MALAYSIA'S S& T *POLICY FOR* THE 21st CENTURY

Science, technology and innovation are central to success in *today's modern economy. They are vital resources and strategic investments for building* a *more innovative and vibrant economy* in *order* to *face the challenges and uncertainties* of *the* 21st *century. The Second National Science and Technology Policy will put* in *place programmes, institutions and partnerships* to *enhance Malaysia* economic *position including the quality* of *life* of *the people.*

The National S& T *Vision*

To *become* a *nation that is competent, confident and innovative in harnessing, utilizing and advancing S*& T *towards achieving the goals* of *Vision 2020.*

Policy Statement

Maximize the utilization and advancement of S& T as a *tool for sustaining economic development, the improvement* of *quality* of *life and national security.*

Goal

Accelerate the development of S& T *capability and capacity for national competitiveness.*

Objectives

- To *increase R&D spending* to at *least 1.5 per cent* of *Gross Domestic Product (GDP) by year* 2010 *in an effort* to *enhance national capacity in R&D; and*

- To *achieve* a *competent work force* of at *least* 60 *RSEs (researchers, scientists and engineers) per 10,000 labour force by year* 2010 *in order to enhance national capability in S*&T

NEW *DIRECTIONS* OF THE SECOND *NATIONAL SCIENCE AND TECHNOLOGY POLICY*

The Second National Science and Technology Policy provides a *framework for improved* performance *and long-term growth* of *the Malaysian economy. The policy* aims to:

- *Increase the national capability and capacity for research and development (R&D), technology development and acquisition;*

- Encourage *partnershiPs between public funded organizations and industry as well as between local and foreign companies for* the *co-development of technologies* with a *view* to *increasing indigenous technology capability:*

- *Enhance* the *transformation of knowledge into products,* processes, *services or solutions* that *add value across every industry for maximum socio-economic* benefit:

- Position *Malaysia* as a *technology provider in* the key *strategic knowledge industries such* as *biotechnology, advanced materials, advanced manufacturing, microelectronics, information and communication technologies, aerospace, energy, pharmaceuticals, nanotechnology and photonics:*

- Foster *societal values and attitudes that* recognize S&T as *critical* to *future prosperity, including* the *need for life-long learning:*

- Ensure that the *utilisation of S&T* accords *emphasis* towards *approaches* that *are in conformity* with *sustainable* developmental goals *including alignment* with *societal* norms *and* ethics: *and*

- To *develop new knowledge based industries.*

OPERATING PRINCIPLES* IN S&** ***T DEVELOPMENT

In *order* to *provide* direction *in* the quest to *achieve* the S& T *objectives,* the *following guiding principles should* be *adhered* to:

Commitment

Ensure that there is national commitment to S&T *that translates into solid investments by both Government and industry and the widespread adoption* of *new technologies* to *enhance export competitiveness.* A *supportive and responsive institutional framework is critical if S&T is* to *flourish.*

Concentration

Optimise the utilization of *resources in strategic priority areas.*

Capabilities

Improve the nation's capability in appreciating, acquiring and applying S&T *knowledge and skills through education, training and life-long learning.*

Capacity

Strengthen the nation's capacity through expanding and upgrading of *the* S&T *infrastructure.*

Collaboration

Promote smart partnerships and synergy among public research institutions, universities, industries and nations to *enhance its effectiveness.*

Commercialisation

Enhance nation's ability to *commercialise R&D outputs into competitive products and*

services that meet market demands.

