

For information
On 11 March 2002

LegCo Panel on Commerce and Industry **Review of the Innovation and Technology Fund**

Introduction

This paper presents the findings of a review of the Innovation and Technology Fund (ITF).

Background

2. The ITF was established as a statutory fund under the Public Finance Ordinance on 30 June 1999 and was officially launched on 1 November 1999 with the promulgation of guidelines on its operation and commencement of invitation of applications.

3. In establishing the Fund, the Administration undertook to review the ITF periodically to ensure that the ITF meets its mission and operates effectively. Members discussed reports on the operation of the ITF in May and November 2000.

The Review

4. With the experience gathered and the changing economic environment in the past two years, the Administration has conducted an overall review of the ITF. A copy of the review report is attached at **Annex**.

5. The major findings of the review include -

- (a) setting up a new innovative product development assistance programme on a trial basis to help promote innovation in product design and development;
- (b) formally establishing the Patent Application Grant as a standalone programme under the General Support Programme to attach more importance to the scheme;

- (c) adopting a more top-down approach in funding applied research and development activities through identification of key technology areas for priority development;
- (d) streamlining the administrative procedures of the ITF; and
- (e) developing a three-tier project evaluation system.

Advice sought

6. Members are invited to note the contents of the report on the review of the ITF and comment on the findings of the review.

Commerce and Industry Bureau
March 2002

Review of the Innovation and Technology Fund (ITF)

Executive Summary

Since the launch of the \$5 billion Innovation and Technology Fund (ITF) in November 1999, we have already supported 236 projects amounting to \$526 million under its four programmes, namely, the Innovation and Technology Support Programme (ITSP), the University and Industry Collaboration Programme (UICP), the General Support Programme (GSP) and the Small Enterprise Research Assistance Programme (SERAP). These four programmes complement each other by targeting at different groups and they all aim to encourage innovative applied research and development activities which could benefit the development of local industries.

With the experience gathered and the changing economic environment in the past two years, we have reviewed the operation of the ITF to see how it could be further improved to best meet its mission. The following aspects were covered in the review: the scheme structure and programme area; funding approach; the management and administration of the Fund and the project evaluation mechanism.

The review has identified that -

- (a) there is room for further refining the existing ITF scheme structure and programme area in order to better meet the needs of the local industries;
- (b) the existing solicitation arrangement for ITSP could be further strengthened to make the most effective use of the limited resources and achieve greater impacts;
- (c) we should focus more on technical monitoring of ITF projects and streamline the administration of the ITF; and
- (d) we should continue to develop a structured system to evaluate the outcome of the ITF projects and programmes.

The main findings of the review include -

- (a) setting up a new innovative product development assistance programme under the ITSP on a trial basis to help promote innovation in product design and development with a view to upgrading the product design capability of local manufacturers and helping transform local original equipment manufacturers (OEM) to original design manufacturers (ODM) for improved competitiveness;
- (b) giving more weight to the commercialization plan of a project in the project vetting process, and requiring the project investigator to take necessary steps to pursue the commercialization plan in the project implementation stage. We would also encourage universities to undertake measures to facilitate the transfer of project deliverables to local industries;
- (c) adopting a more top-down approach in funding R&D activities through identification of key technology areas for priority development;
- (d) enhancing the technical capability of the Innovation and Technology Commission through engaging more external technical experts with a view to further tightening the project vetting and monitoring process;
- (e) streamlining the administrative procedures of the ITF with a view to allowing more flexibility in resource deployment on the basis that all ITF project funds are spent exclusively for the project; and
- (f) developing a three-tier project evaluation system targeting at individual ITF projects, each of the four ITF programmes and impact studies to assess the effectiveness of the ITF.

Through implementing the review findings, we aim to bring about more focused R&D activities being developed and undertaken by the research community and the upgrading of the local industries through benefits from the results of these R&D activities in Hong Kong.

Chapter 1 - Scope and Objectives of the Review

1.1 The Innovation and Technology Fund (ITF) was officially launched on 1 November 1999. The Fund aims to finance projects that contribute to innovation or technology upgrading in industry, as well as those that contribute to the development of industry, to be undertaken by government or non-government entities.

1.2 At present, there are four programmes under the Fund with different purposes. They are -

- (a) **Innovation and Technology Support Programme (ITSP)** which supports midstream/downstream research and development projects undertaken by universities, industry support organizations, professional bodies and trade associations. Applications are normally invited twice a year, and the ITF provides funding support up to 90% of the approved total project costs while the remaining comes from the industry in the form of sponsorship;
- (b) **University-Industry Collaboration Programme (UICP)** which supports commercial research and development projects undertaken by private companies in collaboration with local universities. Funding is provided on a matching basis, with the private company bearing at least half of the project cost. Applications are considered at any time of the year;
- (c) **General Support Programme (GSP)** which supports projects that contribute to fostering an innovation and technology culture, such as conferences, exhibitions, seminars and so on. As with the ITSP, applications are normally invited twice a year and the ITF provides funding support up to 90% of the approved total project costs while the remaining comes from the industry in the form of sponsorship; and
- (d) **Small Entrepreneur Research Assistance Programme (SERAP)** which provides financing for pre-venture capital stage of technology entrepreneurs for starting up, carrying out research and development, and conducting market validation. A grant of up to \$2 million will be provided by ITF on a dollar-for-dollar matching basis. The grant will only be recouped if the project is able to attract follow-on investment

or generate revenue. Applications are considered at any time of the year.

1.3 The ITF is administered by the Innovation and Technology Commission (ITC).

1.4 With the changing aspiration of the community and the changing economic environment in the past two years, there is a need to review the operation of the ITF to see whether any adjustment is required. This is to ensure that the ITF could continue to meet its mission.

1.5 The review aims to examine whether the Fund could achieve its intended objectives and to seek ways to improve the operation of the Fund. It focuses on the following aspects in the operation of the ITF -

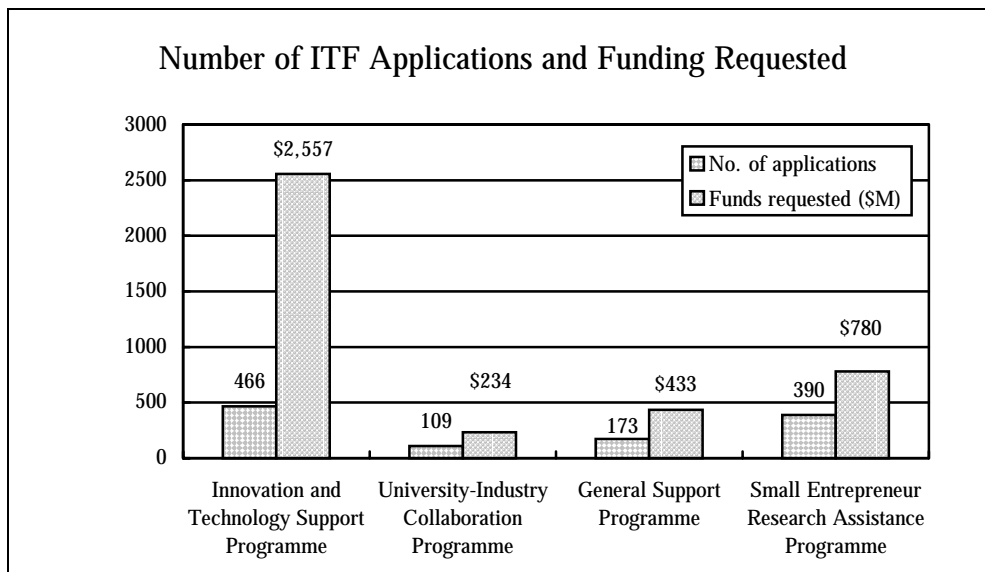
- (a) scheme structure and programme area;
- (b) approach and focus in funding;
- (c) management issues - vetting and monitoring mechanism, inspection arrangements, and administration of the ITF; and
- (d) project evaluation.

