

VOCATIONAL EDUCATION AND TRAINING FOR HONG KONG INTO THE 21ST CENTURY : AN INVESTIGATIVE REPORT

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Abstract: Demands from the 21st century customers will change fundamentally from that of past years. This article attempts to review the traditional strength of Hong Kong economy and its people's ability to meet with these new demands. Vocational Education and Training plays an important role in the provision of human resources. In this article the concept and methodology for "Shaping the 21st century worker" is proposed. The main issue being investigated is to provide workers with knowledge and ability, not just to cope with skills and knowledge require for their related field of work, but also the ability to control their work organization and to shape and design new methods / processes for new generations of products and services. Occupational-related didactics, alongside with their methodological implications and applications are also investigated. It is proposed that project based learning type of education and training are needed to be developed and implemented for various "professional profiles". The requirements of the new age VET trainer to suit the changing needs of service / industry are also discussed.

An initial investigative report.

1. INTRODUCTION

Over the past two decades, especially in the western world, the development of technology in the transformation of materials into consumable products and service has been rapid. As a result great wealth has been created, the average people in the western world owns much more than their predecessors. It is a social norm that when peoples' basic needs are satisfied then their aspiration to satisfy their ego needs will increase. Thus product functional quality alone will not be enough, product variability and fashion have become extra dimensions in their quest for products to be consumed. This consumer led phenomenon reflects the demand on the modern manufacturing and service industry as a whole. Product quality and reliability, product variability, short product life cycle, product availability on short notice and at the right cost are all necessary characteristics of a desirable consumable product. As a result the traditional system of mass production and monotonous type of service with adequate functional quality and lowest production costs is no longer compatible to current consumer demands. Modern system that incorporates production and service of high variety, quality to customers' specification and flexibility of switching product types almost instantaneously are required. On top of this there is also the factor of cost. Although the lowest cost to the consumer is not necessary the most desirable factor in a consumable product, however the lowest production cost will allow a much higher degree of pricing flexibility and the possibility of a higher profit margin. This important factor has become indispensable in an increasingly competitive commercial market for desirable consumable products.

Development of Hong Kong Manufacturing and Service Industry.

The strategic location of Hong Kong in the Pearl River Delta and the post Second World War years of political and economical turmoil in mainland China contributes greatly to the rapid development of manufacturing industry in Hong Kong. Until 1987 the local manufacturing industries are the biggest contributor to the Hong Kong GDP.

Since the creation of special economic zones in Shenzhen and Zhuhai by the Peoples' Republic of China, many local manufacturing industries have started to move most of their production processes to these areas and the surrounding townships. The main reasons are to enjoy conditions such as cheap labour costs, special tax relief and much less stringent regulations in pollution control, fire prevention and industrial safety. What is left behind are functions such as procurement of materials, sales and marketing, design and product development, technical support, production planning and control, quality control, packaging and logistics.

Manufacturing and service industries in Hong Kong are now facing increasing competition from other developed and developing countries. The emergence of new market environment requires products and services not only of high quality, but also with much higher degree of variety and ever reducing product life cycle. Thus the ability to design innovatively, to manufacture and provide products / services flexibly and speedily with very low level of inventory will be of paramount importance. Hong Kong industries have to gradually adapt changes from its traditionally labour-intensive operations to update and upgraded their technology and management techniques.

Meanwhile manufacturers in mainland China will continue to develop, whilst utilizing its abundant resources in terms of labour, land and materials, there is still a lot of room for improvement on areas such as technical support services, manufacturing management and administration. The performance of the economies of Hong Kong and Southern China is so intertwined that it would be unrealistic to do planning without taking into account of the other. With Hong Kong revert to Chinese sovereignty in 1997, it is apparent that both service and manufacturing industries of both regions are starting to co-operate and grow, gradually integrate and merge as one. To sustain such continuous growth of the combined economies, there will be substantial demand for technical support in providing the technological know-how.

The objectives identified by the "Made by Hong Kong" report (Berger et al 1997) does bear considerable significance as guidelines for future Hong Kong industrial development.

That is -

1. Transformation of current production system by identifying the best practices of good companies as well as targeting the strengths and weaknesses of a system as a whole.
2. Concentrate not only at high technology industries (e.g. biotechnology, information technology, and electronics), but also at core industries, by understand how new products combining manufacturing skills and services to create new form of industries.
3. Investigate the emergence of new generations of products that tightly link services and manufacturing goods, which includes information technology.

The same report carries on to point out that if the above objectives are to be realized, human resource in Hong Kong will need to be developed. The following areas will need to be addressed with detail analysis, evaluation, planning and implementation of planned actions:

- Overcome the widespread lack of commitment to the development of human resources at all levels of Hong Kong industry.
- Upgrading the competency of English language.
- Develop new capabilities for product and process innovation and design, including engineering and management with the ability to work as a team, creating and designing new products, processes and systems.

- **Develop new breed of personnel capable of operate effectively beyond a single discipline and to combine deep knowledge of science and engineering fundamentals with practical, real-world knowledge and hands-on experience.**

Strengths of Hong Kong Manufacturing / Service Industries.