Culture

Foster a *pervasive culture* of *creativity, innovation and entrepreneurship in* S&T *through creation* of an *environment that encourages risk taking, rewards market-driven ideas, supports science and innovation and inspires interest* in S& T *careers.*

Community

Enhance support and active participation of *the community* in S&T *development relevant* to *their daily lives and in accordance with acceptable norms and ethics.*

STRATEGIC THRUSTS **FOR S& T** ***DEVELOPMENT***

As a *nation with relatively limited resources, Malaysia has to ensure the desired results and high rates* of *return from every investment made in developing* S&T. *The allocation* of *resources should therefore be closely aligned to national priorities for the country's transformation into* a *knowledge-driven economy* so as *to maximize economic and social returns.*

The Second National Science and Technology Policy therefore addresses seven key priority areas:

I. *STRENGTHENING RESEARCH* AND *TECHNOLOGICAL CAPACITY AND CAPABILITY*

Investments in Science and Technology by the Government have increased tremendously since the introduction of *the Intensification* of *Research in Priority Areas (/RPA) programme in 1988. Despite such increases, Malaysia's investments in research and development (R&D) pale in comparison to that* of *the advanced countries. The gross expenditure in R&D up to year 2000 is 0.5 per cent* of *GDP,* a *figure that compares unfavourably with other more developed countries. Absolute R&D expenditures by both government and industry have increased in recent years especially by the latter and this trend* is *encouraging. But, Malaysia needs to invest more in order to keep abreast with the explosive pace* of *changes in scientific and technological developments.*

Success will go *to countries and firms that continuously invest in knowledge intensive activities. R&D is* a *key activity in enhancing the generation* of *new products, processes, services or solutions. Proficiency in R&D, however, is not automatic. The Government's role is* to *establish an environment conducive for industry* to *invest in R&D and other technological development activities. Industry* too *must complement the Government's efforts in commitment and accept responsibility for R&D in order* to *reap for itself the resultant benefits.*

To remain competitive in the future, the Government must support the development of *critical bases for future specialisation and competence in carefully selected areas.*

Specific Initiatives

I. *Increase public and private sector investments in R&D including infrastructure development targeting for gross national R&D expenditure level* of at *least 1.5 per cent* of *GDP by* 20 *I* O.

2. *Research and technology development programmes including basic research in the new and emerging technologies* to *be prioritised regularly through initiatives such* as *Technology Foresight* / *Technology Mapping and other similar methodologies* to *ensure focus in areas which can yield highest socioeconomic payoffs.*

3. *Invest in upgrading the infrastructure for* S& *T development including establishment* of *new major research* / *technology development institutions* / *facilities* / *initiatives e.g. BioValley Initiative in the Multimedia Super Corridor.*

4. *Launch, jointly with industry associations. new programmes in selected sectors* to *strengthen indigenous technological capabilities oflocal corporations in existing* as *well* as *new and emerging technologies through partnerships with universities and public research institutes (PRIs)* as *well* as *through creative engineering.*

5. *Stimulate private sector investment in R&D I technology development through:*

   - *Enhancing access* to *public research facilities;*
   - *financial contribution from* the *private sector;*
   - *Ensure that the fund* is *used solely for R&D purposes for that particular industry;*
   - *Yearly report* to *ensure accountability;*
   - *Supporting industry initiatives including* those of *industty associations* to *develop specific facilities* to *strengthen technological capabilities;*
   - *Promoting competitiveness through science, technology and innovation;*
   - *Review existing fiscal and financial incentives for R&D* so *that they would promote greater industry investments in R&D* as *well* as *attract significant R&D projects* to *Malaysia; and*
   - *Enlarge allocations for industry grant schemes* e.g. *Industry Research and Development Grant Scheme (IGS), Multimedia Super Corridor Research and Development Grant Scheme (MGS), Demonstrator Application Grant Scheme (DAGS).*

6. *Aggressive and strategic implementation* of *existing Technology Acquisition Programme under the smart partnership framework with Malaysian companies and government-controlled agencies.*

7. *Establish strong linkages with regional and international centres* of *excellence* in *collaborative R&D as well as co-development* of *technology.*

II. PROMOTING COMMERCIALISATION OF RESEARCH OUTPUTS

Success in *innovation is determined by the ability* to *transform ideas and knowledge into products and processes that are demanded by market.*

