Science, Technology and Innovation Advisory Council Report

EXECUTIVE SUMMARY

Mr. John Travers, Chief Executive of Forfás has been appointed Chairman of the Task Force established by the Government to examine the STIAC (Science, Technology and Innovation Council) Report and its recommendations. The Task Force will report to a Cabinet Committee of which the Chairman will be the Minister for Commerce, Science and Technology, Mr. Pat Rabbitte T.D.

On the occasion of the launch of the STIAC (Science, Technology and Innovation Council) Report by Minister Rabbitte in Dublin today (Monday, 27 March) Mr. Travers said "the Report marks a watershed in the approach to development policies in Ireland. It is a report of immense significance and importance. The report should be required reading in Schools, Universities, Board-Rooms and in Government Departments and Government Agencies over the coming weeks and months.

Science & Technology today provides the foundations for new methods of production, new ways of delivering essential social services, new methods of work and it is at the heart of the communications revolution.

If we, as a country, neglect these essential foundations we set aside the means by which innovative solutions can be applied to our economic and social problems. To do this would be to fly in the face of what is happening right across the developed world in those countries against which we compete in the production and sale of goods and services at the present time. If we neglect the insights and practical solutions which Science, Technology and Innovation can bring to our development policies we do so at great peril to our future social and economic prospects.

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The significance of the report lies, not just in the detailed recommendations on the implementation of S & T policy that it contains - and there are many and varied (160) - but in the principles and in the overall approach that it so clearly enunciates and convincingly argues. The Report makes clear that these principles and the importance of Science, Technology and Innovation, apply not only to the industrial sector of our economy but that there are equally relevant sectors - industry, services and natural resources.

The main message of the Report for me is that: "Knowledge is King". The title of the Report - "Making Knowledge Work for Us" neatly sums up what the Report is all about.

Ireland is not a country rich in natural resources. The key factor which will determine whether or not we achieve the increased employment levels and the higher living standards for which we strive lies in the knowledge and the skills of our people. From a developmental perspective, the need to upgrade skills and knowledge is as important - if not more so - to the non-market sector of the economy as it is to the market sector.

"Innovation" is the "buzz word" widely used at present to describe the application of knowledge, including technical know-how, to improving and upgrading the way things are done in the work-place. It is all about providing new or better products and services for customers and clients. In the market sector firms must innovate to protect existing markets and to break through into profitable new markets. In the non-market sector innovation is equally important to maintain the relevance and improve the efficiency of services provided to clients - many of whom are in the exposed market sector.

The Report goes on to make a series of detailed and practical recommendations through which these principles can be translated into action. Among the most important are:

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- The objective to double the level of R & D undertaken by the Business Sector with State support by 1999.

- The objective to increase funding for basic research from £1.5 m to £6 m. per year, the proposal to provide a special fund for research equipment in the Third Level sector and the call for a Research Charter to promote greater interaction between the research capability of the Universities and other Third Level Bodies and the Business Sector.

- The proposals to establish new management structures for the Programmes in Advanced Technology (PATs) which will clarify their objectives and provide the means by which priorities can be established including those relating to the needs of the indigenous sector of Irish industry.

- The proposals to establish a National Task Force to achieve a "state of the art" Communications Network.

- The objective to create a Special Awareness Fund of £1m per year to improve the awareness and understanding of the value of science, technology and innovation to the achievement of national social and economic objectives.

- The proposals to put in place new organisational arrangements to reflect the importance of Science, Technology and Innovation to our development policies including a Cabinet Committee on Science & Technology, the establishment of a National Office of Science & Technology and the preparation and prioritisation of an Annual S & T Plan.

The challenge now passes to the Cabinet Committee of which Minister Pat Rabbitte will be Chairman and the Task Force which the Government have established to examine the recommendations of the STIAC Report and to report to the Cabinet Committee. The foundations have been well laid in that Report and the Council deserve an enormous vote of gratitude for a task well-undertaken and accomplished. We are all greatly indebted to the Chairman, Mr Dan Tierney, and to his colleagues on the Council.

At a personal level, I am greatly honoured to have been nominated by the Government as Chairman of the Task Force. The nomination represents a tribute to my colleagues in Forfás who worked closely with STIAC in the preparation of the report. The job involved is of immense national importance and I will give it the commitment and hard work it deserves.