The uniqueness of Hong Kong geographical and political location has greatly influenced the culture of its industries and workforce. From the early days of British colonial governorship to today autonomic rule under Chinese sovereignty, the Hong Kong economy is continuously influenced by outside political and economical factors. Face with no natural resources of its own, Hong Kong continue to prosper, utilizing its only assets, its geographical location and its people. It is true to argue that Hong Kong has a good economic infrastructure and a huge reserve in the Treasury, which it can buy itself out of any economic crisis. This may be true over the short-term period. One only has to look at Japan economy and you will soon realize that economic problem lies more closely with its people, or rather, the culture and capability of its people. Upon close scrutiny Hong Kong industrial strength lies with its huge reservoir of multi-talented entrepreneurial human resources. The "Made by Hong Kong" report (Berger et al 1997) again identifies and summarizes the strength of Hong Kong industrial workforce as follows:

1. Flexibility in production according to customers' diverse needs - ability to detect changes in trend and to respond with new products, the ability to get goods to customers quickly, the ability on the shop floor to work on many different products at the same time and to switch lines rapidly from one product to another.
2. Coordination - Managers who are capable to master the complex problems of production in territories with relatively lesser industrial experience and complicate political environment. Hong Kong managers are with multifaceted skills: education in engineering and science in HK and abroad, years of work in HK plants with skilled workforce, multiple close contacts with demanding and sophisticated buyers in HK and abroad, experience in international markets, and job rotation through a number of HK companies, across different parts of the industry, collaboration in production with workers who have long experience and skills to rapid learning, operate effectively in the absence of a stable workforce, coordinate the factory and produce consistent result in quality and productivity.
3. Political framework - rule of law, limited government, the protection of individual rights, freedom of information and association that created a public environment that supports economic growth and innovation, is open and secure for foreign investors. Low tax regime, good transportation and telecommunication infrastructure, relative comprehensive education and cheap medical services, public housing program that supplies low cost housing. All these effectively subsidize the cost of industrialization.
4. Internationalism - the ability to understand, interprets and translates into specific and diverse customers' requirements. Large communities of foreign nationals, significant presence of European, Japanese and USA Corporation's regional headquarters and offices, and Hong Kong people bilingualism.

Weakness of human resources development in Hong Kong.

Up until now most Hong Kong manufacturing and service companies tends to resolve problems as it arises, to seize upon manufacturing opportunities and to invest the minimum amount so as to obtain the largest possible margin on the return of their investment.

Troubleshooting, crisis management etc., forms a necessary and important part of the techniques processed by management and technical personnel of the manufacturing industries. Uncoordinated piecemeal approach to resolve problems seems to be the order of the day. This is particularly true for the majority of the medium size of manufacturing companies in Hong Kong.

Upon close examination of this type of approach, at best it can still cope with shorter term of demand of low cost, high quantity type of products and with considerably high wastage of human and materials resources. But for longer term this type of approach is simply inadequate to respond to modern market demands.

If the Hong Kong manufacturing industry in general still adopts this type of approach and explains it to themselves that it is their blend of flexibility and adaptability, then it poses a big question mark on the capability of the industry as a whole to cope with the demands of consumers of today and tomorrow.

2. HUMAN RESOURCE DEVELOPMENT IN HONG KONG

Despite the tremendous growth in prosperity over the last decade in Hong Kong, the number of skilled and semi-skilled positions in Hong Kong has been declining rapidly since the mid-1980s, but the demand of managerial staff, engineers, technicians and other skilled workers has continued to rise (Federation of Hong Kong Industries survey 1995). The fall of skilled and semi-skilled positions can be explained by the fact that most industries have been relocating their manufacturing operations across the border to Chinese mainland, where land, materials and human resources are much more cost efficient. However the trend of rising demand of technical and managerial staff has created shortage of qualified engineering and managerial professionals.

There were comments (Federation of Hong Kong Industries survey 1995) made to suggest that Hong Kong higher educational institutions do not tailor their teaching and research activities closely enough to industries' needs and that local graduates are weakest in the area of management and human relation skills, lack of practical knowledge. All employers expressed strong preference of North American and European University graduates to local graduates. The difference being the broader and more practical experience and knowledge and the extra edge in creativity and initiative. Thus the narrowness of education received by current higher education graduates, lack of general management skills need to be replaced by new capabilities not just for management and finance, but also includes a thorough understanding of basic technological concepts of product / process innovation and design, with the ability to work as a team, creating and designing new products, services, and its relevant processes and systems. What is required is as the "Made by Hong Kong" suggests, a new breed of personnel capable have operate effectively beyond a single discipline and to combine deep knowledge of science and engineering fundamentals with practical, real-world knowledge and hands-on experience.

3. VOCATIONAL TRAINING SYSTEM IN HONG KONG has undergone a major review in 1997, apart from reorganization of the Vocational Training Council management and organizational structure; it also recommends focus on strengthening the role of employers in the design of training strategies for different sectors of the economy. Flexible and vibrant vocational training system is desperately needed for Hong Kong to realize its aspirations for knowledge intensive, high value added economic growth.