Chapter 2 - Overview of the existing operation of ITF

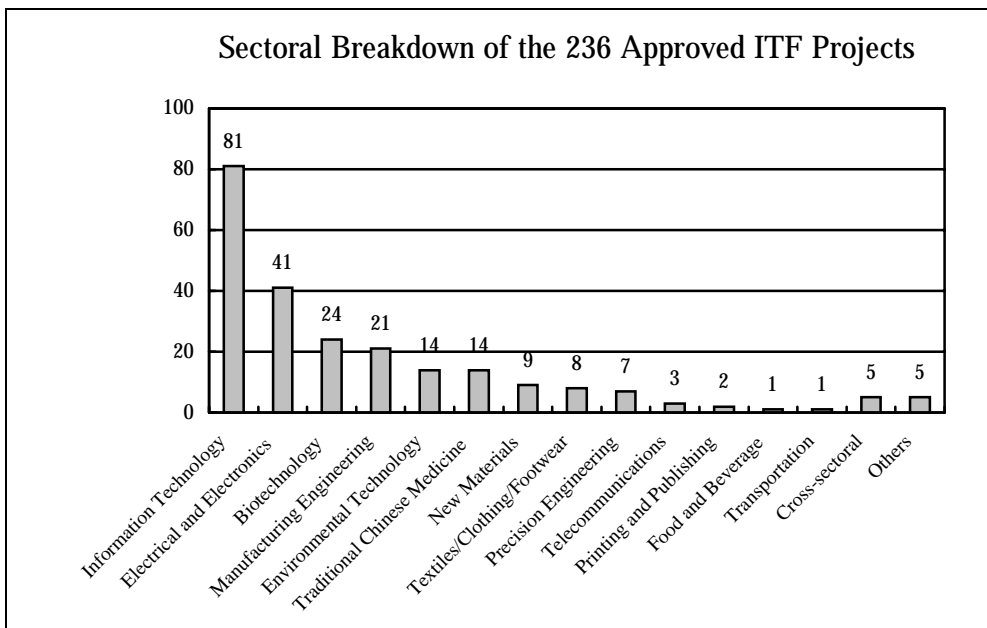
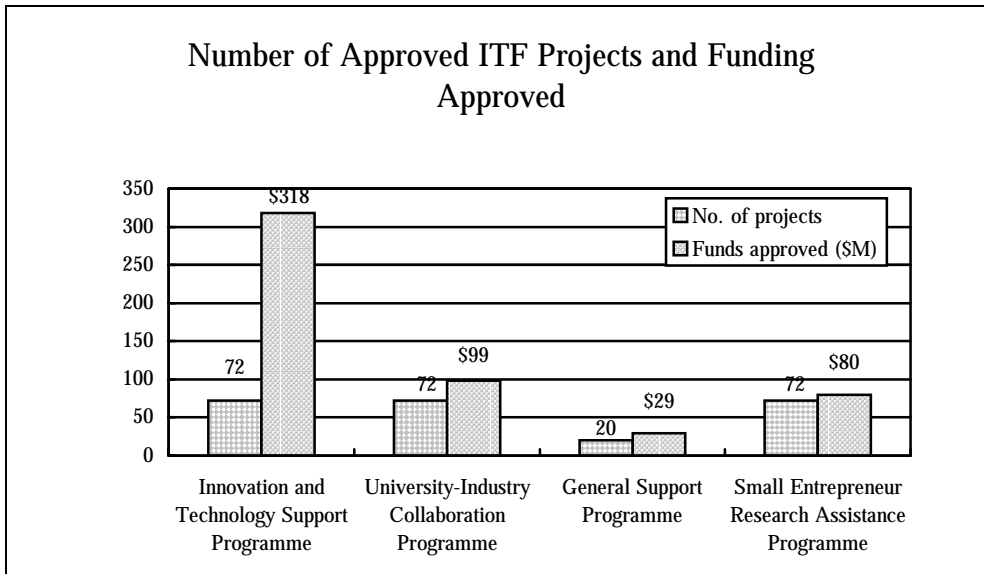
Applications received and Amount of Fund approved

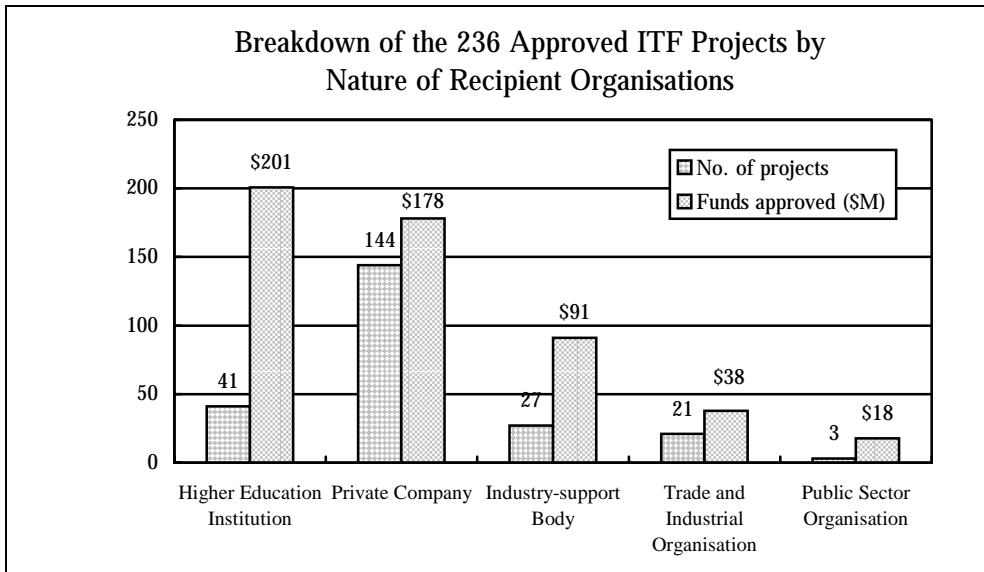
2.1 Since the Fund's establishment in November 1999, the ITC has received a total of 1,138 applications as at 31 December 2001 in all the four categories totaling \$4 billion. Of these, the Commission has approved 236 projects at \$526 million. The success rate is 24%¹.

2.2 Details of the funding applications and approvals, broken down by programme categorizations, sectors and nature of applicant organizations, are shown in the following charts. It can be seen that information technology, electronics and biotechnology are the three major sectors receiving ITF funding. Moreover, 38% and 34% respectively of the funding has been granted directly to higher education institutes and private companies as applicants.



