Constructing An Integrative Education Platform for Engineering and Business Human Resources—The Innovative Experience at Taiwan

James Yu-Shan Liu, Dean, Academic Affairs, Ta Hwa Institute of Technology, Taiwan

ABSTRACT

In order to enhance innovation education for engineering and business human resources, a web-based interactive Fundamental Teaching Platform (hereafter as FTP), has been proposed at the campus of Ta Hwa Institute of Technology in Taiwan. FTP is a collaborative scheme that involves educators from widely different backgrounds to work on an interdisciplinary program. Under a grant support from government, Ta Hwa has successfully implemented a cross curriculum platform in the areas of Manufacturing and Commerce. Three departments in those areas, International Trade, Information Management and Automation Engineering, have been designated to develop course materials & training methods for this purpose since three years ago.

Through this FTP program, whose project running into three years, much anticipated and even unanticipated benefits have already emerged. This paper will present our experience in the course of program development and also discuss its impact upon methodological innovation related with construction of integrative platform that cuts across traditional disciplinary boundaries.

Keywords: Fundamental Teaching Platform, Integration of Manufacturing and Commerce program, Web-based Teaching, Wheel of Learning.

KNOWLEDGE-INTENSIVE CAMPUS AND TREND FOR INTEGRATIVE CURRICULUM

In the much-cited knowledge-based economy age, universities are supposed to provide business and society with competent human resources who can integrate knowledge and thus add potential value to their jobs (Drucker, 2000). However, traditional technical and vocational education system, which is based upon the concept of vocational training and skill-development, usually fails to meet this challenge.

Yet as shown by TABLE I (overleaf), environments drivers have made the need for human resources with integrative competency covering both engineering and business fields more imperative than ever. Universities nowadays have to invest great effort to formulate a program, which can meet business as well as engineering purpose.

Incidentally, functional-oriented concept of job training, which is characterized by Department-based program, also begins to include some concepts as shown in TABLE 1 (e.g. Supply Chain Management and Customer Relation Management). But until very recently, it has not yet started to build up an independent program around the core concept of integrative manufacturing and commerce process.

Thus as an overall project to improve our fundamental technology human resources here in Taiwan, government has put integrative education of manufacturing and commerce high priority on education and training agenda. With grant from Government, together with Ta-Hwa’s own matching fund, we then started to experiment on this three-year innovative project, totalling $1m.
Table 1: Trend For Integration Of Manufacturing And Commerce

<table>
<thead>
<tr>
<th>Drivers Fields</th>
<th>Environments Drivers</th>
<th>Technology Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.2. Shorter life-cycle for high-tech products.</td>
<td>• Just-in-time operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Agile manufacturing system.</td>
</tr>
<tr>
<td>2. Electronic Commerce (short as</td>
<td>2.1. EC is taking place everywhere.</td>
<td>• Innovative Business models (B2B or B2C).</td>
</tr>
<tr>
<td>EC)</td>
<td></td>
<td>• Supply-chain-management.</td>
</tr>
<tr>
<td>3. Knowledge-Intensive Teaching</td>
<td>3.1. Innovation is key to competitiveness.</td>
<td>• Knowledge-management.</td>
</tr>
<tr>
<td></td>
<td>3.2. Increasing value through IPR (Intellectual Property Rights)</td>
<td>• Innovation education.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Customer Relationship Management.</td>
</tr>
</tbody>
</table>

Source: adapted from Hou (2000)

In the Table 1 above, it is not very hard for us to understand why the traditional engineering or business education, based upon isolated training and learning courses, often fails to provide the industry with qualified and suitable graduates.

The main reason is that new technology or skill requirements in the present highly competitive environments often cut across traditional disciplinary boundaries. Take the competency requirement for Integrative Logistics for example. It not only covers engineering fields such as automation warehousing and product standardization, but also deals with the business areas such as material and distribution management and even demand forecast. So a new approach in program planning and training method is urgent (Costa & Kallick, 2000).

It is based upon this training philosophy thus Ta-hwa has set out to design and implement the above-mentioned FTP. Also for the purpose of reaching as many people as possible, this FTP is basically web-enhanced and can be accessed in real-time and on-line basis.

**CONFIGURATION OF FTP**

Though many see web-based education only as a supplement rather than a substitute for traditional training (Bollinger et al., 2000), e-learning and its related technology still dominate most of the so-called “teaching innovation” in these days.