This has led to increasing attention being paid to initial and continuing vocational education and training. The Vocational Training Council in Hong Kong has embarked on ambitious programs of reform to ensure a supply of skilled labour for industry and commerce. Their objectives are clear, that is to provide technical education and training to meet the changing demands of the economy with high degree of flexibility and

responsiveness. Their overall strategy is to review their resource deployment, quality of work and efficiency of all the operating units, to enhance their information infrastructure and to identify a new methodology so that improved labour market analysis can be carried out, allowing the re-deployment of their resources according to social demand. (Lee 1997)

But it is clear that current processes of planning and implementation of initial and vocational education do not prepare workers for the new work activities. Analysis of current Vocational Education and Training plans disclosed shortcomings that are inherently built into the planning method itself, deficiencies include problems associate with centralization and objectifying of curriculum development and design, slowness in response to society needs and adaptation-oriented tendencies. It denies the opportunity of active participation for those directly concerned, i.e. in-company human resource planners and the young people themselves. If future can be foreseen and predicted more accurately, the more awareness of the possible shortcoming of the VET plans can be brought about and the better preparation and provisions can be made for these shortcomings.

Technical innovation of today and tomorrow creates a very complex world and to learn to cope with such complexity is now becoming overwhelming. One method to education and training of future vocational personnel may be **through innovative learning, by participation in the present and to anticipate of the future.**

To be more specific, one can argue that VTC objectives could include -

- The development of closer links between the operating units of the VTC and the local industrial and commercial enterprises,
- The development of core skills and/or key qualifications,
- Measures to ensure the parity of esteem of vocational education and
- Moves to promote continuous training and lifelong learning.

But we mustn't lose sight of the challenge we are facing with is that new forms of work organization and relevant human resources are required for the ever shortening product life cycle, new standards for quality assurance and an explosion in the implementation of new technologies. If the traditional forms of vocational education and training are not overhauled radically, both in concept and in its operating mode, one can doubt that whether it can achieve its objectives.

Comparison of the three basic methods of vocation education -

- Training on the job, trainees are assured of job and income security, but the program (e.g. apprenticeship) can be long and in a narrowly defined skill or trade. Ratio of trainee to training course is relatively small and cost can be relatively high.
- Training off the job in education establishments, has the advantages of accommodating a large number of students and offering a variety of courses, but require a minimum number of students and instructors for the course to be effectively and efficiently run. These programs tend to be inflexible and can involve expensive equipment. Also no guaranteed of employment after the course is completed.

- Combined type of Training on and off the job, co-operative work/study programs provide income and experience while allowing trainee to achieve an academic qualification, require close coordination of roles of employer and training institution.

For most developing countries, Vocational education (training off the job) is normally the favorite choice, since it has the least administrative and operational obstacles. For advanced industrial and commerce countries the combined type of training is normally the chosen form of Vocation education, e.g. Dual system in Germany and the Sandwich courses offered in UK and some European countries. In Hong Kong all three types of vocational education are practiced.

Efficiency and effectiveness of Vocation Education and Training, *how is it measured and monitored?*

- Most effective type of training. Measure benefits of a program derive from the quality of instruction or from the employment opportunities available.
- Cost efficient. Cost of a given training method is taken into account to measure against some form of economic and social returns of Vocation Education.

Review of Vocational Training Council Employment and Attrition statistics will soon identify some inadequacies of the current system. There are high drop out rate and low employment rate for Technical Institute students. The same statistics indicates that Technical College students did better but drop out rate still remains unsatisfactory. The main cause cited for the high drop out rate is that students lost interest in the courses they attended, very often in the first year of study.

The issue is not which method is more cost effective but rather under what circumstances one type should be chosen over another. **The solution must be reached by a systematic exploration of conditions.** Both economic and social factors will determine the choice. The decision to train workers on the job, off the job or with some combination of the two methods will therefore depend on the analysis of all these factors.

Economic factors - average cost per graduate, affected by the scale of operation, the optimum number of programs offered in the same institution, the nature of laboratories and workshops, the costs of teaching staff will be affected by its scarcity and quality.

The average cost of a program will depend not only on enrollment per program but also on the mix of programs offered by the institutions.

Social factors - characteristics of the labour market such as level of employment, level of wages and the entry requirement of jobs (some occupations have standard prerequisites for entry. Industry/commerce are bias against a certain type of education. The social image of a certain type of education (that is eventually determined by well-planned curriculum, competent administrators and teachers with both practical experience and pedagogical ability).

4. VOCATIONAL EDUCATION AND TRAINING OF THE 21ST CENTURY WORKER.

The traditional approach for vocational education and training is to provide skills and knowledge for the learner to adapt to current social and technological development. In other words, it always follows behind new technology and new economic development, learning to cope with what is new and what is needed. Very often students found that their knowledge gained in vocational training institutions are inappropriate, out of date and unsuitable for their needs. This is entirely inadequate for the new forms of work organization and relevant human resources, which is required for the provision of 21st century products and

services. Instead workers should be given the knowledge and skills to utilize available technologies, to control their work organization and to shape and design new methods / processes for new generation of products and services (F. Rauner, 1995).

