



**INFO-COMMUNICATIONS DEVELOPMENT AUTHORITY OF
SINGAPORE**

**PUBLIC CONSULTATION ON PROPOSED
MANPOWER DEVELOPMENT IMPLEMENTATION STRATEGIES
FOR INFOCOMM PROFESSIONALS IN SINGAPORE**

ISSUED ON 3 MAY 2007

PROPOSED MANPOWER DEVELOPMENT IMPLEMENTATION STRATEGIES FOR INFOCOMM PROFESSIONALS IN SINGAPORE

PART 1 - OBJECTIVE OF THIS CONSULTATION PAPER

1. In July 2006, IDA unveiled Singapore's 10-year masterplan for the infocomm industry, Intelligent Nation 2015 (iN2015). Led by IDA, iN2015 was a multi-agency effort that was a result of private, public and people sector co-creation. One key area of the iN2015 masterplan was the Manpower Chapter developed by the iN2015 Infocomm Competency Council. The Manpower Chapter put forth its vision for Singapore and key infocomm manpower targets, as well as recommendations on how these targets can be met by 2015.
2. Moving forward, IDA aims to operationalise the recommendations made in the iN2015 Manpower Chapter. Therefore the objective of this paper is to consult the industry on IDA's implementation strategies and approaches to be taken, so as to ensure that we meet our infocomm manpower targets.

PART 2 - OVERVIEW OF THE iN2015'S VISION FOR SINGAPORE

3. The acceleration of infocomm technology advances has created strong, competitive pressures on economies and companies. This has also generated immense growth opportunities for economies and companies who are able to differentiate themselves from the competition. The iN2015 Manpower Chapter postulated that the success of any company or economy will be determined by its ability to develop, attract and retain talented manpower.
4. The iN2015 Manpower Chapter has noted that manpower capability is a key component to the overall success of Singapore's infocomm industry. The iN2015 manpower vision for Singapore was to develop an infocomm-savvy workforce and globally competitive infocomm professionals to drive national economic competitiveness. This vision was tied to the target for the year 2015 to boost the number of infocomm jobs by 55,000 to about 170,000. This was expected to generate another 25,000 non-infocomm jobs in the infocomm industry, to bring the number of such jobs to about 70,000.
5. To realise this vision and target, the following strategic thrusts were proposed:
 - a. develop infocomm competencies in key economic sectors;
 - b. develop globally competitive infocomm professionals; and

- c. develop, attract and retain infocomm talent.
6. Globally competitive infocomm professionals are said to be those who engage in high value-added activities and have the ability to successfully create and exploit infocomm, in a way that is superior to their foreign counterparts. This means that a globally competitive infocomm professional must not only be fully equipped with good technical expertise, but should also have the ability to combine this technical know-how together with their respective domain knowledge and experience in order to develop innovative solutions to enhance business competitiveness.
7. In line with the iN2015's strategic thrust to develop globally competitive infocomm professionals, IDA's policy objective here is to ensure that Singapore has a sustainable pool of highly valued infocomm professionals who are able to compete globally. We will need to ensure that there is a sufficient number of infocomm professionals equipped with relevant infocomm skills to meet the needs of the industry. Thus, this paper aims to: (a) discuss key issues and challenges facing our infocomm professionals today; and (b) put forth an overall approach and strategy to implement the above-mentioned thrust and address the key challenges raised.

Views and Comments on the Definition of Globally Competitive Infocomm Professionals

Q1. *IDA invites comments on the characteristics, attributes and skills sets of what it takes to be a globally competitive infocomm professional.*

PART 3 - OVERVIEW OF CURRENT PROFILE OF INFOCOMM MANPOWER

8. The pool of infocomm professionals has increased from 108,000 in 2004 to 111,400 in 2005. The number of infocomm manpower since 2005 has exceeded the number during the dot.com boom year of 2000 (105,600). Approximately half of the infocomm professionals in Singapore worked in the infocomm sector and the other half in supporting end-user organisations in other sectors. Of the total number of infocomm professionals, about 83% were tertiary educated with 15% having postgraduate qualifications¹.
9. The number of job vacancies has more than doubled from 2,100 in 2004 to 5,700 in 2005. However, this number did not reach the level of vacancies of the dot.com year of 2000 (10,400). Infocomm organisations and end-user organisations had about equal shares of such vacancies in 2005. The top 3 job vacancies in 2005

¹ Source: IDA Infocomm Manpower Survey, 2005.

were in the areas of *Technical Support, Programming & Software Design and Database Design & Administration*².