The representatives of Government Departments on the Task Force will be nominated shortly. In the meantime, I am greatly heartened and appreciative that the Chairman of STIAC, Mr Dan Tierney, of the Cross Group and his colleague in STIAC, Professor Dervilla Donnelly of UCD, have agreed to be members of the Task Force. Both will bring a continuity and a depth of knowledge and understanding to the work of the Task Force that will be of immense benefit. The work of the Task Force will be further facilitated by the involvement of Mr Michael Fahy of the Office of Science & Technology who acted as a Special Advisor to STIAC in all of its deliberations and of Mr Eugene Forde also of the Department of Enterprise & Employment who was Secretary to STIAC.

I look forward to the challenge and work involved which will now start immediately".

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Chapter 1: Science, Technology, Innovation and Economic Development

Main Conclusions

S&T based innovation is at the top of the national agenda in all developed, progressive countries. This is clearly manifest in attention to STI status, policy, structures, programmes, strategic concentration on technology diffusion, linkage between providers and users, and commitment to R&D investment.

In many instances there is a solid connection between economic, STI and industrila policies. The prevailing thrust is towards enhanced national competitiveness in the face of relentless globalisation of all aspects of enterprise.

Ireland is not well positioned at present in respect of these technological and market dynamics. A recent NESC report stated that the

" capacity for innovation can be stimulated or inhibited by the institutional and policy framework within countries"

Many countries are engaged in sustained experimentation with policies and measures to stimulate their national innovation process. However such experimentation implies risk, and the willingness to take risk; it presupposes the long term view, and above all it requires determination. Their is no quick fix in the STI domain. We in Ireland have little but to engage in the same process.

Ireland has based industrial development since the 1960s primarily on foreign direct investment. The strategy has been successful, against strong competition, in capturing a respectable share of the global investment pool. However, in the main, production units were established in Ireland as self-contained islands , with little other than sub-supply linkages to the indigenous base.

The concentration on foreign investment has resulted in a neglect of the local industrial base and indigenous S&T innovation, although this is being partially addressed through the new industrial development agency structure.

There is an undoubted need to increase Ireland's R&D investment, both public and by business, as a means of funding the reduction of the substantial technology gap that exists in the indigenous sector.

Experience from other countries points to a four-fold approach to maximise economic impact:

- proactive programmes to stimulate technology transfer, absorbtion and diffusion, in recognition that no enterprise or country, no matter how sophisticated, can afford to grow and live off it's own technology alone;

- the creation and maintenance of productive linkage mechanisms between S&T providers and users;

- selective strengthening of the S&T supply side, and the enhancement of SME capability in technology absorbtion and technology management;

- focused investment in the innovative development and maximum exploitation of natural resources.

Chapter 2: STI in Ireland - Key Issues

Main Conclusions

Despite the apparently healthy picture painted by the official macroeconomic statistics, there are serious grounds for concern about the real state of indigenous enterprise.

These concerns are reinforced by a significant number of studies and reports relating to economic development, particularly industrial development. There is an increasing consensus that a poor record in innovation is at the root of the problem.

There is a link between science, technology and indistrial innovation. Many submissions to the Council have confirmed the low status and funding which science and technology receive in Ireland.

Innovation is a complex process and the concept of a

"national system of innovation"

(NSI) has been developed internationally to identify the key factors influencing innovation.

The lack of an integrated NSI, as described previously, and the fluctuations in Government committment to STI over previous decades, have been at the heart of the reason why there is not a better appreciation of STI and of the culture of technological innovation in Ireland.

Government must recognise and promote a long term investment strategy to build up the elements of NSI. Fundamental to this is the need for an integrated national STI policy.

The component parts of the innovation system need to be examined in depth to identify the important weaknesses. On the demand side is the enterprise sector, while the supply side is represented by the Third Level and State sectors. Linkages with these sectors and with the rest of the economy are also critical.

Expenditures on research and development in Ireland is low compared to most other OECD countries. Business sector R&D is an important element of the innovation system and needs to be substantially increased. Funding for basic research is inadequate and the Government must increase its level.

The traditional low status of science and technology in this country means that the politiacl mechanisms and structures do not exist to co-ordinate and prioritise the State's annual investment in S&T activities.

Chapter 3: STI Capability in Enterprises

Main Recommendations

Increasing the Levels of STI Activity in Irish Firms

(1) We recommend the establishment of an Irish Interfirm Co-operation Programme modelled on the Danish system. Existing programmes and schemes should be used to encourage such co-operation, for example, a 5% premium on grants as a reward for co-operating with network partners.

(2) A minimum target of 5% of Measure 1 of the R&D sub-programme should be earmarked for R&D co-operation linked to the Network Co-operation Programme.