Expertise cannot be developed through simple although extended information acquisitions, but only through continuous and subtle cognitive experiences related to putting knowledge into action, co-developing personal and professional knowledge into the larger dimensions of knowledge held by groups and whole organizations.” (Attwell et al 1997).

The above statement on **work related knowledge** aptly describes the significance of types of skills and knowledge that Vocational Education and Training (VET) professionals have to recognize both as planners and as teachers. Further it might be useful to distinguish different types of knowledge. Lundvall and Johnson (1994) identify four different kinds of knowledge - know-what, know-why, know-how, and know-who.

- Know-what refers to knowledge about facts and information of the specific topic.
- Know-why refers to scientific knowledge, influencing technological development and the pace and characteristics of its applications in relevant industries. This is not dissimilar to production and reproduction processes in organized institutions, such as universities, scientific research organizations and technical colleges.
- Know-how refers to skills refers to skills and capabilities to do something ion different contexts, e.g. judging the market prospects for a new product, or operating a machine tool etc.
- Know-who refers to a mix of different kinds of skills, allowing the access and use of knowledge possessed by someone else.

Another important aspect concerning knowledge is that certain dimensions of knowledge cannot be taught or explained. "We can know more than we can tell" (Michael Polanyi 1962) explains that that there is a level of knowledge that cannot always be put into words or linearly explained. This level of knowledge can only be obtained by focusing on certain elements of the subject matter and by successive feedback of what was learned previously. To put it simply, by doing, practicing and learning from past experiences of successes and mistakes. This is very similar to the standard definition of skill - ability to do something well especially as a result of long practical experience and / or a particular technique.

The term "**work process knowledge**" (Attwell 1997) can be used to summarize the above statements of knowledge and skill - it can be regarded as knowledge encompassing the whole work process, often acquired through the experience of work, which is required for successful performance in the workplace. Thus work related knowledge and work process knowledge enables the workers and the workplace management to have clear focus on learning, knowledge acquisition and development.

However work experience or on the job learning alone does not lead to work process knowledge, it requires the guidance of teachers and trainers through a planned learning program. Without this structured program may lead to the learners' development of narrow mindedness and limited capability of reproducing what is observed. In the fore coming century, rapid changes in technology will continue, new forms of work organization will continue to develop and evolve. **Thus work process knowledge for the 21st century worker have to include not only a broader and deeper knowledge base, but also the capability of application and adaptation of these knowledge to cope with new situations and to meet future change.**

The implication of new form of work process knowledge will have profound effects on 21st century vocational education and training. Especially in Hong Kong, where economical, social and technological changes are influenced mainly and frequently by external factors. VET professionals will need to have a thorough understanding of their own subject based knowledge and competence to related occupational fields. They will need to have the ability to plan curricula and design learning programs to **incorporate**

knowledge of present and future context in which skills and competencies are to be applied

Furthermore the concept of work process knowledge has to be linked to the idea of life long learning. Initial vocational education and training only forms the basis for the development of work process knowledge. It is this initial knowledge base that will help the new age workers to change and shape the 21st century work organization through the application of advance technology.

5. THE CONCEPT OF "SHAPING THE 21ST CENTURY WORKER" FOR THE HONG KONG MANUFACTURING AND SERVICE INDUSTRIES.

The philosophy of this concept is instead of people adapting to socio-economic and technological developments, they should be given the necessary competence to work self-reliantly and independently. They should be able to utilize creative and communication skills to shape work conditions, work organizations and work contents in order to create and facilitate innovations. This shaping concept can be achieved by imparting the relevant **work related knowledge** and **work process knowledge** to the intended individuals. But here lies the main problems of **what and how** to deliver this knowledge.

With technological advances, analytical and communication skills were required as well as more theoretical knowledge. In developed economies rapid technological change required workers with more flexibility and a deeper theoretical knowledge of their occupation. The abolition of some occupations and the creation of new employment opportunities necessitated training or retraining of workers. Industrial sector's growing demand of skilled workers, vocational education provides not only specific vocational training but also general education - reading, writing, mathematics and science. Thus the vocational education process is an integration of **all the transformational knowledge and methods ranging from identification of customers' need to fulfillment of customers' satisfaction**, both in terms of service and products.

The heart of the matter is **'What'** does industrial human resources need and **"How"** can these needs be satisfied? One method is that we can anticipate needs by referring to past historical statistics and to forecast future trends of requirement. Recent publication "Manufacturing 2000" by the Hong Kong Education and Manpower Planning Department will show that its validity and usefulness in forecasting the future is limited. Even the latest updated republication of this report fails to catch up with 1998/9 requirement, let alone year 2000 and beyond.

