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**CURRICULUM DEVELOPMENT IN RESPONSE TO INDUSTRY REQUIREMENTS-
THE ITE MODEL**

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Introduction

- 1 This paper introduces the main programmes of the Institute of Technical Education (ITE). The paper also discusses the systematic approach to curriculum development in the ITE in response to the changes in technology and industry requirements.

Main Programmes of ITE

- 2 The main programmes of ITE are as follows:
 - 2.1 Full-time institutional programmes leading to Nitec and HNitec certifications for secondary school leavers;
 - 2.2 Part-time programmes in Master Nitec/ Higher Nitec /Nitec, short courses and other academic programmes offered on modular basis for adult learners;
 - 2.3 Industry-based Training programmes with industry partners through Approved Training Centre, Approved Training Providers and Certified On-the-Job Training Centre Scheme (COJTC); and
 - 2.4 International Programmes offered through the Overseas Training and Certification Scheme for local providers who can offer ITE courses on a commercial basis outside Singapore, as well as International COJTC accreditation to support COJTC partners with overseas operations.

Overview of the Functions of Curriculum & Education Development in ITE

- 3 The setting of skill standards is largely a centralized activity in ITE. The design and development of curriculum, development of training and testing materials are done together with subject experts from its colleges. The key functions of curriculum & education development in ITE are:

- 3.1 To establish skills certification in various occupational areas, set the skills standard, as well as design, develop and review courses and curricula that meet industry standards;
- 3.2 To design, develop and review audio-visual materials including computer-based training and conduct pedagogic and related training for ITE staff and industry trainers;
- 3.3 To develop, administer and evaluate institutional examinations and skills evaluation tests, and to implement evaluation studies and feedback surveys on ITE's training programmes.

A Structured and Rigorous Curriculum Design and Delivery System

- 4 ITE adopts a structured and externally-oriented process in the planning, design and delivery of its key programmes, with extensive external consultation to identify training needs for course planning, followed by a 5-stage process to design and implement the specific courses identified.

Identifying Training Needs for Course Planning

- 5 Curriculum Development begins with training needs analysis. ITE has a system in place for identifying the training gaps in the economy, which can be plugged by developing appropriate courses for the school leavers and workers. Such identification of training courses takes into consideration the overall national manpower development and training system plan.
- 6 ITE adopts a structured approach in planning its courses. The government's economic policies and initiatives determine the long term planning of ITE courses. The manpower requirements projected by the Ministry of Manpower together with relevant government economic agencies such as the Economic Development Board (EDB) and Info-Communications Development Authority (IDA), are key factors in deciding on the types of programmes to be introduced by ITE to support the growth of the economy. This together with the regular feedback on demand, interest of school leavers as well as annual evaluation of performance indicators of the existing courses will lead to determination of annual intake capacities.
- 7 An overview of ITE's approach to identifying and planning courses is shown at Annex A.

Curriculum Design and Implementation

- 8 Once the courses have been identified and approved, a 5-stage systems approach is adopted to design and developed the programmes as shown at Annex B. The 5-stage model of curriculum development is as follows:

- 8.1 Analysis. This phase determines the need and demand for training, the skills, knowledge and attitude required of an occupation and the skills standard to be attained;
- 8.2 Design. This phase determines the design and structure of the training programme. Entry requirements and instructional objectives are specified. The assessment scheme and test design are laid down. In this phase, the requirements in training facilities and staff training need are identified;
- 8.3 Development. In this phase, instructional materials ie teaching and learning materials used by the training staff and students are developed. The materials include audio-visual aids and computer-based training package;
- 8.4 Implementation. Training is implemented and monitored in the pilot course. Formative evaluation is conducted to identify deficiencies and refine the curriculum, its materials and the delivery system; and
- 8.5 Evaluation. In this phase, the training course is evaluated to determine whether it has achieved its intended goals. The major considerations are whether the students have learned what they are supposed to learn and able to perform at their jobs and meet the expectations of their employers.

