For discussion on 24 February 2000

Legislative Council Panel on Manpower
Manpower Training in the Information Technology Sector

Purpose

This paper informs Members about the Administration's strategy and plan to meet the manpower needs of the information technology (IT) industry.

Manpower Training in the Information Technology Sector

2. With the rapid development of electronic commerce and the application of IT, there is an increasing demand for trained IT manpower by local companies, whether big or small. In view of this, the Education and Manpower Bureau (EMB) places much emphasis on the provision of IT training and retraining. Our objective in IT manpower training is to ensure there are sufficient training opportunities to meet the needs of the industry so that Hong Kong will have sufficient well-trained IT manpower to enhance the competitiveness of different industries.

3. The Vocational Training Council (VTC) conducts IT manpower survey biennially to identify the needs of the industry so that suitable training can be provided. The last survey was conducted in 1998 and another survey will be carried out this year. In addition, EMB commissioned a consultancy study last year on the manpower and training needs of the IT sector to facilitate the formulation of appropriate manpower and training strategies. For details, please refer to paragraphs 12 and 13 below.

Existing Training Opportunities

4. At present, various institutions and training bodies are providing IT training programmes at different levels. IT-related courses offered by University Grants Committee (UGC)-funded institutions fall mainly into two categories. The first category covers computer science and

information technology, such as Bachelor of Science degree (Honours) courses in Computer Studies, Computer Science and Information Technology. The second category covers engineering and technology, such as Bachelor of Engineering degree (Honours) courses in Information Engineering, Computer Engineering and Electronic Engineering. These courses range from sub-degree to postgraduate levels.

5. Currently, a total of about 19 000 IT-related training places are provided by the UGC-funded institutions. Last year, more than 6 000 students graduated in these courses. We estimate that the number of graduates in these courses for the academic years of 1999/2000, 2000/01, 2001/02 will be about 6 800, 6 900 and 6 400 respectively.

6. Apart from the above courses, tertiary institutions also provide IT-related programmes at various levels on a self-financing basis to meet market needs. For example, the continuing and professional education units of a number of the tertiary institutions provide IT-related degree courses in collaboration with overseas universities, such as the Bachelor of Business Systems Support offered jointly by the School of Continuing Studies of the Chinese University of Hong Kong and a university in Australia. The courses provided by the tertiary institutions are kept in step with market needs. For instance, two short courses, namely "Business Research on Internet" and "Data Security and its Application in E-commerce", are offered by the School of Professional Education and Executive Development of the Hong Kong Polytechnic University to tie in with the rapid development of electronic commerce in Hong Kong. In the last academic year, a total of about 19 000 persons pursued studies on IT-related subjects in the continuing and professional education units of various UGC-funded institutions. This represents an increase of nearly 6 000 persons as compared with the figure of the preceding year.

7. Besides, IT is also the subject of one of the three projects to be developed into areas of excellence by our higher education institutions. The UGC will provide an amount of $51 million to the University of Hong Kong, the Chinese University of Hong Kong and the Hong Kong University of Science and Technology in support of their joint project to promote IT development, including research and manpower training.

8. VTC currently provides some 7 000 training places for IT-related courses at senior technician, technician and craftsman levels through its Hong Kong Institute of Vocational Education. These courses cover computing and mathematics; electrical and electronic engineering, etc. Examples of such courses include Higher Diploma in Software Engineering and Certificate in Electronics. VTC's Information Technology Training and Development Centre also provides upgrade courses for in-service personnel as well as conversion courses for non-computer university graduates in order to assist them in joining the IT profession. These courses cover a wide range of topics, including Internet, Intranet, electronic commerce, data bank, software application, programming etc. In the 1998/99 financial year, the Centre provided nearly 8 000 training places. In the 1999/2000 financial year, its training capacity has been increased by more than 1 800 training places to some 10 000 places. In view of the robust development in electronic commerce and Internet, the Centre plans to re-deploy more resources to such courses, by providing an additional 1 600 training places in these areas in the next financial year to cope with the market demand.

9. The Employees Retraining Board (ERB) provides IT-related courses at the basic levels. The major categories of courses include Chinese computer operation, computer operation, Chinese and English word processing, EXCEL, keyboard operation and computer basics. In the current year, the ERB plans to provide some 44 000 training places in IT-related courses, which is close to half of the ERB's total retraining places. In the last financial year, over 33 000 trainees completed ERB's computer-related courses.