There are other innovative concepts, which are more futuristic oriented. The **Scenario method (G.Heidegger 1998)** suggests four scenarios of interconnected work, technology and education to describe possible situations of the future industrialized society. In order to plan more effectively for the provision of vocational education, systematic efforts has to be made and to take into account of prospects of future development of work and technology. If the future of work becomes visible, at least in the horizon, then it can become a decisive aspect in the anticipatory and shaping-oriented vocational education planning process. Briefly the four scenarios of future work can be summarized as follows -

1. Computer-aided Neo-Taylorism - work and technology become more prominent; work will be subdivided and automated increasingly. Human resources of two main types will be required - a. peripheral workforce with low qualifications and fluctuating composition to man the residual tasks (which can also be automated except that employment of labour is still more economical). b. Core staff of well qualified skilled workers for the complex design, development and production work.
2. Computer-aided Humane Rationalization - extensive and accelerated automation of all possible and suitable tasks, even if this increases economic costs, resulting radical reduction in working hours. The higher-level technical staff will carry out the work tasks in the professions that cannot be shortened as desired.

3. Dichotomized Re-professionalization - corresponds to present experience that is characterized by a relatively slow rate of development and introduction of technologies. The current industrial hierarchical structures will remain unchanged and that human intervention in production and administration will be significant. A new breed of semi academic skilled type of workers who can carry out a wide range of practice related and theory oriented type of work, adapting to technological, economical and political changes when it arises. The more capable elite of professional staff will still man the management tasks at a higher level.
4. Integrated vocational and general education - a non-futuristic technology scenario is assumed whereby simple peripheral jobs are retained. Various people acquire very different combinations of skills during their occupational life. Occupational work becomes more significant and that an integrated vocational and general education is required for the training of specified abilities.

Yet the economic, social and political structure and climate in Hong Kong is so complex and sensitive that any of the described scenarios or a combination of these scenarios can occurred, making the prediction of an overall picture almost an impossible task. However these scenarios can and will help if we try to segment the Hong Kong industries into different occupational profiles.

One can try to visualize that in Hong Kong, most business services e.g. banking, commerce, can be adapted to *Computer-aided Neo-Taylorism* scenario; information technology, telecommunication and the electronic manufacturing industry can be aligned to the *Computer-aided Humane Rationalization* scenario. While the majority of manufacturing activities in and surround Hong Kong can be classified as the *Dichotomized Re-professionalization* category and the more mundane and manual type of manufacturing operations which have been or being transferred and relocated to mainland China can be classified as the *Integrated vocational and general education* type.

But any visualization of these scenarios needs to be substantiated by factors, relevant trends and dimensions that can indicate its likely consequences. The Delphi method (Van Wieringen 1998) suggests structured consultation of experts by means of questionnaires and interviews might be required for the -

- Identification of patterns and trends in economic technological and industrial events.
- Classification of predetermined and uncertain variables and their order of importance and predictability.

This method might provide relevant information and data, yet it still does not produce clear-cut guidelines for the formulation of scenarios into different professional profiles. Recent study aimed at outlining future occupational profiles of teachers in primary education (Meelissen and Brandsma 1995) adopted the following approach. Two rounds of consultation in forms of questionnaire were conducted. During the first round, questions concerning factors, relevant trends and dimensions of related occupational profiles in general terms were surveyed. These questions are supplemented by subsequent discussions on the likely consequences and the probability of occurrences.

In the second round, respondents were asked to reconsider on those statements that bear low level of consensus.

Observing the pros and cons of the above approaches, the following methodology is suggested for the development of various scenarios, which in turns will provides detail information and guidelines for the formulation of related "**professional profiles**":

Phase 1 Investigation of local trends of industrial developments and future requirement human resource requirement by means of questionnaires and interviews of industrialists, technologists, educational professionals, economists and politicians.

Phase 2 Using data and information obtained from Phase 1 and applying "Shaping Methodology" to generate scenarios of possible future human resource requirement, survey of industrial organizations feedback according to these scenarios.

Phase 3 Summarize information to form basis for development of various professional profiles.

It is anticipated that the question of "**What does the Hong Kong industry need in human resources for the 21st century**" will be answered in the formulations of the **various professional profiles**.

The following are some of the suggested actions -

1. To conduct survey on past and present study and reports on the state of service and manufacturing industries of Hong Kong and China.
2. To conduct survey on past and present study and reports of technical education for manufacturing industries of Hong Kong and China.
3. To liaise with other leading vocational education institutions (e.g. Institute of Education and Technology, Bremen University, Germany) to gain experience and techniques on research methods, curriculum design and implementation of planned actions.
4. To visit manufacturing companies of various industries (e.g. plastics, metal working, electronics, light engineering, watch making, electrical equipment etc.) in Hong Kong and China, to conduct survey and research of their development plans for the next ten years, their investment plans, their requirement for technical support services.
5. To visit various companies of commercial and business service industries (e.g. banking, insurance, finance etc.)
6. To visit various technical education institutes in Hong Kong and China, to conduct survey and research into their existing and future plans of provision of technical education for the manufacturing industries.
7. To review surveys conducted by various government agencies on economic, political and social environment that will affect the development of the manufacturing industries.
8. To review surveys on trends of student preference of study, their ability of learning of technical subjects, their future outlook on their employment and the supports given by various government and private institutions on technical education.
9. Collate and summarize gathered information and data, utilizing a special designed computerized simulation model to analyze these data and information to generate summarization of individual scenarios for the provision of technical education in Hong Kong and Southern China.