The Government plays a key role in *forging linkages between the generators* of *knowledge and the users* of *knowledge. Government funded research organisations must playa more proactive role in making connections with industry. Such an active stance, incorporating the introduction* of *new mechanisms and incentives* is *consistent with the mission* of *conducting research for the benefit* of *the nation especially when the outputs are commercialised.*

Specific Initiatives

8. *Establishment* of *Business Development Unit within MOSTE* to *develop strategies and programmes aimed at enhancing the commercialisation and diffusion* of *research findings generated from public funded research organisations. Such programmes include, among others:*

    - *The introduction* of a *new Reach* Out *programme* to *support the efforts* of *Business I Innovation units in universities and PRIs;*
    - *Establishing new mechanisms (e.g. IMCNation* Centres *I* Best *Practice Centres) to provide universities and PRIs with* support *in commercialising research outputs;*
    - *Establishment* of a *pre-seed capital fund for universities. PRIs and Innovation* / *Best Practice Centres which are* to *be allocated on* a *competitive basis;*
    - *Study on establishment* of *holding company under MOSTE* to *promote commercialisation* of *research findings from universities and PRIs; and*
    - *Improving incentives for researchers* to *commercialise their findings.*

9. *Introduce, in collaboration with Association for Small and Medium Enterprises (SMEs),* a *Public Sector-Industry PartnershiP programme where researchers will spend* some time *providing technical assistance* to *companies.*

10. *Incorporate within existing procurement practices, programmes* to *support innovation and development* of *indigenous technology development.*

11. *Apply self-financing targets (operating budget) for all public research institutions (30 per cent by 2005) and universities* (*I5 per cent by 2005).*

III. DEVELOPING HUMAN RESOURCE CAPACITY AND CAPABILITY

Investments in the "intangibles" such as *education and training, R&D and new managerial skills* are very crucial*. Investments in these intangibles must achieve two main objectives:*

- *Achieving the numbers; and*

- *Attaining quality.*

While Malaysia's Information Technology (IT) and Multimedia agenda are powerful initiatives for economic advancement, the broader scope of *the* S& T *agenda encompasses* a *wider range* of *activities that include the Biosciences and Engineering. The development* of *these areas will further* enhance *the wealth creation processes* consistent *with the* expansion of *the knowledge-driven economy.* A *specialised core group* of scientists and *engineers should be developed* in *tandem with the expansion* and setting *up* of new *research centres* and *laboratories.*

Current statistics indicate that Malaysia has to *expand the human resource base* in S&*T* to *fulfil the requirements for* scientists and *engineers* in ten *years time. This means that there will have* to *be* a *substantial* injection of *investment* in *human resource development* in *the* setting *up* of *more* S& *T institutes* and *universities.*

The shortage of S& *T personnel* is *estimated* at *between* 20 *per*cent to 30 *per* cent *across all levels* of *scientific, engineering* and *technical areas. The situation* is *particularly* acute *for small* and medium *scale industries. Malaysia therefore has* to *adopt* a *broad-based approach* to *human resource development* to *support its* S&*T agenda.*

In the long term, Malaysia requires a much more effective delivery system for human resources to *drive economic growth and progress. This must translate* to *a high component* of *Science and Technology graduates as well as a culture* of *life-long learning.*

Specific Initiatives

12. Intensify development of *critical mass for* S& *T through:*

- *Adoption* of *60:40 ratio* of *students pursuing science, technical and engineering disciplines in upper secondary schools and universities;*

- *Adopting a different approach* to *education that is, from an examination oriented and rote learning* to *hands on and innovation oriented approach;*

- *Increasing the number* of *post-graduate students in science, technical and engineering disciplines* to *at least 10 per cent* of *the undergraduate population by 2005 through measures such as:*

    - *Establishment* of *a post-graduate research* S& *T university; and*

    - *Introduction* of *attractive incentives* to *entice more students* to *pursue science, technical and engineering disciplines at under-graduate and post-graduate levels.*