¹ 149 project proposals were still under consideration as at 31 December 2001 and these projects are excluded from the calculation of the success rate.





2.3 A detailed breakdown of the statistics in respect of individual categories is set out at **Appendix A**.

2.4 Among the four programmes, most applications were made under the ITSP and the amount of funds approved under this programme was the largest. Among the \$526 million approved, more than 60% of the fund went to support ITSP projects.

Solicitation arrangements for ITSP Projects

2.5 In the past, we left the initiatives for ITSP project proposals entirely to the applicants. The effect was that limited resources were spreading out too thin and that there was a lack of depth in the existing applied research programmes sponsored by the ITF. In the United States, similar funding schemes such as those sponsored by the National Science Foundation (NSF), the National Institute of Health (NIH) and the Defence Advanced Research Projects Agency (DARPA) provide for the solicitation of mission-oriented project proposals.

2.6 Taking into account the experience in the United States, the ITC introduced a solicitation arrangement under the ITSP in November 2000. Such a more proactive approach with clearly set out project objectives enabled both competition and collaboration among the local research institutions.

2.7 Since the introduction of the solicitation arrangement, we

have issued eight solicitation themes. A list of the solicitation themes issued is at **Appendix B**. A total of 118 project proposals in response to eight solicitation schemes have been received by the end of 2001 and a total of 10 projects² at \$59 million have already been approved. Our intention is to increase the proportion of solicitation in ITSP applications.

The Applied Science and Technology Research Institute (ASTRI)

2.8 About 60% of the ITF, i.e. about HK\$3 billion, has been earmarked for R&D programme undertaken by the Applied Science and Technology Research Institute (ASTRI) over the next five years or so.

2.9 The establishment of ASTRI was one of the major recommendations of the former Chief Executive's Commission on Innovation and Technology chaired by Professor Tien Chang-lin. It started operation in September 2001 and aims to carry out R&D for transfer to industry for commercialization. Transfer options include licensing the technologies to industry to upgrade their technological level and add value to their products and services, or spinning off its R&D projects as possible joint ventures with industry or start-up companies.

2.10 ASTRI has already formulated its initial R&D programme which focuses on selected technology areas such as photonics, wireless, Internet contents and applications, and integrated circuits design. So far, ASTRI has submitted three research projects for funding support under the ITF.

² 61 project proposals were still under consideration as at 31 December 2001.

Chapter 3 - Assessment of existing operation

A. Scheme Structure and Programme Area

3.1 Apart from providing the necessary infrastructure, there are mainly three sources of government funding to support research and development activities in Hong Kong - the research grants awarded to the UGC-funded institutions by the Research Grants Council (RGC), the ITF and the Applied Research Fund (ARF). While the RGC largely supports basic academic research (i.e. the upstream research) undertaken by the local universities and the ARF provides venture capital funding to support fast growing local technology companies, the ITF provides funding support to a whole spectrum of mid-stream and downstream research and related activities through its four programmes (ITSP, UICP, GSP and SERAP).

3.2 The four ITF programmes complement each other by targeting at different groups, and they all aim to encourage innovative applied research and development activities which could benefit the development of local industries. The ITSP supports mid-stream and downstream R&D projects undertaken predominantly by research institutes. In most cases, the project deliverables would be made available to all industrial players on a non-exclusive basis. The UICP supports collaborative activities between the industry and the university so that the industry could leverage on the research capability of local universities. The programme benefits both universities and individual industrial partners. The latter usually are well established companies in Hong Kong. SERAP aims to help small, technology based and entrepreneur driven companies which carry out business-oriented researches at the pre-venture capital stage. Only companies with less than 20 employees are eligible for application.

3.3 Unlike the other three programmes, the GSP provides funding support to activities and studies, e.g. seminars and conferences, and surveys and studies, which aim to promote the development of innovation and technology in Hong Kong. In addition, a special project entitled the Patents Application Grant (PAG) is run under the GSP to provide funding support to first time patent seekers with a view to promoting invention and the importance of protection of intellectual property.

3.4 Through the existing four different programmes, the ITF addresses the different needs of local industries, ranging from providing

support for innovation and technology development to benefit industry or the relevant industry sector(s) as a whole (i.e. ITSP and GSP) to providing funding assistance to individual companies (i.e. UICP and SERAP). As most of the ITF projects are still on-going, it is too early to assess the effectiveness of the various ITF programmes in contributing to the innovation and technology upgrading of local industries. However, judging from the positive response and the many applications submitted by interested parties, it is clear that the ITF programmes have been well received by the universities and local industries.

B. Approach in Funding ITSP Projects

3.5 As mentioned in paragraph 2.4 above, the amount of funds approved under the ITSP is the largest among the four ITF programmes. Also, the results of ITSP projects could have impacts on the whole industry if these could be successfully commercialized. We therefore pay greater attention to the funding approach for ITSP projects in order to ensure that it could achieve our objectives.

3.6 The approach in funding of ITSP has shifted from a non mission-oriented approach to a more focused approach, with the ITC identifying specific subject areas for soliciting research proposals. These specific areas were identified through discussion with the local research community and industries in order to ensure that projects solicited under these themes could meet the needs of Hong Kong. Such a more proactive approach with clear project objectives is welcomed by local research institutes. It enables proposal initiators to think and plan projects in a more focused manner.

3.7 It is expected that more and more project proposals will be approved under the solicitation arrangement and a cluster of research activities focusing on the identified themes will be developed.

C. Management Issues

3.8 To ensure that the ITF is properly spent to meet its objectives, we operate a very stringent project vetting and monitoring mechanism.

3.9 On project vetting, the ITC has a team of technical experts responsible for vetting the technology aspects of projects and where appropriate seek technical advice from external reviews. In the case of ITSP and GSP, the technical and/or processing teams of the ITC would

submit their observations to an independent vetting committee comprising of members from the research community and the industry of the relevant sectors for consideration.

3.10 On technical monitoring, we require the fund recipients to submit progress reports every six months in order to understand the progress of the projects approved and to ensure that the milestones and deliverables as laid down in the project proposals are fully met. In addition, we conduct regular project visits to review the actual progress of the projects on the ground.

3.11 To further strengthen our technical capability, we have recruited more technical experts in various fields, not only for project vetting and monitoring, but also for enabling the Commission to pursue the solicitation arrangement in consultation with industry and the universities.

3.12 On financial management, we have been operating a stringent management and monitoring system in ensuring that ITF project funds are properly spent as reflected in the project progress and final reports submitted to the ITC. Major revisions to the approved budget would need prior approval of the ITC. All fund recipients are required to submit to us annual audited accounts in order to ensure that all the expenditures are spent in accordance with the budget approved by the Commission. In mid-2000, we established an audit team within the ITC to conduct audit inspection of selected projects to identify irregularities and recover any mis-spent funds to the ITF.

3.13 Overall speaking, the whole vetting, monitoring and auditing system of ITF projects operates effectively.

D. Project Evaluation

3.14 As the ITF has only been in operation for some two years and very few of the 236 approved ITF projects have been completed to date, we therefore have not conducted any comprehensive quantitative assessment of the success of the various ITF programmes.