6. THE PROVISION OF WORK RELATED KNOWLEDGE AND WORK PROCESS KNOWLEDGE FOR THE VARIOUS PROFESSIONAL PROFILES.

Here lies the main problem of how and in what form. If the goal of vocational education and training is to provide individuals with competence

- To work self-reliantly and independently,
- To utilize creative and communication skills to shape work conditions, work organizations and work contents,
- To create and facilitate innovations,

Then one must examine the effectiveness and efficiency of existing traditional form of vocational education and training. Review of current vocational education and training system shows it often lacks objectivity and the approach is bottom to top. That is -

- Too much method oriented in the curriculum and requires too much learning.
- In most areas, students lack motivation, case experience and confidence.

- They cannot be ready to deal with open-ended practical problems.

In observing the highly developed industrial countries, their established vocational training systems were largely established base on the following criteria:

- Consider how to meet social needs.
- The world is much more technologically and economically competitive.
- Demand on quality and capability of graduating students is high and diversified.

Acquiring ability to co-shape work and technology has become a guiding principle for vocational education and training (F.Rauner 1995). The overall objective is to provide the trainees with work process related abilities and their ability in continuous acquisition of updated work process and related knowledge. It was suggested that work process knowledge should be provided in the form of key qualifications, encompassing work and technology at all relevant levels. Thus VET not only prepares one for occupational work, but also develops one's formal abilities to co-shape work and technology by a design of interchangeability of curricula, through the guises of key qualifications.

This concept was further explored and applied extensively in the "Car Mechatronic Concept" project (F.Rauner, G. Spottl, 1995), a European occupational profile for the initial training of a Car Mechatronic. Subsequently a curricula framework was developed, providing vocational education and training in response to the structural changes in the car service sector from traditional garages to modern services businesses, featuring customer oriented quality work. The car mechatronic is able to deal with all aspects of modern high-tech cars and service demands of customers. The Car Mechatronic is also provided with the ability to participate in shaping work and technology.

The initial training of Car Mechatronic oriented towards work process knowledge, especially prone to workplace based. Deeper, specialized knowledge will be provided through further systematic training. Thus the curriculum for a Car Mechatronic aims at a practice-oriented vocational training, facilitate by specialized training programs through training institutions and participating companies.

This concept also promotes innovation in work organization of the workshops, introduction of team concepts, increase flexibility of the employees and improvement of co-operation with car manufacturers.

On close examination the curricula structure of the Car Mechatronic concept is neither based on traditional school based vocational education where all relevant available technical information are taught, nor it is based on company based vocational training where it is normally structured around fragmented tasks to provide restricted area of objectively measured skills. Rather it is developed along a content driven and work process approach. In other words the contents of the curriculum are gained through work processes but not technology.

If the aim is to cover the knowledge and skill required by a competent worker for the required work tasks, then work itself has to be treated as an entity, the related work tasks in the workplace can then be listed and structured into learning fields and classified into levels.

The learning areas covers:

1. Objects of skilled work - functional work related knowledge.
2. Tools, methods and organization of skilled work - functional work process knowledge.
3. Requirements for skilled work and technology - integration of functional work related and work process knowledge.
4. Training objectives - application of skills and knowledge, enhanced with social and communication skills to achieve the objectives of work.

According to degrees of complexity and difficulty, the skills and knowledge provided to the prospective trainees can be classified into three or four levels, ranging from basic to specialized training.

A work process oriented curricula can be designed, consists of two inter-related structural areas, the learning contents and knowledge of work process. According to the proximity of relevant validity, the curricula can be delivered in either the VET institutions or the workplace itself. Close collaboration between VET professionals and workplace supervisors/management will form the backbone of the teaching/supervision function, with special emphasis place on continuous feedback, improvement and development of work related and work process knowledge.

Thus VET professionals of the new age not only have to be conversant with their own subject areas, but have to continuously updated themselves in the relevant field of work and to possess the capability of designing, developing and delivery of the new form of vocational education and training.

7. HOW TO DELIVER THE NEW FORM OF VET?

The above describes briefly the macro structure of new form of VET, but question of 'how' in terms of micro details have yet to be answered. If one looks at training and education, the term "Course" inadvertently appears. Generally speaking course can be described as a sequence of structured learning with a time interval between each session and the next. The course may stands on its own or it may be part of a program of studies aiming towards a formal qualification. But what types of courses are appropriate for the new form of VET? Could it be the combination of **"knowledge-oriented courses "**, **"Methodological courses"** and **"Issue-based courses"** (D. Rowntree 1981)? The question remains at how do we combine subject matter knowledge and the methodology of various academic discipline to prepare the student for the work tasks intended.