(3) A special effort should be made to ensure participation by natural resource and service-type enterprises in networking and co-operation. The software sector, characterised by small, high technology R&D performing firms, would be a candidate for priority treatment, particularly for co-operation in R&D

(4) A new programme should be introduced for enterprises which are not R&D performers. This would be modelled on the EU CRAFT program, and would bring together groups or firms with similar interests and have a third party carry out research on their behalf.

Addressing the Special STI Problems of Smaller Firms

(5) There should be an allocation of 10% of Measure 1 for new small-firms R&D performers with less than 50 employees, with no minimum grant level per year.

(6) In addition there should be special provision for more than 50% grant-aid for small-firm R&D projects.

State Funding Support for Business Expenditure on R&D (BERD)

(7) The Government should set clear targets in a funding plan for the next 5 years and for the post 1999 situation.

(8) The Government should set a target to double BERD by 1999 and in order to achieve that aim it should maintain its share of BERD funding at 13% (the 1993 level).

Fiscal Incentives for R&D in Indigenous Enterprises

(9) Allow companies performing R&D to pay dividends to their owner/managers and risk-taking shareholders at a reduced effective tax rate. There would be a limit on the amount of these dividends, related to the level of R&D expenditure.

(10) Allow companies earning royalties from unpatented innovative products (but having an innovation warrant based on investment in a qualifying company fro recommendation 1 above) to pay dividends to their owner/managers and shareholders at a reduced effective tax rate, subject to a limit.

(11) Allow a tax credit for new R&D, thus providing a reduction in the cost of additional activity.

(12) Introduce a temporary PRSI holiday fro additional R&D staff.

(13) Provide accelerated depreciation on laboratories and R&D related buildings, reflecting their rapid rate of obsolescence.

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Fiscal Incentives for Commercial R&D Services

(14) Corporate relief for providing capital for research and development and technical service companies (and possibly projects) should be broadly based on the model of investment by companies in film projects.

(15) Extend the BES scheme to shares in companies providing R&D and technical services on a commercial basis.

(16) Extend the 10% rate of corporation tax to companies providing commercial research and development and technical services.

Fiscal Incentives for Local R&D Operations of Multinationals

(17) Provide a deduction for capital payments to and from non-resident connected parties, in respect of transferred know-how.

Fiscal Incentives for Centralised Multinational R&D

(18) Amend tax laws on repatriation of foreign dividends and on capital gains tax on disposal of overseas subsidiaries to encourage the establishment of regional headquarters activities in the State.

Fiscal Incentives to Boost the Rate of Growth in BERD

(19) We have recommended a number of 'carrots' to industry to increase R&D activity and to extend the number of performers. in the event of BERD increasing at a slower rate than that projected in Recommendation 8, further policy intervention may be necessary to make up the shortfall. For example the Government may wish to consider the concept of a Repayable R&D Contribution by industry, or some other suitable mechanism. Full details of the recommendations are contained in Volume III *(of the STIAC Report)*.

Increasing R&D Performance by Multinationals and Larger Irish Firms

(20) An earmarked fund of 205 of Measure 1 for new MNEs and medium/large Irish indigenous firms participating in R&D for the first time.

(21) Provision of tax credits for R&D, at a minimum level of 25% (see fiscal proposals above).

(22) Research, development and innovation to be a "Reserved" part of all investment deals with IDA Ireland.

Seed and Venture Capital

(23) A formal funding mechanism (including coordination of existing activities) should be established which particulariy addresses the lack of funds for high-tecnology start-ups and growth companies.

Increasing the S&T Capability Within Firms

(24) The Techstart and Techman programmes to be extended.

(25) The number of Techstart placements to be increased to 500 for the next three years.

(26) The Techman placements should be increased to 80 - 100 per year with the emphasis on firms in the 10 - 200 employee bracket in the category of "threshold" firms i.e they are ready to undertake a significant product development/innovation programme or install a new production line.

(27) There should be a nationally co-ordinated demonstration and training programme in CAD/CAM skills for SMEs under the auspices of FÁS.

Industrial Design

(28) The existing Technology Audit Programme should be extended to include an industrial design element. This should also be aimed at analysing design needs and capabilities in the services sector. The initial Design Capability Audit would be followed up by a Phase II effort to tackle the identified problems and constraints. The firm would be expected to make a contribution to the cost of the agency/consultant carrying out the audit. The role and experience of An Bord Trachtala (ABT) in the design field would be important in this regard.

(29) A Design Initiative should be introduced, whereby the R&D grants scheme currently administered by Forbairt and IDA Ireland would become the Research, Design and Innovation Scheme and would be widely promoted as such.