- *Introduction* of *Book Allowance Support programme for students pursuing science at upper secondary school level; and*

- *Review* of *syllabi and teaching approaches for science and technical/ vocational subjects in primary and secondary school levels with emphasis accorded* to *development* of *creative thinking and problem solving skills.*

13. *Expand implementation* of S&*T Human Resource Development (HRD) Fund* to:

- *Enhance Human Resources Development and other incentives* to *achieve national* S& *Thuman resource objectives;*

- *Increase the number* of *post-doctoral fellowships;*

- *Initiate brain pool programme through collaboration with renowned researchers; and*

- *Establish, in collaboration with industry, Distinguished Visiting Scientist programme in universities and PRIs.*

14. *Strengthen and expand Teaching Company Scheme and other student attachment programmes* to *build long-term relationships for technology transfer and training between university and industry.*

15. *Improve the career prospects and mobility* of *scientists and research workers.*

16. *Re-examine programme on Retuming Malaysian Scientists* to *make it* more *attractive through targeted fiscal and non-fiscal incentives.*

I 7. *Review the Skills Development Fund* to *finance industry-training programmes. This would be jointly managed by the private sector and the Government, with manufacturing industries contributing one per cent* of *their total payroll* to *the Fund. Existing facilities* at *industrial training and other institutes can* be *made available for fUnd-supported programmes, and in-house training programmes may also qualify for support. Serious consideration can also be given* to *private sector*

organisations opting to *set up their own separate training facilities under this scheme, as well as* to *the privatisation* of *existing government training facilities.*

18.*Enhance and modernise the existing system* of *certification* of *technical personnel and classification* of *skills. This will greatly facilitate the development* of a *technically proficient and mobile workforce.*

19.*Expand adult and continuing education programmes, particularly in technical subjects,* to *upgrade the skill base in specific areas. The provision* of *adequate facilities has* to go *hand in hand with an enlightened management and the realisation that personal fulfilment leads* to *greater job satisfaction and* a *positively motivated employee.*

20.*Strengthen the effectiveness* of *mechanisms* to *allow industry* to *contribute* to *course design and curriculum review in institutions* of *higher learning and industrial training*

institutes. Each institute should set up a committee with adequate representation from the public and private sectors. Continuous consultation will ensure that course content does not become obsolete with changes in technology. or irrelevant with respect to industry needs.

21. Ensure that Malaysian graduates acquire training and skills that are fully relevant to national needs, particularly with respect to the choice of elective subjects and post-graduate programmes and fields of research.

22. Enhance and institutionalise linkages for industrial training between industry and educational establishments. Courses at institutions of higher learning should include a high degree of exposure to practical situations through relevant practical training opportunities.

23. Strengthen the role of tertiary institutions in advanced technology research and innovation. This could be achieved through:

- Providing special development budget allocations in areas related to targeted new and emerging technologies; and

- Increasing the industry orientation of post-graduate courses related to Science and Technology.

This would help provide effective support for the acquisition of competence in the new key technologies.

24. Ensure an effective role for institutions of higher learning in all proposed technology parks and innovation centres. Special attention must be given to the cultivation of skills related to technological reproduction, adaptation and innovation. Universities must adopt a more commercial stance in developing technologies.

Iv. PROMOTING A CULTURE FOR SCIENCE, INNOVATION AND TECHNO-ENTREPRENEURSHIP

Developing a supportive attitude in society for change through increasing S& T awareness and appreciation programmes is crucial towards engendering a climate for invention, innovation and techno-entrepreneurship.

Techno-entrepreneurship is one of the major driving forces behind technological advancements. Malaysian society tends to be averse to risk in technology. But, taking no risk is the greatest risk of all. It closes the door to a new and more rewarding future. The Government will do more to share the risks with industry and individuals in new technological developments.