Knowledge-oriented course aims to get the student to learn and apply the subject matter for its own sake, but not as a vehicle for learning something else. Most pure science courses come into this category, e.g. physics, engineering sciences, biology, chemistry, etc.. Abundant subject matter has to be learnt by the student. Often, memorizing data and facts becomes more important for the student, that is if they want to pass the examination and gain the qualification intended. This leaves little time for them to think about it and to apply it to real life situations.

Methodological courses aims to provide intellectual, physical or social procedures or skills so that students can be a performer in the subject, rather than a spectator or a commentator on the knowledge achieved by others. Methodological courses can be of two types: Task-oriented and Discipline oriented.

Task oriented courses train the student to carry out some clearly defined activity, normally at technician level. Series of specific tasks and procedures are designed to train the students to deal with predictable work situations. Here only "how to do it" knowledge is transmitted.

Discipline oriented courses provides the opportunities for the students in learning a methodology that can be adaptable to a wide variety of circumstances. This methodology encroaches skills and knowledge that will enable the students to apply what they know, to acquire what they don't know, to think and deploy new and improved ways to tackle the work tasks at hand and within their subject area.

Issue-based courses centers on some issue or problem, which are seen to be relevant and significant to the student. The teaching will provide the students with conceptual tools and methodological tools for resolving the issue or arriving at a reasonable solution of the problem. These courses can often be multi-disciplinary whereby the contributing disciplines are introduced separately and attempt to inter-relate them towards the problem solution.

Before we can further our investigation into what courses and curriculum for VET, we must also include the students' needs into our considerations. It is crucial that if we were to motivate students we must identify and fulfill their needs. Their ability and capability to be educated and trained has to be taken into account as well.

If we can identify that the students needs hierarchically, it is argued that they will need to

- Get a job to provide for their physiological needs,
- Get a secured job so that they can feel safe,
- Get a responsible job so that they can be of social significance,
- Get a job with good promotional prospects to extend and to actualize their intelligence capacity and capability.

Thus if any VET program is to be effective, it must also caters for the students' ability, capability and needs.

Project based learning (J. Henry, 1994) represents a different approach form traditional schooling. Instead of the teacher deciding what topics and materials are relevant to the student. By definition, project is a set task given to students, to be completed at a given period of time, subjects are taught with some reference to some chosen topic, and students are encouraged to make independent enquiries to supplement formal teaching. In Project based learning, the students are allowed more control of the topic, seeking and equipping themselves with knowledge and skills that contributes to the solution of the task/problem at hand. The teacher takes on a different role, becoming more of a facilitator and adviser than pedagogue and expert.

If the overall objective of VET programs are to provide the trainees with work process related abilities and their ability in continuous acquisition of updated work process and related knowledge, then a **combined approach is suggested. Project based learning, incorporating various learning areas, structured in relevant levels, where work related and work process knowledge is transmitted and practiced through a combination of methodological and issue based courses, in VET institutions or in workplace where appropriate.**

Thus tasks in the workplace can be grouped and classified into projects of different levels.

Learning contents of projects can be provided in learning institutes, in the form of methodological and issue based courses. This will enable work related knowledge to be gained by the students.

Thereafter work related knowledge is used for practice in simulated situations, preferable in the VET institutions, allowing the students to gain some insight into the work process knowledge that lies ahead in the workplace.

The students will practice work related knowledge in assigned workplace to gain skill and work process knowledge in project form, gradually working their way up through different levels, gaining the competency, skills and knowledge intended for their field of work.

Under the tutorship of experienced supervisors and VET professionals, social and communication skills are obtained and utilized by the students, enabling continuous feed back and to seek further improvements.

After the completion of groups of projects in designated areas and progressively at different levels, the students will then be able to handle work independently, coping with unforeseen problems and to continuously update and improve themselves.

8. TRAIN THE TRAINERS.

If teachers and trainers are to utilize the workplace as the basis for lifelong learning, then they, themselves will need a thorough grounding in occupational/technical skills and work process knowledge. So far the focus was on the design of workplace as a medium and opportunity of acquiring work process knowledge, attention has to be paid to the role of teacher and trainer in mediating and facilitating this process. VET professionals should have an understanding of the theories of learning and be able to design learning situations based on the needs of the trainees, as well as the possession of skills and knowledge that will allow them to move from different contexts for learning.

Most Hong Kong VET professionals are predominantly professional teachers or practicing professionals. Very few have undergone specialist VET education as such. On close examination, VET professionals should possess both technical and pedagogical skill, especially if the suggested "Shaping" concepts of various professional profiles are to be practiced. In Europe, similar problems are encountered.

The report on new curriculum profile for the education of VET professionals" (G. Attwell, 1997) highlights the shortcomings of university programs in Europe, that it is normally based on academic areas and usually short and low level training courses. Most of these courses are for the development of training and competencies for skilled workers. The report carries on to point out that a strategic approach is required for the education of VET professionals. This analysis has led the European Commission to initiate a project new Forms of Education of Professionals for Vocational Education and Training" (EUROPROF). Subsequently a curriculum framework outlining the structure and content of a new Masters (MA) Degree qualification is produced. The program consists of four sections:

1. General background for vocational education and training including the history, structures and systems of VET and the economy and the labour market.
2. Vocational pedagogic covering the theory, practice and research in VET, methods and tools of research in social sciences, VET didactical theories, methods and approaches.
3. Examination of the development of occupations and occupational fields; the development of curricula and its related teaching and learning processes; opportunities for the development of learning situations for the analysis, shaping and evaluation of occupational work; development of life long learning and professional expertise through participation in the shaping of work.
4. Specialized area underpinning occupational profiles and skilled work in related area includes both theory and practice in the general subject and specialized areas within that subject.