Facilitating the Development and Introduction of New Products

(30) The existing Feasibility Study Grants should be more effectively promoted by Forbairt at the local and regional level in order to encourage product development. We propose an increase in the grant limit of the current Feasibility Study Grants Scheme to £30,000 and an emphasis on getting existing firms to look at the prototyping/model building dimensions as much as getting a "New Venture Business Plan" on paper, which now appears to be the main focus.

(31) The Inventions Programme should be strengthened and used to assist small firms to meet the high costs of patenting, including Patent Office fees, finance for firms undertaking an international patenting programme and a nationally funded intellectual property insurance scheme.

(32) There should be better promotional material on both the patent system and the Patents Office.

(33) The Government should set up a formal Procurement Programme aimed at generating new products from Irish sources to meet their needs.

(34) The level of grant aid to MNEs should depend on the use of local expertise and other STI inputs.

(35) To stimulate an innovation-based strategic planning approach an annual "Product Opportunities" event should be organised.

Increasing Industries Awareness of STI

(36) The Government should inintiate an innovation campaign, including seminars, case histories or a travelling road show, as in the UK, The feasibility of a Research, Development & Innovation mark (akin to the highly successful Quality Mark) should also be investigated by the STI Council recommended in Chapter 8

(37) A Chair of Innovation Studies should be funded jointly by industry and the State in a Third Level college to focus both technical and non-technical students/graduates on the role of innovation in modern economic and industrial development.

(38) There is also a need to promote the role of innovation in the services sector through a Services Innovation Centre which would also offer facilities to assist companies to develop new services, or adaptations of existing services suitable for export markets. Every effort should be made to maximise the North-South dimension to these initiatives.

In-House Quality Systems

(39) Extend and coordinate State supports for quality competence in firms.

Technology Management

(40) Assist enterprises to improve their competence in technology management and ensure that appropriate training courses are in place.

Campus Companies

(41) The Third Level colleges should appoint Technology Transfer officers to manage the transfer of technology out of the colleges.

Niche Identification/Foresight

(42) The State must assist in identifying emerging technologies and industry niches that will have major impacts.

Regulatory Bodies

(43) All State regulatory bodies be reviewed in terms of their impact on innovation and business development. Wider industry participation in EU standard setting should be encouraged.

Services Database

(44) The whole range of industrial incentives - financial, technical and marketing - should be put on an easily accessible database.(23)

Chapter 4: State Sector Science & Technology Services

Main Recommendations

The Programmes in Advanced Technology

(45) A company should be established to encompass the existing PATs and the Polymer Centre should also be incorporated in this structure. The new entity would be a company, with its own Board and a large degree of autonomy, and have all the legal rights required for contract negotitations, for establishing spin off companies and for negotiation on intellectual property and other issues.

(46) Key members of the PAT company staff should have industry-style employment contracts, providing a greater element of security than at present.

(47) The PAT company should receive a single block grant annually from 0ST to support all of its non-commissioned R&D activities, with its Board allocating this amongst the individual programmes, based on their performance and on changing emphases in relation to national needs as determined by the STI Council proposed in Chapter 8.

(48) The PAT company should be required to maintain a dynamic balance between programmes having high relevance to important existing sectors, and those considered likely to emerge in the future, as identified through foresight exercises and other means. Support for programmes which do not live up to expectations should be discontinued, releasing funds to introduce new programmes.

(49) The size of the OST block grant should be maintained at about the present level of the combined OST grants to the PATs, NMRC and the Polymer Centre.

(50) The technology transfer and company development programmes of Forbairt and Shannon Development should, in appropriate circumstances, make specific use of the expertise within the PAT company, on terms to be agreed.

(51) The PAT Centres and NMRC should ensure a clear `separateness' from their associated academic departments, both operationally and financially.

(52) An equitable arrangement should be reached between the PAT company and the Third Level institutions in respect of the use of physical resources.

(53) The promotional procedures for staff of the Third Level institutions need to be modified so that time spent working with a PAT (or in industry) is given due credit in relation to academic career advancement.

(54) NMRC should be included in the proposed PAT company, and adopt the modus operandi recommended above for the PATs.

Food R&D In the State Sector

(55) The State institutions which provide developmental support for the food industry should have the same general remit as the PATs, and be evaluated periodically against the same criteria.

(56) The National Committee for Non-commissioned Food Rresearch should encompass marine-based as well as agricultural foods, and should allocate an appropriate proportion of the funding available for food R&D under the current National Plan to research on marine-based foods. The Inter-Departmental Committee proposed in Chapter 8 should be givin the specific task of ensuring a fully balanced food research program in the future.

(57) The recent increased emphasis on food R&D must be matched by a sustained programme oftechnology transfer to the food processing industry.

