

Mauritius Research Council

SCIENCE, TECHNOLOGY & INNOVATION AUDIT

A Summary of Preliminary Findings

INTRODUCTION

In the highly competitive global economy it has become evident that Mauritius will need to extend the application of scientific & technological developments and become a more innovative nation in order to broaden its commercial base and thus improve the standard of living of its communities. In the 1993 *Industrial Expansion Act*, it was stated “...Mauritius needs a new policy instrument, adapted to serve the objectives of an essential technology-driven, higher value-added industrialisation, which only can sustain the growth of our industrial sector in the long term.” The Mauritius Research Council in 1995 also commented: “Careful application of science and technology to any development will ensure that further sustainable expansion can take place. Science and technology has a major contribution to make in the complex process of innovation, international competitiveness and the creation of new jobs.”

The imperative for Mauritius to act in developing a greater S&T base within its private sector is highlighted in the November 2000 Ministry of Finance report **The Present State of the Economy**, which states:

...the present state of the Mauritian Economy is a cause for serious concern with key macroeconomic indicators pointing to a deterioration of the economic & social situation.

EDUCATION

The November 2000 Ministry of Finance report **The Present State of the Economy**, comments on a disturbing *Training & Skills Mismatch*:

Increasingly, in the context of globalisation and intensifying competition, the critical factor that will determine the success of an economy is the quality of its human resource and its ability to master technological changes. Although Mauritius has attained a high literacy rate, the quality of its labour force falls far short of what is needed for the country to move on a higher plane of development. Nearly 50% of our labour force has only primary education compared to 30% in Singapore and 10% in South Korea. The education system has largely failed to evolve in line with the changing socio-economic environment. The result is increasing skills mismatch of the labour market, with high risks of unemployment even for those coming out of the secondary and tertiary education system.

The following are examples of problem areas within the Mauritius education system that impact adversely upon the nation's S&T and innovation system:

- Mauritian students and industrialists appear not to be innovative, and this is hardly surprising when one considers that primary and secondary education is examination and not child orientated. All children are intrinsically creative but the Mauritian school system appears to be suppressing that creativity through a cramming method of teaching and tutoring.
- The fact that no real hands on practical classes in science are offered to most students in schools is particularly disturbing.
- In primary schools EVS is taught by general-purpose teachers as a 'memory' subject with no practical content.
- The teacher-pupil ratio in some schools is over 1:50, whereas, internationally, a maximum ratio of 1:30 is considered desirable for a sound teaching/learning environment.
- Only 30% of secondary school children take science at SC level; only 10% take computer studies. At HSC, the situation worsens to only 2.7% taking computer studies.
- Many teachers are not computer literate.
- For some reason girls are deterred from taking Physics at school. This results in a poor intake of girls into engineering at degree level, and causes the only less-than-100% uptake on engineering technician courses in the polytechnic sector.
- Relative to competitor countries Mauritius is low down in the league table of students at tertiary level studying science with 17% relative to, say the Seychelles with 80%.
- At the University enrolments in science and engineering have reached saturation.

The findings of this and earlier surveys suggest that it is the education system as a whole that constitutes the major impediment to Mauritius developing industries based upon new and emerging technologies.

SCIENCE & TECHNOLOGY & INNOVATION AUDIT – Preliminary Findings & Conclusions.

Central to the present audit of S&T and innovation capability, and infrastructure of Mauritius is a survey of the responses and attitudes of private sector firms to the challenge of rapid technological change and its effect on local and global competitiveness.

The response rate to the survey was an encouraging 44%.

Any survey of this kind will, of necessity, impact upon the critical associated areas of **education** and **training**.

Attitudes & Capability

In 1995 Dubois *et al* reviewed, with a 32% response, private sector competencies in S&T in Mauritius. During the intervening five years since that study little advance in private sector S&T capability appears to have been made. In spite of serious economic threats, not only to individual firms, but also the to the nation from S&T gearing by competitor nations, the general attitude of industry appears to be one of complacency.

Information & Communication Technologies (ICT): the Manufacturing & Tourism/Services Sectors.

