in the public sector including universities and research institutes, are necessary for growth.

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Some studies have suggested that Ghana can add 2 percentage points to its GOP growth rate if the quality of its public institutions were improved to levels comparable to equivalent institutions in Asian countries (1).

Availability of finance is an important enabler, but it is worth repeating that enterprise improvement and competitiveness enhancement do not depend only on capital injection; organization types and timely changes, the use of analytical tools, and the skills of managers, staff and workers all do count.

We are unable at this stage to make concrete recommendations for S&T experts whose current pursuit is enquiry and whose ambition is the acquisition and advancement of knowledge, or related traditional and routine vocations; these are life-long challenges whose importance need not be devalued.

However, it is non-contentious that for a provider of S&T goods and services to have the expected impact on the country's current rate of development, a model S&T service provider must possess the following attributes (2):

- Extensive experience and knowledge in one or more fields of Science and Technology
- Use of worldwide sources of information
- Flair for identifying new technology opportunities of practical significance to industry
- Knack for presenting information in a useful business format
- Ability to convince non-technical executives of value of technical presentations
- Interest in commercializing opportunities
- Technologies investigated often result in business opportunities
- Ability to marshal and coordinate resources to implement ideas
- Ability to create and sustain initiatives of inter-departmental and inter-institutional support
- Seek opportunities on an international scale
- Possess strategic direction and implementation skills

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- Possess entrepreneurial skills and wide-ranging resourcefulness

In effect, we expect that such Science & Technology experts who would have the inclination to work with commitment in partnership with the Private Sector will be highly resourceful persons who provide leadership in their areas of expertise. They are recognizable readily as agents of change. By and large, they create their own opportunities and consolidate their own markets.

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