Non-R&D State Services for Enterprises

(58) A 'new blood' programme should be introduced for Forbairt'sS&T activities which will

allow the recruitment of 50 new professional staff on a phased basis over five years. this should be accompanied by a voluntary early retirement scheme.

(59) The Technology Centres Programme should be evaluated as soon as possible in order to determine its current and likely future contribution to serving the needs of enterprises, and the potential for increasing the number of centres in the future.

(60) As part of this review, generally similar initiatives in other countries should be studied to see if they have features which might be beneficially incorporated into the Programme.

(61) To maximise the benefits of from the Technology Centres Programme, Forbairt should introduce an effective system for cross-referrals and co-operation.

(62) Forpairt should co-ordinate and promote the the proision of regionally-based S&T services for small enterprises provided by institutions such as the PAT company and the Technology Centres.

(63) Business plans should be prepared and agreed annually for the main technical services provided by the State Agencies, and these must specify the financial targets and sources of funding whether public or private.

(64) All technology services provided by any State institution should be charged for at market rates.

(65) The Technology Audit Programme should continue its activity in auditing general manufacturing operations at the current level, but give increased attention to the possible needs of firms introducing new or improved products.

(66) Forbairt should ensure that its technology support initiatives are fully integrated into its business-oriented developmental activities.

(67) Forbairt should introduce, through its regional offices and in combination with FÁS and ABT, a structured diagnostic approach to the developmental support of lower capability companies. This should take the form of a broad assessment of the existing capabilities and growth potential of the firm, and identification and prioritisation of all its developmental needs.

State S&T Support for Natural Resource Based Sectors

(68) The Department of Agriculture, Food and Forestry should produce a plan for an ircrease in voluntary contributions from producers in line with the aspirations of theProgramme for Competitiveness and Work.

(69) Associated with this increased R&D expenditure, a National Committee for Agricultural Research should be established, analogous to the National Committee for Non-commissioned Food Research, to set priorities and ensure co-ordination between Teagasc and the Third Level sector.

(70) Teagasc should charge full market rates for its advisory, consultancy and analytical services to the commercial farming sector. The resultant release of public funds should be redirected to other public priorities within the organisation.

(71) The Department of Agriculture, Food and Forestry should set up an internal policy, planning and administration group, analogous to OST in the Department of Enterprise and Employment, with specific responsibility for overseeing all of its S&T activities.

(72) Increased funding should be made available to the Marine Institute to allow it to implement RTD activities in priority areas which it has identified. The amount of this incraase should be decided by the STI Council and the Inter-Departmental Committee proposed in Chapter 8.

(73) he Marine Institute should establish a formal coordination mechanism with Forbairt to ensure an integrated approach to the development of enterprises in the sector.

(74) The level of RTD funding for the forestry sector should be raised, and continue to be co-ordinated through COFORD. The amount of this increase should be decided under the new structures proposed in Chapter 8.

(75) This funding should be mainly devoted to projects aimed at maximising the added value of wood-based products.

(76) A review should be undertaken to evaluate the effectiveness of the forestry RTD programme, determine the level of future funding (including the appropriate contribution from Coillte), and examine the possible need for a more formalised administrative and co-ordination structure.

(77) Assistance from the forestry S&T programme for the technological development of firms in the sector (sawmills, processors, manufacturers) should be managed through Forbairt.

(78) Each Government Department should prepare a plan for environmental conservation in its own area of responsibility, to include the necessary research and monitoring activities.

(79) State R&D programmes in support of enterprises, such as the PATs, NMRC and the Teagasc centres, must pay specific attention to the use of best-practice, clean technologies in all their developmental projects, and should also maintain awareness of cleaner processes developed abroad which are potentially applicable in Ireland.

(80) A consultative group should be established to develop a national S&T programme to support the integrated management of natural and environmental resources. It should report by the end of 1995.

(81) Both the consultative group, and the subsequent co-ordination and administration of any national S&T programme, should operate under the aegis of the EPA.

(82) The adequacy of the research programmes and funding for specific sectors such as the equine industry should be examined by the STI Council recommended in Chapter 8, so that they can be reflected in the setting of national priorities for research funding.

State S&T Activities for Public and Societal Needs

(83) The HRB, with its current modus operandi, should be retained, and its budget increased to £5m.

(84) Social sciences should in future be considered as part of the national S&T system, and be integrated into the STI and RTD activities of each Department.

National Structures

(85) The State should require that all public sector laboratories which provide calibration, testing or analytical services, and all private sector laboratories which it uses, commence procedures during 1995 aimed at achieving ICLAB accreditation as soon as possible.