10. We will work closely with various training providers with a view to providing sufficient training opportunities that are relevant to the needs of the industry. For example, we have recently set up a new IT Assistant Course with active input from the industry and training bodies. The aim is to equip trainees with the necessary skills to take up jobs at the junior assistant level in the information technology field.

IT-related Job Vacancies

11. In 1998, the Labour Department (LD) handled 14 678

vacancies which required computer skills on the part of the applicants. These vacancies accounted for 10.6% of the total vacancies handled by LD during that year. In 1999, the number of such vacancies rose by 5.1% to 15 425, amounting to 10.8% of the total vacancies handled during that year.

Consultancy study on the manpower and training needs of the sector

12. The government commissioned a consultancy study on the manpower and training needs of the IT sector last year. The aim of the consultancy study is to identify the manpower and training needs of the IT sector and to recommend appropriate manpower and training measures in this connection. The consultant has made a series of recommendations on improving the range and relevance of training and education, timeliness and flexibility of training and education and linking demand (employers) and supply (trainers and educators). The consultant has also undertaken a forecast of the demand and supply of IT manpower for the next ten years. The executive summary of the consultancy study is at the Annex.

13. We will circulate the findings and recommendations of the consultancy report to relevant Government bureaux and departments, universities, training bodies and relevant organisations so that appropriate follow-up actions would be taken to facilitate the formulation of appropriate IT manpower training strategy.

Education and Manpower Bureau
February 2000

Appendix

Executive Summary
IT Manpower and Training Needs Study

1. Introduction

PricewaterhouseCoopers were commissioned to undertake a study to identify the manpower and training needs and recommend a co-ordinated manpower and training strategy for the IT industry. The project commenced in January 1999.

2. Methodology

The project was conducted over five major phases. During phase one the project approach was confirmed, case study economies selected, stakeholder interview candidates agreed and project plans established to guide the team on subsequent tasks.

During phases two and three, qualitative and quantitative data was gathered about the local supply and demand of manpower and the supply and demand of training and education. More than 60 individuals and groups were interviewed. These individuals and groups represented six major stakeholder groups - companies employing IT manpower; IT companies; the higher education sector; vocational training providers; industry advisory groups; and Government Departments and Bureaux. Six questionnaire templates were developed to use with each type of stakeholder. The targeted questions covered several major categories such as organisational characteristics; the wider IT environment; IT manpower within the company; training requirements and policies, and views about future IT manpower and training studies. Thirty-six companies participated in the interview programme. These companies covered nine major industry sectors.

The major activities in phase four (conducted in parallel with phases two and three) concentrated on gathering international information about IT manpower, training and education issues in ten overseas economies. The ten overseas economies studied were Singapore, India, Ireland, Taiwan, Australia, Sweden, Canada, Israel, UK and USA.

The final phase focussed on preparing the final report and concluding the project.

The scope of the study did not include the technology training needs of other professional groups – it focussed on the supply and demand and training needs of IT practitioners. The study therefore focussed on central IT activities such as hardware

providing and support services; software design, development and providing services; data management; system analysis and design; and IT research, consultancy and training. The study covered the issues and needs of specific IT companies, as well as IT departments within industry organisations such as banks, airlines, hotels and manufacturers.

3. Key findings

3.1. International comparisons

There was considerable variation in the state of development of the IT industry in each of the overseas economies examined. Some case study economies have clearly articulated and targeted IT strategies and specific strategies for developing their IT manpower. On the other hand, some case study economies relied on generic strategies to develop manpower or industry. The strategies employed by other jurisdictions include:

- Development of State and National Information Technology and Telecommunications Plans identifying strategic vision and future focus;
- Government funding or research and infrastructure; and
- Creation of Centres of Excellence.

Three key themes were identified which underpin policy development in the IT sector. Firstly, policy development for IT is integrated with telecommunications and media; secondly overarching frameworks to develop manpower have been put in place; and thirdly, there is evidence of all comparator jurisdictions implementing strategies to develop the domestic IT industry.