Curriculum Manuals Development

- 9 The outcome and deliverables of this systematic curriculum and instructional development process typically includes the following 5 curriculum for a course:
 - 9.1 Training Standard manual comprising the skills standard, assessment scheme, test plans and phase tests to determine a student's mastery of skills and knowledge of the occupation;
 - 9.2 Training Specification manual setting out the course structure and instructional objectives written in behavioural form to guide training staff to deliver the curriculum;
 - 9.3 Practical Work manual containing the job sheets for the students to practise and develop the occupational skills;
 - 9.4 Progress Test manual containing tests covering units of lessons to help provide feedback to the teaching staff on how well his students have achieved the learning objectives; and
 - 9.5 Audio-visual aids package containing materials such as Video Compact Disc (VCD) and/or Powerpoint slides to support teaching and learning.

ITE has also introduced multi-media courseware and on-line learning package to support learning and assessment.

- 10 The details of each phase of model are explained in the ensuing paragraphs.

Analysis Phase: Occupational Analysis & Competency Profile

- 11 Once the training needs are identified, an occupational analysis is then conducted to determine the skills and knowledge contents of the occupation. The occupational analysis is done using the DACUM methodology. Under the DACUM – an acronym for **Devolving **A** **C**urriculum, a trained facilitator spends about one to two days eliciting job skills information from a panel of 8 to 12 expert workers who are able to describe their jobs well. The outcome of the DACUM workshop is a competency profile of a skilled person in that occupation. Occupational trends and concerns that likely to change their job in the future are also identified. This competency profile is then validated by a wider sample of firms for confirmation.**

Analysis Phase: Establishing Skills Standard

- 12 The skills standard sets a measurable, observable and acceptable standard of skills performance, including the required knowledge and attitude(s) needed to support satisfactory performance in a job. The skills standard is developed based on the validated competency profile.

Design Phase : Developing Assessment Scheme and Test Plans

- 13 Assessment scheme refers to the overall method of assessing a student in the training course and the criteria for the award if the certificate. It sets out the required modules a student must complete to obtain the national certificate.
- 14 A module is the smallest certifiable unit. A module is defined as a self-contained unit of coherent knowledge and skills. Credits units are assigned to each module as an indication of its academic worth in terms of learning effort. Once a student has achieved the competencies of a module, the achievement is credited to the student. Award of certificate is based on successful completion of all modules stipulated in the course requirements.
- 15 Besides technical core modules, Life Skills modules such as Personal & Interpersonal Effectives, Thinking and Problem Solving Skills are compulsory modules. They are essential not only for success in initial employment, but also for providing the motivation for continual development and life long learning. The electives provide students learning opportunities to deepening or broadening their skills during the course of study. A Higher Nitec or Nitec course generally has 8 compulsory technical core and 7 Life Skills modules, and few elective modules.

- 16 The test plan is a document containing specifications and guidelines, which the test setters, moderators and markers must observe in implementing a test. It set out the type of assignment, test duration and marking scheme in the case of practical tests. For a theory test, the specifications include content, type of question, number of question etc. The actual assessment of occupational skills is through actual performance of a task, assignment or project under conditions as near to an industrial workplace as possible.

Development Phase: Developing Instructional Materials

- 17 The training specifications is a structured, sequenced, learning document, which guides the teachers in delivery training to enable students to achieve specified training outcomes.
- 18 The Job Sheets are developed with reference to the training specifications and the skills standard for the course. Each selected job covers a specific training objective and contains the skill elements, which the students are expected to learn.

Implementation Phase: Conduct Training

- 19 To equip students with the necessary skills for effective performance at the workplace, it is important that the curriculum must provide sufficient hands-on practice to acquire those skills. The curricula of ITE courses provide theory and practice in the ratio of 30:70 and 40:60 for Nitec and Higher Nitec courses respectively.
- 20 In the workshops and laboratories, students sharpen their skills development through individual and group projects. The training environment is designed to be close to workshop standards in industry. Actual industrial machines, tools and equipment are used.
- 21 Besides acquiring the technical competencies pertaining to the skills and knowledge of the occupation, the development of social competencies of working in a team, to co-operate and share responsibility; and the methodological competencies of planning, implementing and controlling work and solving problems are also emphasized. Workers need these key competencies to continually adjust to fast technology changes and the changing organizational structures and work processes at the work place.