(86) The role and function and location of the State Laboratory should be examined by the STI council proposed in Chapter 8.

(87) The current OST practice of undertaking rigorous evaluations of the individual programmes and activities which it funds be extended to all S&T initiatives which receive discretionary funding from the State, and the findings of these reviews should be published. The overall budget for evaluation should be increased to reflect the much wider remit.

(88) The S&T data, programme monitoring and evaluation activities of Forfás should be strengthened, and combined in a single unit.

Chapter 5: The Third Level Sector and the Role of Knowledge and Skills

Main Recommendations

The Knowledge Generation Process

(89) We recomend that prioritisation in the science system becomes an integral part of the overall national S&T prioritisation process (Chapter 8).

(90) There should be a substantial increase for all R&D activities - basic and applied - so that over time this country comes into line with the patterns of our main competitor countries of similar size.

(91) There should be a phased increase in the level of basic research funding, starting immediately and rising from £1.5 at present to £6 million per year.

(92) Funding for the Strategic Research Programme, which supports oriented basic should be increased at the same time.

(93) Funding under the basic research programme should be applied according to the following principles:

- the prime, but not sole, criterion for selection should be excellence;
- other factors taken into consideration could include as appropriate, relevance, the track record of the researcher, his/her ability to manage the research professionally, the added value of international collaboration and the potential for building up a research group of international repute.

(94) All elements of the knowledge base should be eligible to apply. This would refer primarily to the Third Level sector but would also include research institutes, State Agencies and private industry.

Research Personnel

(95) The Government should facilitate a scheme to promote the progressive regeneration of the human resource component of the knowledge base while remaining within existing staff limits.

(96) This process should take into account possibilities for better use of existing human resources, such as:
- mobility across the knowledge base, both between and within agencies and institutions and the possibilities for mobility between the North and South of Ireland;
- balanced use of contract and permanent staff;
- where appropriate, earty retirement schemes;
- continuing education and training for researchers in the knowledge base.

Postgraduate Training

(97) All PhDs, including those funded by the PATs, should be treated in a similar manner. They should be funded at a level of not less than £3,OOO per annum where the scholarship is held normally for no longer than three years.

(98) Eligibility for funding should be open to all appropriately qualified graduates, including those in industry and regardless of when they graduated.

(99) Support for PhDs by the PATs should continue to be directed at areas of strategic importance.

(100) The STI Council envisaged in Chapter 8 should recommend how the support for PhDs outside the PATs should be determined.

(101) As regards MScs, existing Industria1 sponsorship arrangements such as the Forbairt/Irish American Partnership should be built on.

(102) A study undertaken by the ESRI should be completed as quickly as possible to allow a rational basis to be established for determining the appropriate numbers of doctorates which Ireland should produce. It should also be extended to address the appropriate split between PhDs and MSc's.

(103) A system of post doctoral fellowships should be introduced aimed at supporting five grants per year.

Equipment for Research

(104) There should be a systematic 5 year programme to address the equipment shortfall problem across the public sector knowledge base.

(105) A £5 million per year fund should be established over and above existing levels to address this roblem within the Third Level sector. This funding wlll cover equipment used for research but which will have some use in teaching. It is also important to recognise that the RTCs and DIT have critical requirements for both space and equipment.

(106) We believe that possibilities such as lease/purchase, central purchasing, etc., should be fully investigated to ensure best value for money.

(107) It is important that all major equipment and facilities should be used to maximum effect. To this end such approaches as joint use/ pooling/ multiple access etc. should be fully explored.

(108) Global participation by Irish scientists through international collaboration should be encouraged and a fund of £200,000 should be set up for this purpose.

(109) The STI Council referred to in Chapter 8 should review the question of Irish participation in big science proiects such as CERN, EMBL, etc.

The Role of the RTCs and DIT

(110) We strongly support the extension of the role of these colleges and consider them to be important and effective parts of the knowledge and skills base. It is recommended that greater efforts be made to market the specialist skills at the centres of excellence to make them more accessible. The colleges should be regarded as an integral part of regional industrial development activities and should have formal representation, for example, on the County Enterprise Boards.

(111) There should be clear mission statements set down by all RTCs, DIT and the universities, to increase awareness of their various functions.

Links Between the Third Level and Other Elements of the National System of Innovation

(112) The Third Level should adopt a new Research Charter which:
- promulgates, for the benefit of all research staff, its proactive attitude towards research activities and in particular towards interaction with commercial users of research expertise;
- unambiguously deals with policies relating to career prospects of researchers involved in commercial contract research and to the issue of obtaining sponsorship for their work.