There were many consistent features in all case study economies:

- all are experiencing some level of shortfall in IT manpower – Hong Kong is not unique;
- the demand for IT manpower is growing quickly;
- there are a number of consistent "hot skills" that are in high demand;
- companies are demanding technical IT expertise along with industry knowledge (such as banking, manufacturing or hospitality);
- IT manpower command high salaries; and
- IT manpower is very mobile.

Strategies introduced by overseas economies to attract IT manpower, include improving access to information about the IT industry; providing incentives

for IT employees and employers; and encouraging overseas nationals to return. Some of these strategies are applicable in Hong Kong.

With respect to education and training, the trends are for shorter and more intensive training; upgrading and re-skilling; developing accreditation systems to recognise a broader range of training and education activities; focusing on core business competencies alongside technical skills; and building stronger links between trainers and employers. Some economies are introducing systemic proposals such as introducing IT education at kindergarten level.

Each case study economy used a variety of methods to forecast manpower and training needs. Some economies use a structured approach to data gathering, other economies have adopted market based and ad hoc project approaches to determining manpower needs. Manpower forecasting methods used overseas include regular surveys of individuals and companies; specific issue surveys (e.g. HR issues); periodic research; and application of generic manpower studies.

3.2. IT manpower in Hong Kong

There are a number of headline factors which affect the need for IT manpower, these are the trends in both the IT industry, and industry more broadly; government policies; economic indicators; and employer demands. In order to estimate the number and skill requirements of IT manpower that are needed to satisfy local demand, these factors need to be understood.

Understanding local trends and developments sets the context for determining how many IT practitioners are needed and what types of skills they need. However, it is also necessary to understand the needs of employers. Employers in Hong Kong identified a number of specific shortfalls in IT manpower. Employers are demanding IT professionals who are capable of managing the business aspects of IT, for example, project and contract management; business analysis and sales. Employers identified a shortfall in the availability of technical experts in the areas of networking; and programming legacy or proprietary systems. Importantly, employers recognise the need for IT practitioners to have technical, business and interpersonal skills.

To develop Hong Kong's position in the IT industry, a number of quantity and quality issues need to be addressed. In particular, IT practitioners need to have a more rounded approach to work, that is, having technical expertise along with an understanding of how technology impacts on business. IT practitioners also need to combine technical skills with interpersonal and

generic workskills; and IT practitioners also need new skills to tackle emerging priorities.

3.3. Training and education in the IT industry in Hong Kong

The current training and education system comprise many parties including vocational training institutions, higher education institutions, continuing and professional education institutions, commercial training providers, industry/advisory/practitioner organisations and product vendors. Each of these parties makes a significant contribution to preparing new graduates and developing the skills of existing manpower. These education and training providers offer qualifications including:

- sub-degree or vocational qualifications;
- undergraduate and postgraduate qualifications; and
- completion or application certificates.

The key issues that emerged from discussions with stakeholders in the IT industry were around four key themes. Firstly, some stakeholders were concerned about the range and relevance of the training programmes. Secondly, there was some concern about the quality of programmes, thirdly, some stakeholders considered that the timeliness and flexibility of programmes was inadequate. Finally, concern was expressed about inadequate linkages between the training and education providers and industry employers.

There are a number of areas for improvement in the training and education area. These are summarised against the themes of range and relevance; timeliness and flexibility; and linking demand and supply.

To improve range and relevance the following areas need to be addressed:

- basing training and education on a modular and articulated framework which connects training and education components for IT practitioners;
- promotion of life-long learning;
- promotion of conversion programmes;
- promotion of the value of training and education to employers;
- investigation of the benefits of IT practitioner registration or accreditation; and
- rewarding employers for their training investments.

To improve the timeliness and flexibility of training, action will be required in the following areas:

- collecting industry trends and ensuring all participants in the industry share this knowledge;
- gearing the curriculum development process for rapid change; and
- expanding flexible education and training delivery modes.

Building more effective links between demand and supply require the following actions:

- enabling a mechanism to facilitate the linkage of employers and training providers;
- Advisory Committees of educational institutions be empowered to provide timely and detailed advice; and
- conducting annual information forums.

The project brief required an assessment of the capacity of Hong Kong to become a regional training centre. Our view is that Hong Kong is not in a position to develop as a regional training centre in the short to medium term.