10. The distribution of infocomm manpower by job category in 2005 is shown below in Table 1.

Table 1: Distribution of Infocomm Manpower by Job Category

Infocomm Job Category	Proportion
Technical support	31%
Programming and software design	17%
Infocomm sales and marketing	14%
Operations and administration	10%
Consultancy and project management	7%
Database design and administration	5%
Enterprise systems and integration	4%
Web development	4%
Infocomm education and training	3%
Infocomm research and development	2%
Digital media	2%
Technical writing	1%

Views and Comments on the Demand for Infocomm Professionals

Q2. *IDA invites comments on the demand forecast for infocomm professionals over the next 2-3 years for the above-mentioned job categories. IDA also invites inputs on the demand forecast for fresh infocomm graduates vis-à-vis experienced infocomm professionals in these job categories over the next 2-3 years.*

PART 4 - ISSUES AND CHALLENGES FACING INFOCOMM PROFESSIONALS

Skills Requirements and Gaps

11. Many employers have raised to IDA that they have encountered difficulties in recruiting sufficient number of infocomm professionals with appropriate skills. This feedback was similarly noted in a report which stated that, in general, 73% of infocomm employers in Singapore face such difficulties³. IDA understands that these difficulties are mainly in the following areas.

² Source: IDA Infocomm Manpower Survey, 2005.

³ The Hudson Report – Employment & HR Trends in Singapore, Oct-Dec 2006.

Technical Skills

12. IDA understands from some infocomm organisations that Singapore requires more infocomm professionals with deep technical skills. For example, such technical skills include advanced Linux administration skills and practical experience with configuration and use of common open source software packages. In the area of convergence, it is noted that employees have found it challenging to recruit competent technical trainers, telecommunication consultations / specialists and software developers in Singapore.
13. IDA also understands that non-infocomm organisations that require infocomm professionals with deep technical skills face similar issues. For example, financial institutions and foreign banks based in Singapore have fed back more local infocomm professionals who have specific technical knowledge in areas such as Java, Enterprise Resource Planning (ERP), SAP, mobile computing, wireless technology and wireless security will be required.

Multi-Disciplinary Job Requirements

14. The use of infocomm has become more pervasive in many aspects of work and across many sectors in Singapore. It is noted that approximately half of the infocomm professionals in Singapore are employed in end-user organisations mainly to manage infocomm-related projects and help such organisations improve their business processes and competitiveness through the use of infocomm.
15. Employers in end-user organisations have noted that infocomm jobs in Singapore increasingly require contract and project management skills, in-depth domain and business knowledge. User organisations are increasingly looking for people who can manage complex outsourcing contracts and translate intricate business needs into solution specifications. A few specific examples have been highlighted :

- a. Financial services

IDA understands that financial institutions tend to look for infocomm professionals who are both experts in their field and have good financial knowledge so that they are able to formulate and design IT solutions to solve specific business problems. Some banks have noted that the proportion of financial knowledge to infocomm knowledge needed was about 7:3.

b. Healthcare services

IDA understands that healthcare organisations also look for infocomm professionals who have strong domain knowledge in healthcare and strong IT skills to effectively re-engineer hospital processes to support information flow and decision making. Such infocomm manpower is currently lacking in Singapore and this could possibly hinder the development of products and services for the healthcare sector as well as the generation of new intellectual property for the infocomm companies.

c. Manufacturing and logistics

The competitive advantage of Singapore's manufacturing and logistics sectors depends largely on its ability to manage increasingly complex supply chains. IDA has received feedback from manufacturing and logistics companies that they increasingly require infocomm professionals with domain knowledge in supply chain management so that they are able to innovatively apply the use of infocomm to increase their organisation's competitive advantage.

d. Other Sectors

IDA understands that other sectors, such as transport, tourism, hospitality and digital media and entertainment ("DME") sectors would also require infocomm professionals who have the necessary domain knowledge in their respective sectors and are able to innovatively apply the use of infocomm to increase their organisation's competitive advantage and meet the needs of their clients and customers.