3.15 For the approved ITSP and UICP projects, only 21 projects have been completed and we are either considering or waiting for the final reports of these projects. They will be evaluated against the set milestones and deliverables as laid down in the approved project proposals. For the GSP projects, nine of them have already been completed. They

are largely seminars and conferences and are industrial support activities in nature. It is estimated that more than 160,000 people have participated in these activities and the feedback received has been very positive.

3.16 For the 72 approved SERAP projects, while all are still in progress, they have already resulted in the creation of more than 500 jobs, most of which are at professional rank, such as engineers.

3.17 We have been evaluating the success of each project on its own. The deliverables of some of the ITSP and UICP projects are being commercialized and the business of some SERAP start-up companies is progressing well.

3.18 As regards a systematic mechanism to evaluate the success of individual ITF programmes or a framework to evaluate the impact of ITF as a whole to the economy, we have been examining the components required for a comprehensive project evaluation system and aim to develop such a system within 2002 as a management tool to assess the performance of the ITF.

Chapter 4 - Areas for Improvement

4.1 Having reviewed the existing operation of the ITF, we have identified the following areas for further improvement -

- (a) **scheme structure and programme area** - whether there are any gaps and room for expansion in the existing scheme structure and programme area in order to better meet the needs of the industries;
- (b) **approach in funding ITSP projects** - whether the solicitation arrangement could be further strengthened to make the most effective use of the limited resources;
- (c) **management issues** - how to balance the need for better monitoring of ITF projects and the need for streamlining the administration of the ITF; and
- (d) **project evaluation** - how to develop a more structured system to evaluate the success of the ITF projects and programmes.

A. Scheme Structure and Programme Area

4.2 In our contacts with the universities, local industries and other fund recipients, we have obtained useful input and suggestions on how the operation of the ITF might be further improved.

4.3 Some universities have expressed that they sometimes had difficulties in finding industrial sponsorship and it was not always easy for them to commercialize their research results. There has not been any well-established mechanism to facilitate the flow of information on the research expertise available from universities to industries.

4.4 Some industries have expressed the view that the present ITF programmes could not benefit them directly. The industries, in particular, the small and medium enterprises (SMEs), would like the Government to provide support to them for upgrading their technology and production. Some have suggested that more financial assistance should be made in upgrading the product design capability of local manufacturers to help transform local original equipment manufacturers (OEMs) to original design manufacturers (ODMs) in order to enhance Hong Kong industries' competitiveness.

4.5 Some individual inventors suggested that the PAG should not be restricted to first-time patent seekers and the funding ceiling should be increased to above \$100,000.

4.6 Taking into account the feedback received, we consider that the scheme structure and programme area of the ITF could be further refined and expanded in the following three possible areas with a view to improving Hong Kong industries' overall competitiveness -

- (a) enhancing technology transfer and commercialization of technology developed under the ITSP programme;
- (b) providing more support to local industries, such as funding the product development process; and
- (c) exploring how the profile of the PAG could be raised to attract more applications from individual inventors who have innovative ideas which could help contribute to the innovation and technology development in Hong Kong.

Commercialization and Technology Transfer

4.7 ITSP projects, if they are successful, will lend themselves to commercialization opportunities. We welcome these opportunities as they are the most convincing proof that the technologies developed are useful and commercially viable and relevant to the industry.

4.8 We have, however, observed that after project completion, some project investigators may not follow through the commercialization phase by transferring the technology to the industry. In some other cases, while the project investigators may be interested in commercializing their project deliverables, they could not find the channel and communicate the project results to interested industries.

4.9 We have been encouraging universities to step up their efforts in technology transfer, and we note that some universities have already set up Technology Transfer Offices to help transfer project deliverables to the industry. However, there is still room for further improvement and we consider that the following should be done -

- (a) to instill in project investigators the importance of commercialization so that their research efforts would not

have been wasted; and

- (b) to devise a system to enable the local industries to have better access to the research results and expertise available in Hong Kong.

4.10 For paragraph 4.9(a) above, we now only require project investigators to include a brief marketing plan in the ITSP project application and there is insufficient emphasis on the importance attached to such plan during both the application and implementation stage. We consider that project investigators should seriously think about the application area and commercialization potential of their project proposals at the project application stage. During the project implementation stage, in particular towards the latter part of the project period, project investigators should review their commercialization plans to see whether any adjustments should be made in the light of the progress of their research.

4.11 In order to give more weight to the commercialization potential of a project, we will -

- (a) require provision of a broad commercialization or business plan in the project applications, and the commercial viability of the commercialization/business plan would be taken into account in the project vetting process; and
- (b) require in the last six months or year the submission of a detailed plan for commercializing their project deliverables in order to ensure that project investigators would follow up with the commercialization or business plan as stated in the project proposal.

4.12 For paragraph 4.11(b) above, we need a system or platform whereby the results and expertise available in the local research community could be publicized. At present, some project investigators rely on their universities' Technology Transfer Offices (or equivalent) to find relevant industrial partners to materialize their commercialization plans. On the other hand, some project investigators make use of the TechMart operated by the Hong Kong Productivity Council to help market their research results. While all these are useful channels to disseminate research results to the industries, they are all project based and there is no comprehensive database which could identify and present the research

results and expertise available by sector or by subject area in Hong Kong. Such a database should be helpful to the industries as they can have access to the research resources available in Hong Kong. With the database, they can identify suitable partners to explore business opportunities more easily.

4.13 In this regard, six of the universities in Hong Kong have commissioned a study on the possibility of establishing a central research resource database on the expertise available in the local research community. We will -

- (a) monitor closely the development of the centre; and
- (b) provide assistance and facilitate the setting up of such centre, if appropriate.

4.14 However, the success of such centre would rely heavily on the input from the universities regarding the updating of information for putting into the database. In this connection, we will encourage the research community to maintain and update the database from time to time to avoid the database becoming obsolete.

Expanding the Programme Area

4.15 In exploring whether there is room for expanding the ITF to cover other areas, we notice that the Trade and Industry Department has already launched four funding schemes to support SMEs and we are mindful of the need to avoid duplication of efforts.

4.16 At present, we have already had a range of funding schemes addressing the different needs of different size of industrial establishments. For small and start up companies (fewer than 20 employees), the SERAP can provide direct financial assistance on a matching basis for developing technological start-ups. For SMEs (fewer than 100 employees in Hong Kong for manufacturing businesses and 50 for non-manufacturing businesses), the four SME funds could help SMEs raise capital, enhance human resources, expand overseas markets and enhance competitiveness. For large and well-established companies, the UICP can provide assistance on a matching basis for the companies to team up with local universities and undertake R & D activities.

4.17 In our contacts with the local industries, some have expressed the view that the existing funding schemes do not offer specific support in the area of product and component design and development for the local industries. They consider that this is an important area to improve the innovation and technology level of Hong Kong industries and enhance local industries' competitiveness in the global market.

4.18 At present, the focus of the ITF is more on the applied research and development of new technology and innovative process for commercial applications. As product and component design may not necessarily involve the deployment of new technology, only very few applications which relate to product and component design have been approved under the various ITF programmes.