Specific Initiatives

25. Expand the scope and coverage of S& T promotion activities in collaboration with S& T NGOs and industry. Such measures to include, among others:

- Blending S& T with the performing arts; and

- *Support for professional and scienceoriented organisations.*

26. *Establish five Regional Science Centres by* 2010 to *elevate* S& *T awareness among the populace.*

27. *Promote techno-entrepreneurship through:*

- *Provision* of *technoentrepreneurship courses* to *all science, technology and engineering undergraduates;*

- Conduct, *in collaboration with Malaysian Technology Venture Association or other sponsors. annual technoentrepreneurship competition;*

- *Amendments* to *university / PRI personnel service scheme that enable selected staff* to *take sabbatical leave with* no *loss* of *seniority in order* to *commercialise a research finding;*

- *Ensuring existing public venture capital funding and banking system* to *provide window for early seed financing as well as support for technology development;*

- *Establishment* of *Malaysian Technology Credit Guarantee Scheme through existing mechanism* to *support formation* of *new technology based firms (NTBFs);*

- *Introduce* a *more innovative mode* of *financing such* as *debt ventures funding with flexibility* in *the lending facilities;*

Encourage local corporations to *set up Angel investment funds by publicising the incentives through seminars, workshops and newsletters;*

Create an *avenue* to *showcase companies* to *Angel Investors and Venture Capitalists; and*

.. *Review achievement* of *ventures capital fund and other incentives* to *encourage commercialisation* of *R&D output.*

28. *1ncu/cate Science and Technology awareness and appreciation* at *all levels* of *government. The objective* is *the permeation* of a *Science and Technology consciousness into the structure for national decisionmaking and implementation* of *development programmes. This can be achieved by* a *wide ranging series* of *measures, including special courses* on S & T at *public seNice institutes and the appreciation* on *the* S & T *dimension* in *general courses* at *such institutes.*

29. *Raise* S&T *awareness and appreciation by inculcating* S&T *culture* in *the education system. This would involve:*

- *programme* to *intensify creative thinking and problem-solving skills.* in *primary education;*

- *Research grants* to *schools;*

- *Redesigning* of *syllabi* to *achieve* a *balance* of S&T. *the arts and humanities;*

- *Increasing the vocational and technical skills content* in *secondary schools; and*

- *Intensifying efforts to increase* S&T *language competence to facilitate the flow* of *information.*

30. Use the mass media to heighten public awareness and appreciation of *Science and Technology. This will involve not only* an *expansion* of *the* S&T *content in the mass media, but also steps to improve the standard* of *science journalism.*

31. Enhance the scope and coverage of *the Science and Technology Week programme and other promotional activities. Such promotions not only raise* S&T *awareness, but also provide the* S&T *community with* a *definite focus and identity. The National Science Centre should aim at being one* of *international standard to heighten the image* of *Science and Technology* as an *exciting and relevant facet* of *everyday life.*

32. Encourage the formation and development of *centres* of *excellence in science. The government should promote the development* of *viable professional and science-oriented societies by providing them with financial assistance.*

33. Promote the formation of *guilds for technical personnel with activities that are specially focussed* on *technical and professional issues. These associations represent* an *important part* of *informal education and training framework. They can help upgrade skills and promote sound industry-wide codes* of *practice through* a *wide range* of *industrial activity. They can also elevate the social standing* of *blue-collar skills.*

34. Support the Malaysia Design Council that aims to create and maintain a *fund to be used for encouraging the creation. design. development, financing.manufacture and utilisation* of *Malaysian inventions, research results and other intellectual property. In addition,* a *series* of *award could be implemented* to *provide additional impetus* to *specific target groups, or in specific areas* of *technology including product design, invention and innovation. This would raise the prestige* of *scientific accomplishments generally.*