(113) Forbairt should spearhead a campaign to create a greater awareness and understanding throughout the knowledge base of the concept of Intellectual Property, and of the principles governing its protection and ownership.

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S&T Performance Indicators for the Third Level Sector

(114) There should be no misunderstanding between the knowledge producer and knowledge user about how to deal with IPR arising from work. This issue is explored further in Chapter 6 in the context of technology transfer.

(115) A number of performance indicators should be identifed for research in the Third Level sector and these should be collected and published annually. Other parts of the public sector knowledge system should strive to maintain a comparable system.

(116) The need for performance indicators must take cognisance of the institutional contexts, e.g. some parts of the knowledge base would have a strong basic research bias while others would be more applied in nature. Quality should be an overriding consideration.

Development and Application of STI Skills

(117) There should be a formal mechanism to ensure collaboration and coordination between the main participants in the STI skills system, i.e. HEA, NCEA, FÁS, Fobairt and the other development Agencies. Such coordination would allow better planning to meet the needs of the economy and more effective use of expertise across the system.

(118) Industry must have access to a wide range of skills and talents based on an understanding of STI and a familiarity with the practical requirements for its application.

(119) A much greater level of student mobility should exist between colleges in the vocational and university sectors. This should occur in both directions, but primarily to boost the vocational elements of university courses.

(120) Course content should be adjusted and adapted continuously to reflect changing industry requirements. Education and training providers should make it their business to establish a continuing liaison with the users of the skills produced.

(121) There should be support for the increased use of operative placements during all appropriate science, technology or innovation-relevant courses.

(122) There should be an increased level of mobility between staff in RTCs, DIT and industry.

(123) There should be support for Irish involvement in EU programmes designed to bring a transnational dimension to education of young people, in particular where placement in industry in an objective.

(124) Programmes should be put in place to enhance mobility and cross-border skills transfer, to the benefit of Ireland both North and South.

Education and Training for the Employed

(125) We strongly support the need for training for the employed. FÁS should ensure that at least £50m of its annual budget is put to this purpose.Of this sum a sizeable portion should be dedicated to training for innovation, and in particular the need to promote an ethos of training which encompasses its contribution to innovation.

(126) We also endorse moves under discussion to create an Industry Training Board to give a greater focus and level of co-ordination in this area.

(127) There should be a system of certification of training providers, which assures the quality of the supply of continuing education and training. This will help firms to assess the quality of courses offered by the wide range of providers. This action should be undertaken by FÁS.

(128) We support developments in distance education and urge providers of education and training for the employed to assess the relevance and applicability of distance education techniques.

(129) Coordinated efforts should be made to create and provide high quality course material on the management of innovation which should be available in a form which will be easily accessible to personnel in industry.

(130) A national training mark should be established, comparable to ISO9000, to give visibility to STI training and to promote its use as a market tool indicative of a professional approach. The mark would be awarded to an enterprise on the basis of evidence of systematic commitment.

Chapter 6: Information and Technology Transfer and Diffusion

Main Recommendations

Improving the Transfer of Technology

(131) Forbairt should emphasise the importance of information dissemination and technology transfer for indigenous companies by the establishment of a National Technology Brokerage Activity (NTBA).

(132) All State sector and Third Level institutions involved in research or technological developoment should devote sufficient resources to a specific function for technology transfer, aimed at identifying those firms which can benefit from currently available technology.

(133) A model contract should be formulated between representative bodies of both industry and Third Level colleges, as well as patent agents and other professional associations. The model should specifically deal with the question of intellectual property rights. In Volume III we set out draft guidelines as a basis for agreement on intellectual property.

(134) We recommend the establishment of a National Taskforce to define Ireland's overall objectives and the costings, of a communication network.

Science Parks

(135) The findings of the Inter-Departmental Committee should be considered by the STI council as recommended in Chapter 8, in the context of the wider issue of a national policy for science parks.

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Chapter 7: Perception and Awareness of STI

Main Recommendations

New Initiatives by Forfás for Enhancing Awareness of STI

(136) A seperate budget of the order of £1m should be made available annually for the promotion of STI through a structured and targeted campaign aimed at the relevant audiences. It should be administered by Forfás and the following projects suggested to us could be considered for support:

- a national campaign to promote the importance of science, technology and innovation;
- sponsorship of science journalists and articles with an annual award for excellence in S&T journalism;
- a science magazine to popularise current Irish scientific activity in a format which can be easily understood;
- promoting support for other amenity type developments which could do much to popularise STI, for example:
- a talking science database, through which speeches on S&T subjects would be available to both the general public and the media;
- an interactive science museum through which the public could lean more about S&T and its impact on daily life;
- assistance to the National Science Museum and Science Centres in Armagh, Birr and Dunsink;
- open days for young people in our existing research facilities.