4.19 When considering the introduction of a programme to support all product design and development activities, we have to balance the need for providing direct financial assistance to help industry and the need for maintaining a level playing field. To be consistent with the ambit of the ITF, we should target at those product design and development activities which contain an innovative element and could enhance the overall competitiveness of our industry.

4.20 Against this background, we plan to set up an innovative product development assistance programme under the ITF which aims to -

- (a) promote innovation in product design and development;
- (b) support the product and component design industry which could benefit other manufacturing industries;
- (c) upgrade the product design capability of the local manufacturers; and
- (d) help transform local OEMs to ODMs for improved competitiveness.

4.21 The new programme will only fund the development process, including the design, of a new product, but not the manufacturing and production process. Local companies, industry and trade associations, and consortia of companies would be eligible to apply. However, applicants need to demonstrate how their proposals and the final products could help enhance Hong Kong's competitive edge of the relevant industry.

4.22 As ITF is public money and the fund recipient would be a private company or a consortium of private companies, the form of funding support has to be in the form of matching grant, under which the applicant must contribute at least 50% of the total project cost. (This is in line with similar matching funding requirement under the UICP.) The mass production process of the commercial products will not be funded and the project deliverables should be in the form of pilot-production samples ready for production. As regards the funding ceiling, we consider that the maximum amount of funding support should not exceed \$5 million as this would already provide a reasonable size of funding for product development purposes. The grant would be awarded on a competitive basis.

4.23 In order to better assess the feasibility of this funding programme, it is considered that a pilot scheme should be implemented as a start so that we could review the cost-effectiveness and practicability of such a programme.

4.24 In selecting the type of products for pilot testing, we have adopted the following criteria -

- (a) the product and industry concerned must be of importance in Hong Kong;
- (b) Hong Kong must have good track record and capability in the development of the product concerned;
- (c) apart from the industry concerned, the scheme could produce positive knock-on effects on related industries; and
- (d) the scheme would result in enhancing Hong Kong's overall competitiveness.

4.25 Against the above criteria, we have selected consumer electronics products for the pilot scheme. In Hong Kong, the electronics industry is the largest merchandise export earner, which accounted for about 35% of Hong Kong's total exports in 2000. Hong Kong has been the largest world exporter of calculators, radios and telephone sets in monetary terms. Given consumer electronics products are one of the areas that could attract plenty of innovative ideas and use of new technology, they would be a suitable choice for the pilot scheme. In addition, Hong Kong has a very efficient production base of consumer

electronics products in the Pearl River Delta region and a well-established marketing channel for consumer electronics products worldwide.

4.26 Apart from the electronics industry, the success of the pilot scheme could also benefit other supporting industries and services, such as plastics, metals, printing and IT industries.

4.27 We intend to invite proposals for the pilot scheme of the innovative product development assistance programme before the end of this year.

Refining the Scheme Structure

4.28 There have been requests for providing more financial assistance to individuals who have innovative ideas and inventions that could benefit Hong Kong.

4.29 At present, we have already been providing such assistance under the Patent Application Grant (PAG). An applicant, either an individual or company inventor, who is a first-time patent seeker may be granted a maximum of \$100,000. The objective of the grant is to encourage local companies and individual inventors to capitalize on their intellectual work through patent registration.

4.30 We have reviewed the operation of the PAG to see whether the eligibility criteria and the funding ceiling should be adjusted as well as how the PAG could better fit in the overall programme structure of the ITF.

4.31 On eligibility criteria, the spirit of the PAG is to encourage inventors to make better use of patents to protect their inventions and gain the experience of how to apply for patents. Given the limited resources, we should focus our resources to support first-time patent seekers who have no prior experience in patent application and registration, rather than spreading the resources too thinly to fund those who have benefited from the PAG or who have been successful in obtaining patents before. Having regard to the spirit of the PAG and the financial implications, we consider that the existing criteria of limiting the scheme to first-time patent seekers should continue.

4.32 On funding ceiling, the existing maximum support of \$100,000 from the PAG is generally adequate for applications for patents at two to three places, depending on the country of application and

complexity of the subject invention. Popular countries and places for patent applications include the US, mainland China, Taiwan and Europe. The cost of applying for a patent in the US, for instance, may range from \$40,000 to \$80,000 whereas that for mainland China may range from \$20,000 to \$40,000. Given the PAG's support of 90% of the cost of patent application and registration, the \$100,000 funding ceiling is generally sufficient to cover the cost of making patent applications in the US and mainland. Raising the funding ceiling does not necessarily encourage more inventions, but may simply induce more applicants to apply for patents in countries that they do not really need to, since the marginal cost is low to them in view of the PAG's support of 90%. We therefore consider that the funding ceiling is now set at an appropriate level and should remain unchanged.

4.33 The PAG is not a standalone programme and is managed as an individual project under the GSP. Under this arrangement, individual applications for the PAG are processed by our implementation agents, namely the Hong Kong Productivity Council and the Hong Kong Institute of Biotechnology.

4.34 Since the launching of the grant in May 1998, we have received about 500 applications and some 200 applications were approved. More than 60% of the applications came from individual applicants, reflecting the popularity of the PAG to individual inventors. Among those 200 applications approved, 21 cases have turned into commercialized products. Since 2000, the number of applications received and approved have however started to drop.

4.35 The PAG is a worthwhile scheme which could help local inventors and contribute to the innovation and technology development in Hong Kong. In view of the recent decline in the number and quality of applications, and in order to attract more inventors to apply for the grant and to allow the industry to benefit more from the results of the invention, we will -

- (a) discuss with the TechMart operated by the Hong Kong Productivity Council to see how to better publicize the inventions of successful PAG cases in order to help them find more business opportunities; and
- (b) formally establish the scheme as a standalone programme, instead of an individual project, under the GSP to attach

greater importance, give a higher profile, and arouse more public interest in the programme.

B. Approach in Funding ITSP Projects

4.36 Since the start of the solicitation arrangement in November 2000, more than ten proposals submitted under the eight solicitation themes have been approved and there are 40 to 50 proposals being examined. With the establishment of ASTRI, there is, however, a need to review the arrangement in order to avoid duplication of efforts and optimize the use of resources.

4.37 In the past, we identified specific solicitation themes and invited applications under these themes. These themes focused on very specific subject areas which were identified through discussion with the relevant industries and the research community. With the ASTRI starting its operation, most of the work could be more appropriately transferred to the ASTRI in future and the Institute would identify and develop research direction focusing on very specific technology areas.

4.38 With the changing landscape in the research community in Hong Kong through the emergence of clusters of research activities in specific fields in recent years, the existing funding approach for ITSP may in due course not be as effective. We need to develop a new strategy to give ITF a much clearer focus that could help Hong Kong to build on her strengths that could enhance Hong Kong's overall competitiveness.

4.39 To make the best use of existing and potential research resources available to Hong Kong, we consider that a top-down approach in funding R&D activities should be adopted. On top of the solicitation arrangements for isolated themes, we may need to identify the key technology areas where Hong Kong is assessed to have the capability and potential to excel and compete with others.