V. *STRENGTHENING INSTITUTIONAL FRAMEWORK AND MANAGEMENT FOR S&T AND MONITORING OF* S& *T POLICY IMPLEMENTATION*

Proficiency in S& *T does not happen by chance. It must be made* to *happen. Decisions* on S& *T developments must be taken based* on *well-informed options and not* on *exigencies. The current institutional framework for* S&*T is characterised by* a *lack* of *resources devoted* to S& *T policy analysis and the diffusion* of *responsibilities throughout various arms* of *government.* A *well-defined system for the management* of *national* S& *T agenda needs* to *be set* in *place. Ability, agility and adaptability must underpin the efforts* in *enhancing the National Innovation System. Towards this direction consideration will be given* to *strengthening the National Innovation System.*

The National Innovation System (NIS) will involve a *set* of *distinct processes involving institutions that jointly* as *well* as *individually contribute* to *the development and diffusion* of *new technologies. It will provide the framework within which government forms and implements policies* to *influence the innovation process.*

Developments in S&*T cannot be undertaken* in a *vacuum. They must be sensitive* to *the needs and concerns* of *society, which ultimately influence the quantum* of *resources devoted* to *the development* of S&T. *Rapid advances in* the new *technologies especially in the field* of *genetics, are raising serious moral and ethical concerns. These issues have* to *be addressed in consonance with acceptable societal norms and ethics.*

Specific Initiatives

35. Strengthen the Ministry of *Science. Technology and the Environment (MOSTE) by endowing it with necessary resources* to *ensure effective* S&T *policy formulation and implementation.*

36. *Review the role* of *Majlis Penyelidikan Kemajuan Sains Negara - MPKSN (National Council for Scientific Research and Development)* to *ensure effectiveness* of S & T *advisory and coordination system.*

37. Expand efforts to *develop effective information gathering. monitoring and evaluation and transmission mechanism* to *track the nation's performance in* S & T as *well* as *development* of *new technical developments I technologies.*

38. *Promote adoption* of *sound research management practices including intellectual property management and commercialisation* of *research outputs in all PRIs and universities.*

39. Enhance the management of *intellectual property rights including patent advisory and other services.* To *review existing legislation* or to *develop new legislation related* to *policy. Enact legal provisions* to *allow for the securitization* of *intellectual property where intellectual property rights can be used* as *collateral for loans.*

40. Develop mechanisms and codes of *practice* to *ensure that development* of S& T *accords emphasis* to *preventive approaches* as *well* as *being consistent with acceptable societal norms and ethics.*

41. Enhance the management of *the technology intelligence and information system. This would facilitate rapid and effective dissemination* of *information on research within the country. The system would also be a* source *for information on international research. The existing system already in place in various research institutes, universities and colleges, and specialised and general libraries, would be the nucleus on which* to *build the National Science and Technology Intelligence System.*

42. Require public sector R&D institutes to *draw up five-year budget plans detailing research programmes and priorities. The budget should be reviewed annually by the ministry responsible for Science and Technology. This will help create greater awareness in key public and private sector organisations, about research programmes underway* or *being*

planned.

43. *Enhance the system* of *contract research as a first step towards corporatisation* of *all industrial research institutes. The objective* is to *encourage market-driven research through a clear understanding* of *priority areas, the monitoring* of *R&D performance. and the introduction* of *a degree* of *competitiveness in research activities.*

44. Aim for a greater degree of *financial autonomy for R&D institutes. The decision-making process could thus be speeded up. manpower and skills would be better utilised. and R&D programmes would be more clearly geared towards performance.*

VI. ENSURE WIDESPREAD DIFFUSION AND APPLICATION OF TECHNOLOGY, LEADING TO *ENHANCED MARKET-DRIVEN R&D* TO *ADAPT AND IMPROVE TECHNOLOGIES*

Dissemination of *technology* is *vital* in *creating the infrastructure and environment within which the needs* of *the technology and business communities can work together* to *mutual benefit. For maximum effectiveness, the private sector has* to *be encouraged* to *take the long-term view* of *business ventures through investments* in *R&D, and the research community has* to *reorient its activities* in *line with industry needs.*