Views and Comments on Skills Requirements and Gaps

Q3. *IDA invites comments on the quality of technical skills of local infocomm professionals and how these skills compare with the technical skills of foreign infocomm professionals. Please elaborate by providing the specific skill sets that our local infocomm professionals are lacking today and areas where they can improve on.*

Q4. *IDA also invites comments on whether there are sufficient numbers of professionals well-skilled in both technical and domain skills to meet the needs of the various economic sectors in Singapore. Please elaborate by providing the specific skills required by your organisation / sector.*

Views and Comments on Skills Requirements and Gaps

- Q5. *IDA invites views and comments on the possible reasons for the lack of relevant technical and domain skills amongst our infocomm professionals. Please provide suggestions on how these skills gaps can be narrowed.*
- Q6. *IDA invites comments on the types of infocomm competencies that Singapore should build over the next 3-5 years for Singapore to remain competitive.*
- Q7. *IDA welcomes views on the types of infocomm competencies that Singapore should build over the next 10 years, and whether you see the need for a significant shift in the skill sets of our infocomm professionals today.*

Quality of Fresh Infocomm Graduates from Local Institutes of Higher Learning (“IHL”)

16. Over the last few years, infocomm courses have become more popular amongst students in the polytechnics and universities. Popularity is generally measured by the number of first choice applicants (“FCAs”)⁴ as well as the average subscription ratio⁵ for infocomm courses. In the polytechnics for example, the number of FCAs for infocomm courses increased from about 3,000 in 2005 to more than 3,500 in 2006. The average subscription ratio of polytechnic infocomm courses also increased from 0.7 in 2005 to 0.8 in 2006. This means that for every 10 places available in the polytechnics in 2006, there were 8 FCAs. At the university level, the number of FCAs for infocomm courses also increased from about 7,500 in 2005 to nearly 8000 in 2006. The average subscription ratio of university infocomm courses also increased from 6.6 in 2005 to 7.4 in 2006. This means that for every 10 places available the universities in 2006, there were 74 FCAs. On average for the past few years, there are approximately 3,500 polytechnic infocomm graduates and 1,100 university infocomm graduates every year.
17. Students are an important source of talent for our pool of infocomm professionals and for the infocomm industry as a whole. Thus, it is imperative that we have good quality infocomm graduates and our graduates are able to adequately meet the needs of the industry.

⁴ First choice applicants refer to applicants who put infocomm courses as the first choice of study when applying for admission to polytechnics or universities.

⁵ Subscription ratio measures the proportion of first choice applicants out of the total number of students matriculated into the course.

Views and Comments on Quality of Fresh Infocomm Graduates from Local IHLs

- Q8. *IDA invites inputs on whether your organisation tends to hire fresh infocomm graduates for infocomm-related jobs. If not, please elaborate on the reasons. If yes, please elaborate on the areas of work for which these graduates are hired.*
- Q9. *IDA invites views and comments on the skills or competencies your organisation looks for in our fresh infocomm graduates and whether you think that the graduates today possess these skills? If not, please elaborate on the reasons and share some suggestions on the ways these skills gaps can be narrowed.*
- Q10. *IDA invites comments on whether changes in the IHL curriculum could possibly help to produce fresh infocomm graduates who are better able to meet the needs of the infocomm industry. If yes, please elaborate on the specific changes that would help.*

PART 5 - PROPOSED IMPLEMENTATION STRATEGY

18. Bearing in mind the issues raised above and the iN2015 report's aim to develop globally competitive infocomm professionals, the following section puts forth some suggested proposals to ensure that our objectives are met.

Sectoral Approach to Manpower Development

19. Over the past 2-3 years, IDA's approach to manpower development has been broad-based in which the programmes and initiatives launched were targeted at Singapore's pool of infocomm professionals at large. Moving forward, it is proposed that IDA complements its existing approach with a sectoral approach to manpower development. This means that in addition to our broad-based approach, we will also focus our efforts on certain strategic sectors. IDA will analyse the manpower needs of those sectors with a goal of ensuring that the sector's manpower needs are met in the short, medium and long term.
20. The sectors chosen should bear one or more of the following characteristics:
- a. the size of the sector should be significant in terms of revenue, value-add, contribution to gross domestic product ("GDP") and IT spending, profile of jobs etc;
 - b. the sector should have a very high chance of success through the leveraging on national efforts; and

c. infocomm manpower plays a pivotal role in the development of the sector.