The Role of tha Media

(137) RTE should investigate the possibility of purchasing or commissioning a series of television programmes on STI-related issues in Ireland and the national daily newspapers should be encouraged to inciude a greater coverage of STI.

Annual STI Conference

(138) There should be a yeariy conference on innovation, enterprise, science and technology which would demonstrate their contribution to economic development.

Promoting STl In Schools

(139) NCCA should continue the facilitation of practical S&T related subjects on the curriculum at primary and secondary level.

(140) The relevant authorities should examine the suggestions made to us to remove the gender imbalance in the numbers studying S&T related subjects.

Chapter 8: Organisation and Funding

Main Recommendations

Managing S&T Activities Within Individual Government Departments

(141) All S&T activities in each Government Department should be co-ordinated under a divisional head, with the rank of Assistand Secretary.

(142) S&T funding within each Department should be consolidated into a single S&T budget for that Department. It should be approved separately by the Oireachtas and would therefore be committed only to S&T spending within that Department.

Co-Ordinating S&T Activities Between Government Departments

(143) The provisions in the Forfás legislation should be fully utilised as intended to ensure a coherent approach to S&T spending and to advance the process of prioritisation.

(144) There should be a Cabinet Committee to deal with S&T matters and particulary to settle budgetary/estimates matters and establish national pnorities. This should be chaired by the Taoiseach or, if not available, his nominee.

(145) This Committee should be assisted by a permanent Inter-Departmental Committee of civil servants of all S&T spending Departments. Departments would represented by their group heads of S&T divisions at Assistant Secretary level. The Committee would be serviced by OST and chaired by the Minister responsible for Science and Technology.

(146) A National S&T Plan incorporating all Government Departments should be prepared including targets and indicators. There should be monitoring, evaluation and commentary.

(147) The National Plan should be published and debated by the relevant Oireachtas Committee.

Establishing an Independent STI Council

(148) A permanent STI Council should be established.

(149) This should be an independent body capable of providing expert advice on STI policies and programmes and on the achievement of a more effective National System of Innovation. It should be free to offer advice on its own initiative or in response to specific requests and should provide a channel for advice from other STI interests to Government. It should have an involvement in the prioritisation process and the work on the National S&T Plan. It should have statutory backing with secretarial support provided through Forfás

(150) The present Council should be continued until the new Council has been established.

Rationalising S&T Functions of the Department of Enterprise and Employment

(151) All S&T matters within the Department of Enterpnse and Employment should be brought within the Office of Science and Technology under the responsibility of the Minister responsible for Science and Technology.

(152) The present OST should be up-graded to Divisional status, with the title of National Office for Science, Technology and Innovation (NOSTI). NOSTI should have a strengthened and dual role, firstly to manage and co-ordinate all the S&T activities within the Department and secondly to facilitate inter-Departmental co-ordinationof S&T and the formulation of the National S&T Plan.

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Positioning STI Within Government

(153) The Government should continue the present arrangements, with responsibilities for STI residing in the Department of Enterprise and Employment.

(154) The title of the Department should be changed to Enterprise, Employment and Innovation. The inclusion of the word "innovation", we believe, would demonstrate Government's intention of placing a new emphasis on the concept of a National System of Innovation and on the role of S&T.

(155) Government should appoint a Minister of State exclusively for S&T. This would provide a positive signal to the S&T community and help reverse the negative impression created by the recent apparent degrading of the role of S&T. We note that there are a variety of S&T programmes and activities within the Department which could usefully come under the aegis of the Minister of State for ST.

Improving the Effectiveness of the State Agencies

(156) There are 41 Agencies and institutions engaged in S&T activities within the public sector. Opportunities for interinstitutional collaboration, synergy, rationalisation or greater mobility of personnel should be investigated. Arrangements should be put in hand to ensure that institutions participate in national and international networks through which new knowiedge is acquired and shared. The Inter-Departmental Committee should provide a lead in this regard.

Administration of Research Grants

(157) Forfás should be responsible for the administration of the research grants included under Measure 4 of the new R&D Sub Programme.

Implementing the Recommendations of this Report

(158) Government should make an immediate additional allocation of £25m so that a start can be made on addressing the most urgent gaps and deficiencies we have identified.

(159) Government should publish a White Paper on its S&T Policy, with minimum delay, including its decisions on the recommendations in our Report.

(160) Government should establish a Task Force to assist in this and to progress our recommendations.