Although some visionary developments are occurring in the IT industry in Hong Kong, it will be difficult for Hong Kong to overcome the high cost of living and training (even if the arrangement was "virtual"), the limited co-ordination between current training and education providers; the 12-18 month lag in implementation of IT trends and the forecast inability for Hong Kong to meet its own IT manpower and training needs.

3.4. IT manpower forecasting

To facilitate Hong Kong's development into a regional IT leader, it is essential that IT manpower and training needs are well-understood and positive actions taken to develop manpower. The existing strategy for understanding IT manpower is co-ordinated by the Vocational Training Council (VTC). They conduct a survey every two years of a stratified sample of companies operating within 9 industry areas. The current approach provides a solid framework for understanding IT manpower needs, however, it does not effectively capture needs associated with emerging technologies, an issue compounded by the fact that the IT industry is developing so rapidly.

The existing manpower forecasting approach does not adequately capture information about future IT industry demands. The approach taken by the VTC was to ask employers about their perceptions of future demand. Employers consistently indicated that they were not confident predicting developments past a two-year time frame. Alternative methods are needed to capture potential developments these include an active programme of

gathering and sharing information between the suppliers and employers of IT personnel.

A forecasting approach was developed which incorporates quantitative and qualitative data elements. The proposed forecasting approach continues to use the VTC bi-annual survey, but strengthens forecasting by adding more robust data on industry trends and policy impacts.

The forecasting method uses the results of the bi-annual survey as base information. To this, the impact of IT trends and government policies are applied. For each IT trend and government policy, we identified whether it would have a positive, neutral or negative effect on the nine existing categories of IT manpower. We added these impacts, to predict the extent of increase (or decrease) in manpower that would result from these collective impacts.

Manpower forecasts must be regarded with caution, as they are only able to estimate future demand in relation to what is known of the past, present and the future. The IT industry, however, is one where an undersupply is more harmful than an oversupply. With an undersupply, there will be substantial pressures on salaries, and tremendous competition amongst companies for limited manpower resources. An oversupply, given the potential for self-employment, could result in greater entrepreneurship and a rapid development in small IT companies able to provide services at excellent value rates.

3.5. Current manpower shortfall

In 1998, the VTC estimated 44,847 IT professionals worked in Hong Kong. At that time, the demand was for 48,710 IT professionals – a shortfall of 3,863.

We calculated two sets of projections – low end projections which conservatively estimate the future demand for IT professionals, and high end projections which make a much more radical prediction about the future demand. Using low and high end estimates, we calculated the demand for IT professionals until the year 2010. At the low end, in the year 2000 demand will be 57,000, and this will grow to 85,000 by the year 2005, and 130,000 by the year 2010. Using the high end estimates, the demand for IT professionals will grow from more than 61,000 in the year 2000 to 112,000 in 2005 and 213,000 by the year 2010.

The two major categories of IT manpower are degree graduates and sub-degree graduates. Based on the supply information currently available, and assuming the maintenance of this level of supply, there is expected to be a

considerable gap between the supply of IT manpower and the demand for IT manpower.

The current gap for degree graduates is estimated at between 1,700 and 4,000 depending on whether low or high end estimates are used. By the year 2005, the gap will be between 370 – 14,000. By the year 2010, the gap will be between 7,000 and 50,000. Clearly the estimates become more inaccurate the longer the projection timeframe. The most difficult projections to interpret are those for the year 2005. The low estimate suggests that past increases in students has virtually satisfied demand. As the demand increase, the effect of the past increases will diminish. At the high end, the demand gap reflects a situation where past increases in students has never been enough to meet the demand and the gap has escalated dramatically. This effect is multiplied because supply figures have been held constant whereas there is likely to be an increase in supply from both government funded and private training programmes.

A basic understanding of the types of new graduates required will help the education sector to gear up to meet needs. However, it is also important to recognise that there will be an increase in demand for people who are experienced. Based on IT industry trends and government policies, the greatest growth is expected in the areas of "Consultancy and Specialist" practitioners and "IT Management". The predicted growth in demand for these two groups is 14% and 12% per year respectively. The lowest level of growth is expected for computer operators at 5% per year.