21. The finance and healthcare sectors could potentially be two such sectors.
22. Today, the financial services sector contributes to approximately 25% of total IT spending by the end-user sector in Singapore⁶, and about 20% of infocomm professionals in the end-user organisations are employed in this sector. As financial services can be infocomm and technology-intensive in nature, infocomm will continue to play a key role in shaping the way financial institutions transform their businesses. Thus, it is vital that Singapore has sufficient infocomm professionals to meet the needs of the financial institutions and to help Singapore realise its vision of being an innovative hub for financial services, powered by infocomm. As more banks are now locating their operation centres in Singapore, it is understood that banking IT specialists are highly sought after⁷.
23. A related area is that of Shared IT Services (“SIS”). Broadly speaking, SIS can be considered a centre of excellence set up by a multinational company (“MNC”) to support and provide certain IT-enabled functions and operations in-house on a regional or global basis⁸. To date, we understand that there have been some mid to large scale projects from the financial sector and that in general, the key financial institutions in Singapore have employed more than 6,500 infocomm professionals over the last 2 years and these numbers are expected to grow. Of the skill sets needed, we understand that these include the following: project management, design, architecture and solutioning, network and database administration, IT security and business process outsourcing skills.
24. For the healthcare industry, it is critical that infocomm professionals should be equipped with the competencies that help healthcare organisations fully leverage on infocomm to improve quality of care, service delivery and reduce costs. Based on initial feedback from healthcare providers, IDA understands that there exist skill gaps in the areas of medical and health informatics, IT architecting and business process re-engineering.

⁶ Source: IDC’s Asia Pacific IT Spending & User Segmentation, 2006 – 2011, Feb 2007, (Doc #: AP381106P). Financial services sector here refers to banking, financial and insurance markets.

⁷ The Hudson Report – Employment & HR Trends in Singapore, Jan-Mar 2007.

⁸ This centre could be run in-house or outsourced to a 3rd party provider. Services offered could cover a full range of services from IT infrastructure-related to business processes. Examples include data hosting and Business Continuity and Disaster Recovery (“BCDR”), network/IT security, database administration, application development, hosting and deployment, etc.

Views and Comments on the Sectoral Approach

Q11. IDA invites views on whether the financial, SIS and healthcare segments are appropriate initial segments / sectors to focus on. If yes, please elaborate on the specific areas of focus. IDA also welcomes suggestions on how best to equip infocomm professionals in these sectors with the necessary skills and how IDA can help to ensure that the infocomm manpower needs of these sectors are met.

Q12. Please suggest other sectors that IDA should focus on. Please elaborate on the specific areas of focus as well as the skill gaps for these sectors.

25. In addition to the sectoral approach, other possible implementation approaches that can be considered are in the area of pre-employment initiatives and in-employment initiatives.

Pre-Employment Initiatives

IHL-Related Proposals

26. To address the issues of relevant skills, one proposal that can be considered is for IDA to collaborate with the IHLs and in consultation with key industry players to review the way that IT is being taught. Some initial proposals that can be considered include the following:

a. IHLs could potentially provide more choices in the curriculum of university computer science undergraduates, to enable the undergraduates to “custom-make” their degree based on their interests and desired future occupation. In this approach, the subjects taken by an undergraduate planning to pursue a career in, say, infocomm security will be different from the subjects taken by someone planning to pursue a career in digital animation. This approach serves 2 benefits. Firstly, it enables students to pick up multidisciplinary skills needed to meet industry’s needs and secondly, it helps to entice students to take up a computer science degree; and

b. The above-mentioned approach to course curriculum also enables students who are interested in pursuing a highly technical career to pick up relevant advanced technical and computing skills. Student attachments to firms could also be incorporated into such a course so that these students are able to get the relevant exposure to larger scale projects. It is noted that the infocomm schools/universities in India have adopted a similar approach where their good infocomm students are attached for periods of 6 – 8 months to IT firms for very technical areas of work.

27. To meet the industry's multi-disciplinary requirements, IDA notes that the universities have started to offer a 4-year double degree programme where students have the option to major in infocomm as well as a particular domain such as business. In addition to this effort, the following 2 options can also be considered:

Option 1 – Domain Major; Infocomm Minor

- a. Explore the possibility to increase the infocomm component taught in non-infocomm courses, such as those in business and accountancy. One possible approach is to promote the subscription of an infocomm 'minor' where students can 'major' in a specific domain such as business, finance or accountancy and 'minor' in infocomm. This approach will help ensure that students obtain a deeper understanding of infocomm as well as a particular domain; and/or

Option 2 – Infocomm Major; Domain Minor

- b. Explore the possibility to introduce more domain modules into infocomm courses. One possible approach is to have an infocomm course where students can 'major' in infocomm and 'minor' in a specific domain such as business, finance or accountancy. This approach will help ensure that students obtain a deeper understanding of infocomm as well as a particular domain.