Where ICT is used in the tourism/services and manufacturing industrial sectors it is largely for routine purposes using off the shelf software. Very few firms develop their own software in house. Although many of the responses suggest IT is likely to become increasingly important to them in the future, some firms are still not using the technology even for elementary purposes. Spending is an indicator for IT activity, and if expenditure continues at the current modest level then Mauritius will begin to lag behind competitor countries in the technology race.

The level of computer literacy amongst staff in the manufacturing and tourism/services components of the private sector is relatively low, and fewer than a half of organisations in the tourism/services sector employ IT specialists. It is disturbing to note that over 90% of enterprises in the tourism/services and manufacturing sectors do not intend to increase IT manpower in 2001.

It was encouraging that an increasing number of firms now access the internet and that a small, but significant, number of companies engage in developing area of e-commerce.

Science & Technology (not ICT): the Manufacturing & Tourism/services Sectors

Investment in new S&T equipment in the tourism/services sector over the past 3 years has been, at best, modest with 39% of respondents having made some investment.

Fewer than 10% of tourism/services firms use universities, research institutes or patent literature as a source of S&T intelligence, however more use a spectrum of information sources including journals, magazines and newspapers, the internet, etc. Manufacturing sector firms are much more cognisant of sources of information about S&T advances and applications. Only low level attempts were made in the tourism/services sector to assess emerging and new technologies and this is reflected in the low uptake (11%) of the Technology Incentive Scheme.

It was clear that respondents from both manufacturing and tourism/services sectors were aware of the benefits that could accrue from applying new technologies to their industry, including improvement of product quality, cost benefits, and the potential to increase turnover particularly through the opening of new markets. However, most demonstrated little urgency in gearing appropriately.

The majority of enterprises in the tourism/services sector do not employ dedicated S&T staff.

Looking at the qualifications level at staff employed reveals a depressing picture. No S&T staff in the tourism/services sector had higher degrees and relatively few have first degrees or diplomas. If that is taken in conjunction with the observation in the recent MRC sponsored audit *Gender Component of Science, Technology & Innovation* that “Less than 1% of those employed (male or female) have even SC or HSC qualifications in any S&T subject.” Then, the seriousness of the skill paucity is revealed. If we add to that the low level of training uptake and training capacity of firms do not need qualified staff, nor that suitably qualified are not available to employ, rather that private sector senior managers are themselves in desperate need of S&T education.

Neither the tourism/services nor the manufacturing industrial sectors has a great awareness of the need for either internal or external ‘technology watch.’

There would appear to be no shortage of S&T ‘qualified’ staff to recruit on the island, and one third of respondents were satisfied with the level and quality of their education and training. Many firms (24%) in the manufacturing sector recruit S&T staff directly from manufacturing schools and appear to be satisfied with their skills level. Contrasting with that statement is the overall lack of satisfaction expressed when firms were asked about the quality and appropriateness of the education system in producing S&T personnel.

One third of tourism/services enterprises required staff to engage in professional training and a similar proportion (increasing to 51% in the manufacturing sector) was satisfied with the training offered by IVTB and other training outlets. Only

about a quarter of tourism/services firms offer in house training. To the majority of firms in the tourism/services sector the training of S&T staff appears to be a low priority. It is clear that manufacturing sector firms take training more seriously with about a half offering in-house training and 19% sending staff overseas for training. The indeterminate factor is the nature and quality of that training.

As expected manufacturing sector firms demonstrate a far greater awareness of S&T than do tourism/services enterprises. The principal outcomes they expect from engaging in S&T activities include, improved quality products, reduced costs, the opening of new markets and improved implementation.

In the light of the above, and the fact that almost a half of respondents in the manufacturing sector considered the capacity for the Mauritian S&T system to meet future challenges was 'satisfactory', and whereas far fewer firms described it as poor to totally inadequate, then we can only conclude that there is either a high level of misunderstanding by industrialists or a widespread complacency.

Research & Development: the manufacturing & Tourism/services Sectors

The fact that most tourism/services firms (72%) failed to respond when asked about the reasons for engaging in R&D suggests strongly that few organisations in the sector in activity that could be described broadly a R&D. Amongst those that replied in the affirmative there was a clear understanding of what they expected from their investment, including the improvement of existing products, the development of new products, the increase in their market share and the advancement of knowledge.