There is little doubt that VET will be critical for the economic and social development in Hong Kong, especially into the 21st century. Future economic and employment development does rely heavily on the skills and knowledge of its workforce. There is urgent necessity for Hong Kong VET professionals as an entity to review their capabilities in meeting the future VET needs, to update and educate themselves, to help to shape the new VET principles that is in much need for the implementation of the new form of VET.

9. CONCLUSION.

The customary processes of initial and continuing vocational education and training do not prepare and equipped workers with ability and capability for the work activities of the 21st century. New concepts of occupational-related didactics, with their methodological implications, along with emphasis on life long learning will need to be developed. Attention of VET has to focus upon the provision of multi-skilling, flexibility and adaptability, ability to shape the design and organization of work for the 21st century worker.

VET professionals serve key functions in initiating and implementing a (initial and continuous) shaping oriented vocational education and training. In order to qualify and equip VET professionals in these capacities, the form and quality of their own initial and continuing education is of decisive importance.

The way ahead.

If the overall objective of VET is to equip Hong Kong with a well trained workforce to meet the demands of a dynamic economy and to contribute to the overall economic competitiveness (Education and Manpower Bureau, 1997), then a proactive rather than a reactive approach has to be adopted. One of the current Vocational Training Council commitments is to identify a new methodology so that improved labour market analysis can be carried out.

If this methodology is to be proactive, a more pragmatic rather than hypothetical approach has to be adopted. Industries has to be consulted and surveyed to form possible **scenarios** of what human resources might be required for the future. It is proposed that VET professionals will then apply the **'Shaping'** concept, enhancing these initial findings, according to various occupational requirement, forming **"professional profiles"** to suit relevant industrial needs. To ensure the validity of these so call "professional profiles", it is suggested that both industries and prospective students are to be briefed and consulted, inviting feedback for further updating and improvement of these "professional profiles".

A pilot scheme can be conducted into one or two of the main industries, e.g. manufacturing industries, banking service industries. The outcome can be used for development of an overall labour market analysis methodology. Further these outcome could be used as basis for development of "Shaping" concept of VET - that is, an integrated package with different levels of project based tasks groups through the provision of necessary work related and work process knowledge in relevant Professional profiles, jointly administered and delivered by VET professionals and workplace management. Similar schemes can be developed, taking into account of experiences and further improvement, for other industries.

Such pilot scheme can be planned, potential support can be sought from:

- Hong Kong Vocational Training Council, in the form of human, financial and facility resources, and in providing the background surroundings for conducting such research.
- Institute of Technology and Education, Bremen University of Germany (a world leading institution in vocational education) where experts' research experiences and facilities in related fields can provide guidance in planning, research and implementation of the pilot schemes.
- Education Development Unit, Hong Kong Polytechnic University, where pedagogical and didactical experiences and knowledge for local environment can be provided in forms of short courses and mini research projects.
- Institute of Vocational Education, Shanghai Tongji University PRC, where vocational education and training experience and research data can be shared through collaboration projects.

Equally important and urgently needed is that VET professionals have to be re-equipped with skills and knowledge to design, develop and deliver the new form of VET for the 21st century worker, base on the "Shaping" concept. To this end help has to be seek from other institutions that has prior experience in relative field.

In summary, development of "Professional Profiles" and VET professionals, in my view are two of the most important aspects that are in need of urgent attention. It is hoped that my limited contribution in the form of this report can provide some stimulus and impetus to the acceleration of provision of Vocational Education and Training for the Hong Kong 21st century worker.

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BIOGRAPHY

Mr. Manwey Leung is a Senior Lecturer of the Manufacturing Engineering Department in the Institute of Vocational Education (Chaiwan campus). He is a Chartered Engineer and a Senior Member of the Chinese Mechanical Engineer Society. He has worked in manufacturing industries covering various European countries for over twenty-five years, ranging from production engineering, to product development and to project management. His previous employers include Black and Decker PLC and Lucas Industries. In 1995 Mr. Leung was nominated by the Osaka Business Council to participate in the Factory Improvement Program in Osaka, organized by the Association for Overseas Technical Scholarship (Japan). A strong advocate of the 5S discipline in manufacturing, Mr. Leung believes that the human centered approach supported by appropriate discipline is a vital ingredient for success in manufacturing industries. The phrase CANDO (cleanliness, arrangement, neatness, discipline, organization) coined by Mr. Leung is widely used in Japan and United Kingdom, in conjunction with the 5S activities. Currently Mr. Leung is teaching manufacturing engineering subjects and conducts research into Knowledge-based teaching / learning methodology for vocational education and training.