Evaluation Phase: Course Evaluation

- 22 To ensure that the courses offered meet the needs of school leavers, ITE's courses are also reviewed every 3 to 5 years and evaluated based on the feedback from students, graduates and employers through surveys.

- 23 A Features Analysis Model, which is developed based on 4 broad groups of indicators, viz, Demand, Cost of Training, Success Rate and Employment, provides an integrated and comprehensive approach for evaluating ITE's full time courses. This process enables ITE to identify both the better and poor-performing courses and aids understanding of the causes so that strategies can be formulated to address areas of concerns. Findings from the evaluation exercise also serve as guidelines for planning and adjusting of intakes for the respective courses. Poor-performing courses appeared in few consecutive years must be examined whether or not to continue offering to the students.

Validating Curriculum and Instructional Materials

- 24 Development process is a highly consultative one. Various interest groups are consulted for inputs before implementation. For example, the skills standard has to be firstly endorsed by an academic management committee followed by the academic advisory committee endorsement before approved by the Academic Council.
- 25 The Academic Management Committee is an internal technical committee made up of ITE senior training staff. The Academic Advisory Committee consists of external members from Commerce and Industry. The Academic Council consists of ITE senior management.

Industry Trends and Skills Standard Development

- 26 The manufacturing sector contributes to 27% of Singapore gross domestic product (GDP) and is accountable for 17% of the workforce in 2004. It will continue to be an important engine of growth in the country's economy. Over the past 3 decades, this sector has evolved from labour-intensive low-skilled operations to higher value-added and more technology-based activities. The precision engineering, electronic, chemical, aerospace industry and the recent emerging biomedical science are identified as the critical areas in the manufacturing sector. Focus is placed on certification and training in these critical areas.
- 27 While manufacturing continues to be an important sector in Singapore, the services sector is developing as the second engine for growth. Established industries such as logistics, info-communications technology, and financial services are expected to further upgrade and develop. New areas such as healthcare, and creative design and media are also being emphasized. The new ITE certifications and skills standards developed have reflected these changes.
- 28 As employers become more aware of the importance of training to raise the productivity and quality of their products and services in the competitive world,

more and more of these employers through EDB or employer associations have sought certifications and training standards from ITE.

29 ITE has responded to these emerging industry trends in the following ways:

29.1 New skills standards in biochemical technology and wireless LAN technology are developed to support the manpower needs for the higher value-added and technology-based activities;

29.2 There is demand for skills workers for the services sector, there is an increasing number of skills standards developed in the areas of Info-Communications Technology, Healthcare, Retail & Tourism to support the services industries;

29.3 ITE currently has a total of 41 full time training courses. Of these, more than 60% of its annual intake will be trained for the services sector. Compared to 10 years ago, the training capacity in ITE has shifted from a manufacturing focus to a greater emphasis on training for the services sector. This is in line with the directions of the government's economic policies and initiatives and manpower projections.

30 A sample of the skills standards developed in the last 5 years for the full time course reflecting the trend is indicated as follows:

	<u>Areas</u>	<u>Level</u>	<u>Year Developed</u>
	<u>Manufacturing Sector</u>		
30.1	Chemical Process Technology (Pharmaceuticals)	Nitec	2002
30.2	Precision Engineering (Aerospace)	Nitec	2003
30.3	Mechatronics (Equipment Assembly)	Nitec	2004
30.4	Biochemical Technology	HNitec	2005
30.5	Electronics (Wireless LAN)	Nitec	2005
	<u>Services Sector</u>		
30.6	Nursing	Nitec	2000
30.7	Business-IT	HNitec	2001
30.8	Info-Communications Technology	Nitec	2001
30.9	Multimedia Technology	Nitec	2001
30.10	Integrated Logistic Management	HNitec	2003
30.11	Service Skills (Retail)	Nitec	2004
30.12	Business Studies (Sport Management)	HNitec	2005
30.13	Communications Technology	Nitec	2005
30.14	Product Design	Nitec	2005
30.15	Services Skills (Tourism)	Nitec	2005