4.40 In this regard, we have initially identified the following three areas for further exploration -

- (a) nanotechnology;
- (b) digital entertainment; and
- (c) integrated circuit design support centre.

Nanotechnology

4.41 Nanotechnology is a recent emerging area for scientists and has become a research main stream worldwide. In Hong Kong, we have been funding a number of projects related to nanotechnology through the RGC and the ITF. In the past two years, the Government already provided more than \$50 million to support basic and applied research projects in this technology area. However, researchers and research work are relatively scattered, and there is still some way to go before nanotechnology could bring about potential benefits to local industries.

4.42 In order to have a much sharper focus in research into the area of nanotechnology and to create an impact, we intend to modify the existing funding approach into one which would give us a better direction of what has to be done and what could be achieved in nanotechnology research. In this regard, we will invite proposals from the local universities on creating a technology roadmap of nanotechnology development in Hong Kong.

Digital Entertainment

4.43 Digital entertainment in general refers to entertainment that involves the use of digital technologies such as computer graphics and interactive techniques. The industry is growing fast in the world, and it is becoming popular in Hong Kong. Although we do not have ready figures on the size of the digital entertainment industry in Hong Kong, according to the Hong Kong Productivity Council, there are at present around 30 computer graphics production houses in Hong Kong with some 600 animators. And according to the Census and Statistics Department, there were 437 game centres in Hong Kong in 1999, estimated to have contributed to 0.03% of the GDP.

4.44 Many consider that Hong Kong have potentials in the development of digital entertainment. However, it is necessary to work out the necessary building blocks for the development of digital entertainment in Hong Kong and consider how the Government might assist in technology development in the sector. The Information Technology and Broadcasting Bureau is looking into the overall development and ITF will consider a solicitation theme to support projects which contribute to such development.

Integrated Circuit Design Support Centre

4.45 The semiconductor industry has been the driving force of economic activities worldwide. Multinational companies now dominate the market in standard products (such as microprocessors and memories), but the trend is to develop application-specific integrated circuit chips due to cost, space, and power requirement considerations. The worldwide semiconductor sales in June 2001 was US\$11.6 billion, with US\$3.18 billion in the Asia Pacific region (excluding Japan). The Asia Pacific region indicates large growth potential and the expected future growth is in the mainland China market.

4.46 Custom-designed chips are often produced by independent "fab-less" design houses. Some design houses have been established in Hong Kong to serve the customers in mainland to take advantage of Hong Kong's more advanced infrastructure and better legal system on IP protection. To support the design phase, it requires sophisticated electronic design automation tools. These tools are expensive and require extensive training to use properly. The experience in mainland China (in Shanghai) is to establish a design support centre so that it could acquire the necessary design tools for shared used by the design houses.

4.47 In the Pearl River Delta, such design support centre has yet to be established to serve the electronics companies thereat. Given Hong Kong's well developed infrastructure and culture on IP protection, we will examine the feasibility of establishing such a centre in Hong Kong and how the ITF should finance such establishment.

C. Management and Administration of ITF

4.48 We have been operating a stringent vetting and monitoring mechanism for ITF projects. However, some of our major fund recipients, notably the universities, are of the view that there could be many unforeseen circumstances during the R&D process and the administrative procedures of the ITF should be streamlined as far as possible to allow more flexibility in resource deployment.

4.49 While we note the concern of the fund recipients, as the fund controller, the ITC needs to be held accountable to the public in ensuring that the ITF is spent in accordance with its mission and objectives. To streamline the administrative procedures as far as practicable without compromising public accountability, we consider that we first need to

place more emphasis on our vetting, technical monitoring and auditing process. In this regard, we will implement the following measures -

- (a) tightening the vetting procedures and focusing more on the technical monitoring of ITF projects;
- (b) strengthening the monitoring of the duration of ITF projects in order to ensure that ITF projects are completed in a timely manner before the technology developed has become obsolete;
- (c) allowing more flexibility for fund recipients in deploying ITF project funds on the basis that they are spent exclusively for the ITF projects approved and within the overall approved budget; and
- (d) conducting audit inspection for both completed projects and on-going projects to identify irregularities and recover mis-spent funds.

4.50 On paragraph 4.49(a) above, the Commission has been strengthening its technical capability through the recruitment of more technical experts. Over the past two years, we have successfully recruited four to five technologists for various fields, including information technology, biotechnology and other new technology areas. We are in the process of recruiting a biotechnology director, and we have also obtained advice from overseas experts. These experts will enable the Commission to vet the ITF applications and to monitor the progress of approved projects in the most vigorous manner. We will continue to identify and recruit additional technologists to strengthen the team if appropriate.

4.51 We will also put more emphasis on project vetting and monitoring in order to ensure that only quality projects are approved and they are satisfactorily completed. On project vetting, despite the strengthening of our technical team, we are aware that some project proposals are still beyond the knowledge of our in-house experts. In order to formulate a detailed assessment, we have developed a system of external reviews and would send those project proposals which are beyond our knowledge to relevant experts in the field for examination.

4.52 On technical monitoring of on-going projects, we will continue to conduct regular project visits to the ITF projects in order to ensure that the milestones and deliverables as described in the project

proposals are fully met. For non-performing projects or those projects which have not shown satisfactory progress, we will not hesitate to terminate funding for these projects in order to focus our resources on projects which have a better prospect of success.

4.53 As compared with other prominent research funding agencies, such as NSF, DIH and DARPA of the United States, our project vetting and monitoring process is on par with the practice adopted by these agencies.

4.54 For ITSP projects, the project cycle ranges from 12 months to 38 months, with an average cycle of 25 months. As technology development advances at a tremendously fast pace, we have reviewed the duration of projects, and come to the view that for the project results to serve useful purpose to the industries and not become obsolete by the time they are available, in future, we will as a norm allow a maximum period of 24 months for project implementation. Projects which require more than 24 months for completion will need to be justified on a case by case basis.

4.55 With a more stringent vetting and monitoring system, we will be able to streamline the administrative procedures by allowing major fund recipients, i.e. universities, more flexibility in deploying ITF project funds on the basis that all the funds are used exclusively for the project. This would reduce the amount of administrative work, such as number of change requests submitted by universities, as well as to save the time required in processing such change requests. In this way, project investigators could better focus their efforts in conducting their research projects. In addition, we have requested the universities to take on the responsibility for assisting in the administration and financial management of ITF projects by ensuring the timely submission of reports and accounts.

4.56 To ensure that ITF project funds are spent exclusively for the projects, we have been implementing an audit inspection system for completed ITF projects to identify irregularities and recover any mis-spent funds to the ITF. To strengthen the existing system, we will extend the audit inspection requirement to on-going projects so that irregularities could be identified and rectified at an early stage. Separately, we will initiate audit inspection on suspected cases from time to time. This may either be conducted by external auditors or by our in-house auditors, depending on the availability of resources.