Only 20% of tourism/services enterprises responded to the question on investment levels and of those only 3% expected to spend more than Rs 500,000 in the next financial year.

In contrast over 36% of manufacturing enterprises engage in some sort of R&D but because they do not publish research findings it is impossible to gauge the extent of their research or its quality.

Although in the tourism/services sector there is little evidence of significant R&D activity, 23% of firms reported that within the past three years they had introduced innovations that had, among other benefits, improved product quality or opened new markets. Firms in this sector offer a plethora of reasons why it is too difficult to introduce innovations.

Protection of Intellectual Property

There appears to be little awareness or understanding of the protection of innovations through patents amongst tourism/services firms. The fact that over 5% of enterprises have applied for a patent over the past three years, demonstrates some experience. A surprising contrast is that patent applications in the manufacturing sector over the same 3 years ran out at only 1.6%! Also surprising is that manufacturing sector organisations have very few staff (1%) capable of

conducting a patent search. What is more disturbing is that enterprises in both sectors do not include in contracts with other organisations, reference to the ownership of intellectual property rights.

Agriculture Sector Organisations

Returns were received from only six agriculture sector organisations of which five had 'company' status and all could describe as from the 'farming' sector. All are major employers with one employing more than 1000 people. Because of the paucity of returns this sector will be treated separately.

Information Technology & Communications

Only one company employs ICT/IT managers or administrators, and that one employs between 4 and 6, all Mauritian. No firm in the sector intends to employ additional IT staff during 2001.

For most firms staff training does not appear to be a high priority activity, with only two organisations requiring their staff to engage in regular training.

The one company employing IT staff and indicating its high dependence on IT also reported that ITC was very important in reducing costs, important in increasing turnover. All five entities without IT-support recognised that they operated 'with reduced performance'. Half of the respondents believe that IT will become more critical over the next three years, but the remainder believed that it is not critical to them at all. At best, only modest future investment is planned in IT hardware and software in the sector.

The questionnaire returns illustrate how little ITC has impacted upon the agriculture sector, whilst at the same time the benefits to one user-organisation have been considered.

Only three firms have invested in new S&T equipment (non-IT) of a 'more sophisticated' kind over the past three years. Those firms reported a consequential improvement in productivity.

The principal means used in the sector to glean S&T information are professional conferences & meetings, and suppliers. Clearly, there is no intelligence-sharing network in this or the other sectors.

No agriculture organisation has benefited from Technology Incentive Schemes or has attracted foreign investment into Mauritius.

Four agriculture sector organisations claim to be involved in R&D, including market surveys, but they employ very few appropriately qualified staff. Environmental reasons for engaging in R&D do not appear to be of any importance to respondents.

Only two enterprises intend to increase their R&D spend.

At least half the firms surveyed gave a view on why it was important to innovate in their industry, but in contrast only one firm actually engaged in innovation over the past three years. In contractual arrangements with partner organisations the protection of intellectual property is neglected.

Overall, it is clear that only one firm out of six surveyed in the agriculture sector is engaged in ICT and S&T to any extent. Research & Development and Innovation appeared not to be clearly understood, and from the amount of activity recorded, is not believed by organisations to be very relevant to them. None of the firm's respondents expressed a view on the new areas where Mauritius might find its new wave of wealth creating industry. The impression given is one of satisfaction with what they do, and that tomorrow will be very much like today with minor adjustments.

CONCLUSIONS

The results of this survey of industries in Mauritius demonstrates that, as far as the application of new technologies is concerned, there has been little change in attitude of senior executives and little advance in the technological capability of industry since the last survey in 1995. Inevitably, a technologically static industry will result in Mauritius falling behind comparative lowering of the Mauritian people's standard of living. This, coupled with a need to revisit totally the approach made on the island to education **at all levels**, public and private; the need to review public, private & in-house training; and the need to pay attention to the gender bias in the S&T workplace presents politicians, industrialists and educators with serious challenges. How policy is formulated and presented to address these challenges will predicate the future direction & prosperity of the nation.