Specific Initiatives

45. *Enhance quality awareness and design* in *industry through on-going programmes. Quality and Standards play* an *important role* in *building up international competitiveness, and the level* of *quality awareness must therefore permeate the full range* of *activities* in *Malaysian industry. Competence must also be built* in *industrial design, engineering design and product design* so *that ideas can be translated into workable systems or products* to *improve efficiency and effectiveness* in *manufacturing activities.*

46. *Form a special technical committee* to *propose specific and concrete measures* to *enhance the capability* of *the engineering and technical services sector. This would help in the development* of *a system* of *commercially driven engineering support services* to *meet the requirements* of *industrialisation.*

47. *Ensure the effectiveness* of *the Industrial Technical Assistance Fund. This can be achieved by extending its scope* to *include a larger range* of *activities including automation and R&D in targeted areas; broadening coverage* to *include all firms, while retaining the emphasis on small and medium scale enterprises; increasing the maximum level* of *matching grant for R&D.*

48. *Gear public procurement policy firmly* to *stimulating innovation and product development for local firms* to *help them be more competitive in regional and international markets. Close dialogue between suppliers and procurement agencies would encourage forward planning. Procurement agencies should also be more supportive* of *innovative local firms.*

49. Strengthen linkages between firms by encouraging R&D and product development programmes between purchasers and suppliers and developing vendor support systems. International Procurement Operations (IPO) centres should be given incentives to *set up in*

Malaysia.

50. *Undertake a detailed scrutiny with a view* to *implementation* of *the product group Action Profiles in the key industry sectors such as Advanced Manufacturing, Advanced Materials, Electronics, Information and Communication Technology and Multimedia Technology, Biotechnology, Energy, Aerospace, Nanotechnology. Photonics* as well as *other key technologies.*

VII. BUILD COMPETENCE FOR *SPECIALISATION* IN *KEY EMERGING TECHNOLOGIES*

Technology is never static. Markets are constantly changing. New technologies and applications are surfacing. A *forward-looking approach to the key technologies of the future is crucial to sustain* an *active and competitive industrial* economy

Specific Initiatives

51. *Develop* a *secure knowledge* base *in the key technology areas to sustain technology support for Malaysian industry:*

- *Advanced Manufacturing;*
- *Advanced Materials;*
- *Microelectronics;*
- *Biotechnology;*
- *Information and Communication Technology;*
- *Multimedia Technology;*
- *Energy;*
- *Aerospace;*
- *Nanotechnology;*
- *Photonics; and*
- *Pharmaceuticals.*

52. *Prioritise research programmes* in *the new and emerging technologies* to *ensure focus* in *areas that yield the highest economic pay-offs. Malaysia cannot afford* to *support* a *full range* of *skills and capabilities* in *all these fields. Specific areas must be selected based* on *relevance,* a *demonstrated need, the availability* of a *natural advantage and constraints* of *manpower and budget allocations.*

53. *Institute special measures* to *encourage the formation and development* of *new*

technology-based firms engaged in *the promotion* or *commercialisation* of *technological innovations. These small* to *medium sized firms, highly entrepreneurial* in *nature, will emphasise knowledge intensive R&D activities allied* to *business skills.*

54. *Set up national focal points for each* of *the new and emerging technologies. These would serve* as *the hub* of *R&D activity* in *the respective fields.*

55. *Enhance exposure* to *international developments* in *the new technologies, and exploitation* of *foreign research expertise where necessary.*

CONCLUSION

""We have to be *brave enough* to *explore new pathways and new destinations.* To do *this we* must *have* more *faith* in *ourselves and* be more *hardy and* determined. If *we* do so, *we may* come out *ahead* of *those who went* before us. "

Data' Seri *Dr. Mahathir Mohamad* Prime *Minister* of *Malaysia*

The implementation of *the Second National Science and Technology Policy will involve a large financial outlay by the Government. In order* to *implement fully this policy the Government will have* to *be committed* to *provide the financial allocation needed for such purposes. The quantum* of *financial requirement* to *implement all the proposals is estimated* to *be RM9.5 billion.*