Challenges Ahead

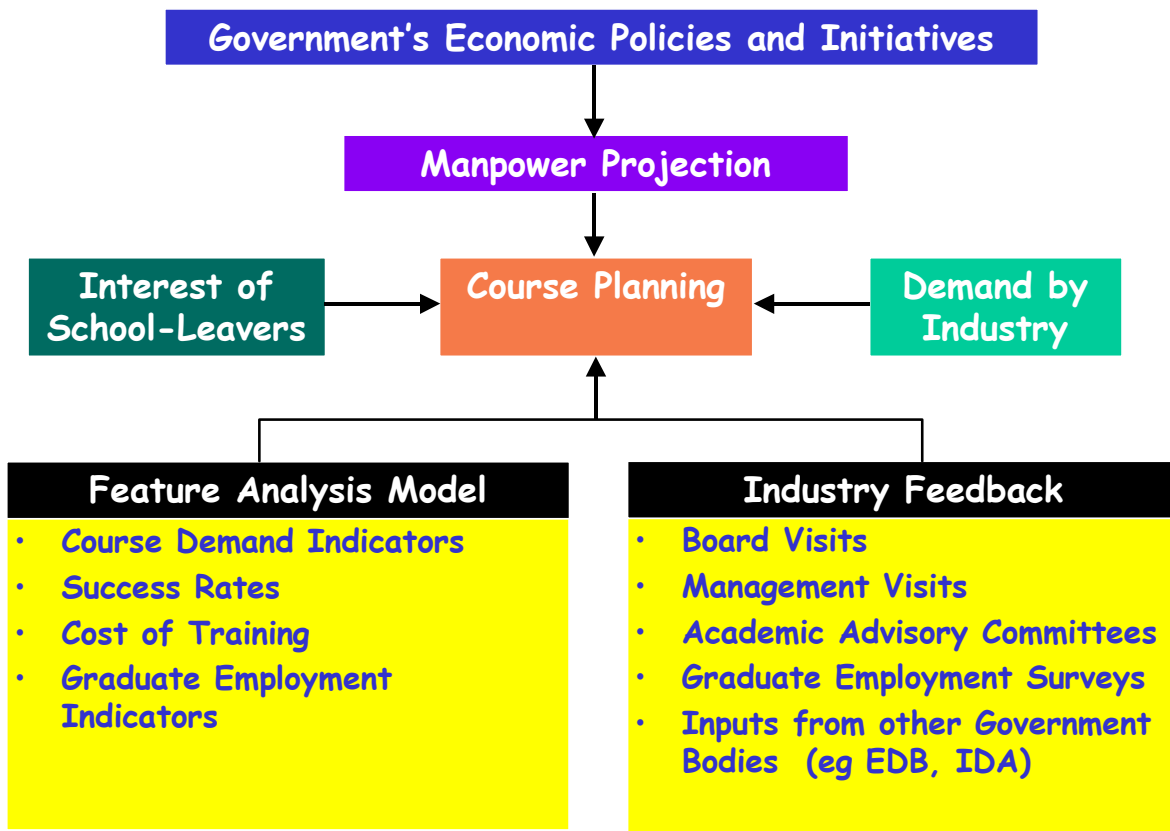
- 31 There are few challenges in curriculum development in response to the industry requirements:
- 31.1 The major challenge in curriculum development is to identify the new emerging occupations. Forecasting the demanded occupations and the new emerging field of work has become difficult due to globalization and restructuring of economy. A cross government agency committee having expertise in country economy development, manpower development, trade development would help to identify the new emerging occupations in demand;
- 31.2 The second challenge in curriculum development is how fast to meet the changes in technological developments and keep training contents relevant to needs of industry. The process of curriculum development is a highly consultative and complex process. Seeking consensus from people representing interests of a diverse background and training needs can be difficult and slow to achieve. It may not be easy to make changes swiftly to skills standards and training materials as one would have them. A continual review of curriculum development process is necessary to ensure the processes are responsive.

Conclusion

- 32 ITE has a system of developing skills standards, test specifications, training curriculum and instructional materials. This system has evolved and refined over a period of time based on national needs and conditions with the objective to produce the skilled manpower to support the economic growth. The system has served ITE well in response to industry requirements.
- 33 This paper has outlined the system in its basic form and highlighted challenges in the development of curriculum.

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An Overview of ITE's Approach to Identifying & Planning Courses



ITE MODEL FOR CURRICULUM AND INSTRUCTIONAL DEVELOPMENT