D. Project Evaluation

4.57 At present, we evaluate completed ITF projects against the set milestones and deliverables as laid down in the approved project proposals. We are considering the feasibility of setting up a project evaluation mechanism, and have made reference to the NSF, NIH and DARPA of the United States. We find that these agencies do not have any established evaluation mechanism because it is very difficult to set objective criteria, both qualitative and quantitative, for such purpose. One of the arguments of not having post-project evaluation for these funding programmes is that all funded projects have gone through a vigorous vetting process and there is already adequate guarantee regarding the quality of the projects approved. For researches into new technology area, it is understandable that not all approved projects will lead to fruitful results. Hence the value of having an elaborated post-project evaluation mechanism is limited as the failure of a project may be attributed to a number of factors and may not offer any particular lessons to be learnt.

4.58 However, given the size of the ITF, and the need for public accountability, we are of the view that we should develop an evaluation system for the ITF so that we could have a useful tool to assess the cost effectiveness of the Fund and identify areas for further improvements.

4.59 The evaluation framework should be a three-tier system targeting at individual projects, the specific ITF programme as a whole, and impact studies.

4.60 At project level, we will introduce a two-stage assessment scheme for individual ITF projects. The first relates to the successful completion of the project (milestones and deliverables). The second relates to the assessment of the "impact" of the project, in the form of a one-rating assessment. At programme level, we will identify a number of parameters which could serve as performance indicators. As the ITF was formally launched in November 1999, it is logical to use the figures for the year 2000 as the baseline figures, and we will compare the figures for subsequent years with the baseline figures to assess the performance of the various ITF programmes over time.

4.61 As for the impacts of the ITF on the development of particular sectors, such as information technology, biotechnology, etc, we would carry out assessment on a sector and selective basis. We intend to identify one or two sectors for the conduct of such impact studies as a start.

Initially, we consider that it is more appropriate to start with the cluster of projects in our solicitation themes. Given the solicitation arrangement was introduced in November 2000 and the duration of most ITF projects is between two to three years, we plan to conduct the first impact study in 2003.

4.62 Details of the project evaluation framework are at **Appendix C**.

Chapter 5 - Conclusion

5.1 In driving Hong Kong to become a world-class, knowledge-based economy, we need to foster an innovation and technology culture in the community, and promote technological entrepreneurship. The ITF is an important and powerful tool to achieve this objective and we need to make the best use of this tool.

5.2 During the review on ITF, we have taken a critical look at the existing operation of the Fund so that areas for improvements could be identified and appropriate measures could be devised.

5.3 After the launch of the ITF for some two years, we start to see some initial results and positive changes in the research community, e.g. greater awareness of commercialization and technology transfer as demonstrated by greater private sector contribution to R&D activities. (The private sector contribution to R&D activities has increased from \$1 for every \$6.4 from the ITF in 2000 to \$1 for every \$4.45 from the ITF in 2001.)

5.4 With the implementation of the various measures identified in Chapter 4 to improve the operation of the ITF, we hope that the various ITF programmes could fully meet its mission with a view to -

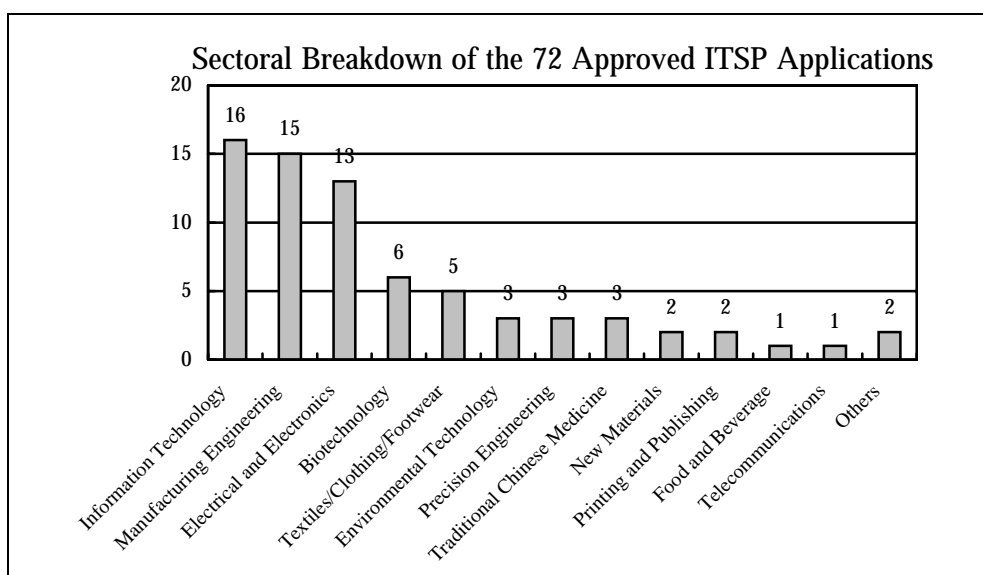
- (a) enhancing the overall innovative and technological capability of Hong Kong;
- (b) strengthening the competitiveness of Hong Kong's industries; and
- (c) helping creating knowledge-based, high value-added industries.

5.5 The review of the ITF is an on-going process. We will continue to monitor the operation of the ITF and the results of the implementation of the various improvement measures.

Analysis of the Approved Projects by Programmes

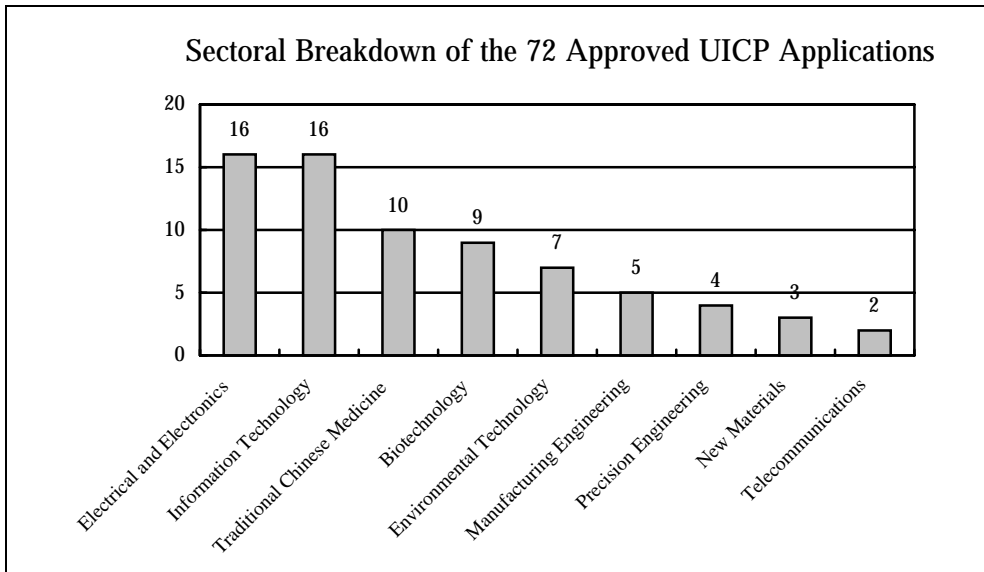
(a) Innovation and Technology Support Programme (ITSP)

Applications are normally invited twice a year. 8 invitations for applications (including 4 tranches of normal applications and 4 rounds of solicitation) were made and 466 applications received since the launching of ITF in November 1999. The sectoral breakdown of the 72 approved applications is shown below:



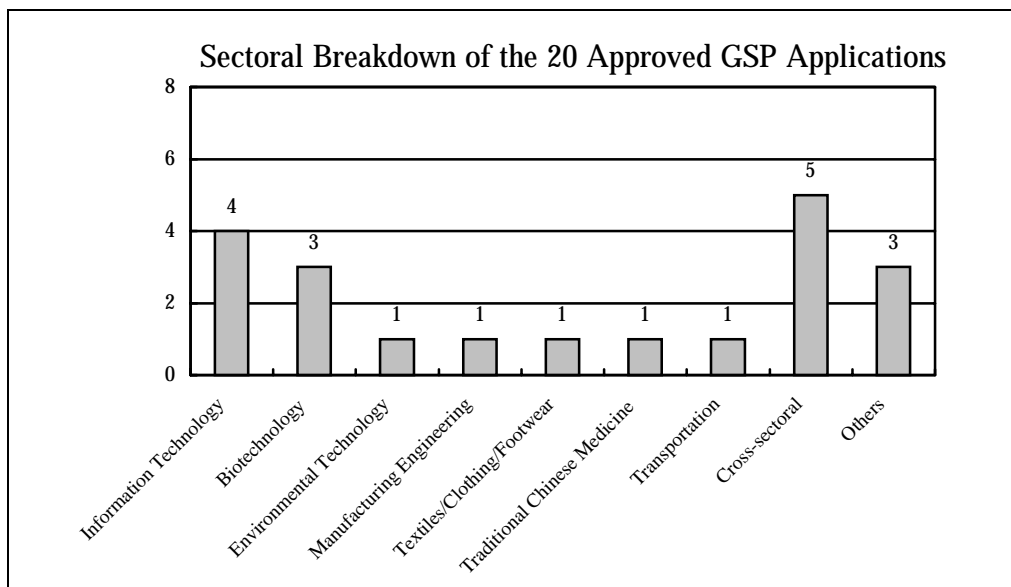
(b) University-Industry Collaboration Programme (UICP)

This Programme is open for applications all year round. 109 applications have been received and 72 approved. The sectoral breakdown of the 72 approved applications is shown below:



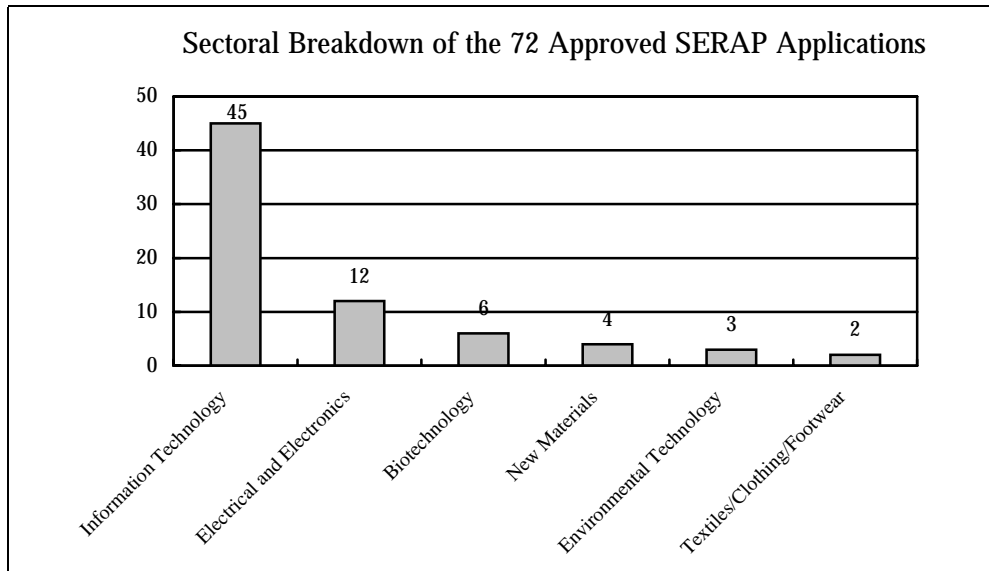
(c) General Support Programme (GSP)

Applications are normally invited twice a year. 4 tranches of applications were invited and 173 applications received since the launching of ITF in November 1999. The sectoral breakdown of the 20 approved applications is shown below:



(d) Small Entrepreneur Research Assistance Programme (SERAP)

This Programme is open for applications all year round. 390 applications have been received and 72 approved. The sectoral breakdown of the 72 approved applications is shown below:



Appendix B

List of Solicitation Themes

(issued between November 2000 and October 2001)

1. Applied Genomics
2. Advanced Surface Coating Technologies
3. Development and Application of Biosensor Technologies
4. Electronic Commerce Using the Internet
5. Industrial Applications of Micro-Electro-Mechanical Systems
6. Innovative Product Development for Textiles, Clothing and Footwear Industry
7. Secure Internet Communications over a Wireless Network
8. Transport Logistics

Project Evaluation Framework

A. ITSP

In assessing the performance of individual ITSP projects, a two-stage assessment scheme will be adopted. The first relates to successful completion as measured against the set milestones and deliverables as described in the approved project proposals. The second relates to the assessment of the "impact" of the project. This involves a one-rating assessment of the "impact" or "practical usefulness" of the project. In making such assessment, we will make reference, inter alia, the following factors -

- (a) whether the new technology developed is recognized as a major breakthrough by the authority in the subject field;
- (b) whether the new technology or product has been successfully commercialized; and
- (c) whether the new technology/infrastructure supports major industrial development or is widely adopted by the relevant industry in their business processes.

2. At programme level, we have identified the following parameters in assessing the effectiveness of the ITSP -

- (a) private sector contribution in R&D;
- (b) human capital deployment, such as number of researchers involved, number of researchers trained and employed, etc.;
- (c) number of patents/copyrights filed or registered;
- (d) technologies, products and services in applicable or commercializable form;
- (e) technology transfer activities, including industrial consultancy; and

- (f) new ventures, new business model, follow-on development or investment.

3. The figures for the year 2000 would be chosen as the baseline figures, and we will compare the figures for subsequent years with the baseline figures to assess the performance of ITSP over time.

B. UICP

4. The evaluation framework for projects supported by the UICP is very much the same as that for the ITSP. However, the impact of individual UICP projects is more a matter for the companies concerned to judge. At the programme level, the same set of parameters will be adopted in assessing the effectiveness of the UICP.

C. GSP

5. As the GSP scheme is basically a supporting programme, the parameters adopted for evaluation are -

- (a) the number of projects broken down by nature (e.g. scientific vs general, seminars, conferences, surveys);
- (b) the profile of the applicants (universities, trade associations, public sector bodies such as the HKPC, etc.); and
- (c) the number of direct beneficiaries

D. SERAP

6. The effectiveness of the SERAP would be assessed on the following factors -

- (a) the number of approved projects which are able to proceed to Phase II;
- (b) the number of approved projects which are able to sustain in the next three years after completion;
- (c) the number of jobs created or sustained due to SERAP funding;

- (d) the additional corporate revenue generated as a result of SERAP assistance;
- (e) the amount of follow-on investment generated as a result of SERAP assistance; and
- (f) the income due to ITF.