Regional Infocomm Competition

28. To give students greater hands-on opportunity to work on complex, large-scale projects and sharpen their technical and project management skills, we could explore organising a regional infocomm competition involving infocomm students and professionals. This could be a collaborative effort amongst many agencies, the IHLs, and research institutes to scope the project for the competition. Ideally, the competition and project should be of a scale similar to the US Defence Advanced Research Projects Agency (DARPA) Urban Challenge⁹. If pitched at the correct level and if the projects are truly challenging, this competition should entice the best of academia and infocomm enthusiasts from around the region to take part in the challenge.

⁹ DARPA (the central research and development organisation for the US Department of Defence) organises a yearly Urban Challenge which is an autonomous vehicle research and development program with the goal of developing technology that will keep war fighters off the battlefield and out of harm's way. This is the 3rd time the competition is being held and this year's Urban Challenge features autonomous ground vehicles maneuvering in a mock city environment and executing simulated military supply missions while merging into moving traffic, navigating traffic circles, negotiating busy intersections, and avoiding obstacles. DARPA is offering US\$2M for the fastest qualifying vehicle, and US\$1M and US\$500,000 for second and third place respectively. This is the 3rd time the competition is being held.

29. Rather than restrict this competition to local participants only, a regional competition may be preferred so that Singapore could attract the best from the region, which could add more excitement and competitive drive amongst the participants. By opening up the competition to the region, we could also help contribute to our on-going talent attraction efforts. If the first regional competition proves to be a success, such a competition could be held more regularly.

Views and Comments on Pre-Employment Initiatives

Q13. *IDA invites views on the pre-employment initiatives raised in paragraphs 26 - 29. IDA would also like views on the effectiveness of these proposals to help address the issues of skills requirements by employers and enhance the employability of fresh graduates.*

In-Employment Initiatives

30. In the area of in-employment training and competency development, IDA has already put in place a few programmes, including the National Infocomm Competency Framework (NICF) and Critical Infocomm Technology Resource Programme (CITREP). NICF is targeted to be launched in 2007 and will help define the required skills and corresponding training/certifications for specific infocomm occupations. Individuals can use the NICF to assess their level of competency and map out their training and career path. Employers can use it to better articulate their job requirements and understand the competency and skill gap of their infocomm professionals, thereby making more informed decisions on training and hiring.
31. CITREP is a training programme aimed to accelerate the development of emerging, essential and specialised infocomm skills for infocomm and key non-infocomm professionals in Singapore so as to increase their organisation's competitive advantage, as well as to enhance their own employability. Launched in 1996¹⁰, CITREP today has evolved into a broad-based training programme which covers an extensive list of courses. Currently, CITREP subsidises training and exam fees for courses in the areas of solutioning and design, web services, IT services and business management, infocomm security, network architecture, design and communications, infrastructure support, digital media, embedded systems and information management. To ensure the continued effectiveness of CITREP moving forward, the programme could be used as a strategic tool to influence the skills profile of our infocomm professionals.

¹⁰ Since its inception, about 35,000 participants have enrolled for CITREP.

32. In addition to the programmes listed above, IDA could work with the IHLs and commercial training providers to ensure that there are relevant training programmes that will enable professionals with strong domain knowledge to efficiently pick up relevant infocomm knowledge. This group of professionals will then have the necessary skills to combine technical know-how with domain experience to develop innovative customised infocomm solutions to meet the needs of specific domains.

Views and Comments on In-Employment Initiatives

- Q14. *IDA invites views and suggestions on the specific skill areas that should be supported by CITREP moving forward. Please provide the reasons for your suggestions.*
- Q15. *IDA invites views on its proposal to equip domain professionals with infocomm skills to meet employer's multidisciplinary skills requirements. IDA also welcomes other suggestions on how best to equip domain professionals with infocomm skills. Please also share your views on whether it would be good for domain experts in a particular field to be separately trained to be highly proficient in key infocomm areas. If yes, please elaborate on the possible options to implement this.*

PART 6 - INVITATION TO COMMENT

33. IDA would like to seek your views and comments on the issues and proposals raised in this consultation paper. This will allow IDA to have a better understanding of the issues and challenges facing infocomm professionals and to refine its implementation strategy.
34. All views and comments should be submitted in soft copies (Microsoft Word Format) via email to manpower@ida.gov.sg and should reach IDA by **12 noon, Friday, 1 June 2007.**
35. Respondents are required to include their personal or company particulars, correspondence address, contact number and email address in their submissions. IDA will make public all or parts of any submissions made in response to this Consultation Paper and disclose the identity of the source. Respondents are required to clearly mark any part of the submission that is considered commercially sensitive and place the information separately as an annex to the submission. IDA will not disclose information identified as commercially sensitive or confidential but will take them into consideration in its review.