4. Recommendations - Strategy for addressing IT manpower gaps

The IT Manpower Strategy is focussed around five key areas: quantity of manpower; range and relevance of training and education; timelines and flexibility of training and education; linking demand (employers) and supply (trainers and educators); and the future manpower forecasting method. Actions will be required of a number of participants in the IT industry, including the HKSAR Government, universities, vocational training providers, and IT industry professional and advisory groups. Importantly, however, these activities need to be co-ordinated, and mechanisms developed to ensure that all parties are working in the same direction to improve both the quantity and quality of Hong Kong's IT manpower.

4.1. Quantity

Our key recommendation is that the HKSAR Government should increase the output of degree holders to meet low end projections. To achieve this a

number of short term and long term measures will be needed. The private sector will also be a significant player in providing additional training and education programmes for IT practitioners.

Short term measures

Universities need to reduce the time it takes to fulfil degree requirements, and Hong Kong residents who have recently completed their studies overseas (and experienced manpower) should be encouraged to return to Hong Kong.

Long term measures

Intake for IT degrees for the 2000, 2001 and 2002 academic years will need to be increased to respond to an anticipated shortfall. IT sub-degrees programmes will also need to be increased. Both the government and private sectors should be encouraged to increase student intake.

4.2. Timeliness and flexibility of IT training and education

Training and education programmes need to be timely and flexible because the IT industry is particularly dynamic.

Hong Kong is not a leader in IT, and currently selects and implements developments occurring elsewhere. Therefore it is essential that Hong Kong develop mechanisms that gather, interpret and apply information about international developments. Each training provider undertakes these activities to a greater or lesser degree, however we recommend introducing (or enhancing) a mechanism to gather and communicate this information to all relevant parties.

Education and training providers in Hong Kong will also need to use computer technology to ensure ready access to training and gear their curriculum development processes for rapid change. Education and training providers, along with IT industry professional and advisory bodies will need to encourage a life-long learning approach to acquiring skills and knowledge.

4.3. Range and relevance of IT training and education

IT education and training programmes need to change at a rapid pace because of the dynamic nature of the IT industry. To respond to this need for rapid change, actions can be taken to ensure university and vocational provider advisory committees are providing relevant, value added information about IT curricula; introduce bridging courses and articulating business and IT courses; accredit IT practitioners to encourage continual skill upgrading; establish

mechanisms to communicate information about skill gaps; team local training and education institutions with overseas providers; reward employers for their investment in training and; encourage employers to maintain a well skilled workforce.

4.4. Linking supply (educators and trainers) with demand (employers)

A significant effort needs to be made to bring together the employers who have a demand for IT manpower and the trainers and educators who develop and support people for IT roles. A key recommendation which will provide this link is an IT Manpower Forum. This Forum does not need to be separately established - an existing advisory group through a sub-committee could assume its functions. The role of the Forum is to channel information from the demand side of the manpower equation to the supply side. This could be achieved through seminars, publicity campaigns or industry conferences.

4.5. Future IT manpower, training and education forecasting

The current VTC led mechanism to establish IT manpower needs provides a useful starting point for future manpower forecasting. The biennial stocktake should continue and job categories be refined and agreed with the sector. However, the stocktake on its own does not capture information about potential developments within the IT industry. The Manpower Forum proposed above would take responsibility for outlining future developments and assessing the degree to which these are likely to effect all the relevant staff groupings.

4.6. HKSAR IT Manpower Forum

A key to the success of the IT Manpower Strategy is the degree to which IT training and education providers understand the needs of employers. The key mechanism proposed to achieve this connection is an IT Manpower Forum. This proposal generated considerable debate as major stakeholders were concerned about the unnecessary introduction of bureaucracy where market mechanisms would be preferred.

There are a number of ways in which the functions proposed for this Forum could be carried out. For example, the Forum could be established as an independent group. Alternatively, an existing IT industry committee or group could subsume the Forum. Different groups could undertake some of the functions.

Regardless of the exact mechanism, it is essential, if Hong Kong wants to achieve the status of regional leader in the IT industry, government measures will need to be applied to assist the market.

5. Conclusions

In order to achieve the goal of being a leader in the IT industry, Hong Kong will need to increase the supply of IT practitioners, and improve the training and education offered to IT practitioners, particularly in terms of the range and relevance and timeliness and flexibility of training.

To achieve this, the suppliers of IT manpower (training and education providers) and those requiring IT manpower (employers) need opportunities to share information, understand manpower issues and plan to rapidly and continually develop the IT manpower resources of Hong Kong.