Our original thinking is to design an interdisciplinary schema, addressing to issue of the integrative capability development, which is so urgently needed in modern industry. Web-based is not our main concern, initially. But the economy and flexibility nature associated with e-learning (Rosenberg, 2001) has made the choice an unavoidable one. Essentially, our FTP schema includes the following three parts:

- Setting up a web-based training data base, including interactive program covering essential business and manufacturing topics.
- Building an on-line learning intranet, functioning as an intelligent learning agent which can be accessed by user as useful tools in self-paced learning.
- Coordinating a comprehensive development plan which reorganizes and streamlines traditional function-oriented programs in a business process-oriented way.

**A. Process-orientated rather than function-oriented**

One drawback of traditional technical education is that effort of students is channelled to the narrow field knowledge of a specific topic only. While seeing each tree clearly, they fail to recognize the picture
of whole forest. So later in career development, they usually stop at technical position and cannot move forward to senior posts requiring integrative competency. Seeing this and realizing that process-oriented organizational reengineering is the dominant trend in modern business, priority in FTP has been assigned to design a program that cuts across traditional boundaries and incorporate the mechanism of wheel of learning as proposed by Senge (1990) and Handy (1996)(See FIGURE-1, below for detailed). This concept is also basically consistent with those courses reengineering projects which are currently being done in the traditional business school (Laputa, 2008). The core concept of this program is that business knowledge whether related with manufacturing or with commerce, should be aligned with actual value-added process in the real world. Course such as marketing research should not be learned and taught in an isolated way; rather it should be rearranged collaboratively with manufacturing course such as Product Design and Analysis.

![Web-based Integrative Database](image)

**Figure 1: Web-Enhanced Learning Database**

**B. Course Planning for FTP**

As business process-oriented program, such as one shown by FIGURE.1 above, is currently not available at Ta-Hwa, so a brand-new one is needed in this FTP. The program planning is interdisciplinary in nature as could be easily seen in TABLE.2 below. Each of three participating departments will tailor its original courses to fit into the whole process-oriented curriculum structure.

More specifically, the program planning includes three main parts as follows:

- Turning the usual classroom materials into electronic format (in power point or other digital form)
- Course structure is composed of modules, so each part can be independently learned and taught.
- Accompanying the electronic format of teaching material with video-audio supplements (mainly to explain the key content by participant teachers)
In such an arrangement, we hope the whole program can be run on a VOD (Video on Demand) basis as a supplementary to the traditional class teaching.

<table>
<thead>
<tr>
<th>Departments</th>
<th>Basic</th>
<th>Advanced</th>
<th>Comprehensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation</td>
<td>•Introduction to Engineering</td>
<td>•Quality Engineering</td>
<td>•Integration of Manufacturing &amp; Commerce</td>
</tr>
<tr>
<td>Engineering</td>
<td>•Mechanics</td>
<td>•Product Design &amp; Analysis</td>
<td>•Practice &amp; Graduation Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>•CAD</td>
<td>(These two courses applies to all three departments)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>•Manufacturing Strategy</td>
<td></td>
</tr>
<tr>
<td>International</td>
<td>•Economics</td>
<td>•Data-mining Research</td>
<td></td>
</tr>
<tr>
<td>Trade</td>
<td>•Applied Statistics</td>
<td>•Customer Relation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>•Financial Management</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>•Human Resources Management</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>•Data Base Management</td>
<td>•Operation Management</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>•System Analysis &amp; Design</td>
<td>•Operation Research</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>•E-Commerce</td>
<td></td>
</tr>
</tbody>
</table>

Currently, the designated requirement for this FTP program is 21 credit hours. When undergraduates, either from engineering or business background, register in this program, they will need to finish these 21 credits besides their original department’s requirement. In such an arrangement, students will be encouraged to study basic and advanced courses beyond their original scope, therefore enrich their knowledge basis.

C. Configuration of e-idea On-line learning

In order to enhance the FTP program, we have set up an on-line learning architecture, incorporating the up-graded version of e-learning package (e-idea). The configuration of this system is shown in FIGURE-2 below. The network is wired by optic-fibre (T1), and can be accessed through designated URL address. With this system, students enrolling in this program may get access to the rich data base of course-related material, and may even run direct dialogue with professors through interactive web pages. Of course, we still encourage students come to class and experience face-to–face learning experience in the context of group learning dynamics.

![Diagram of On-Line Learning Configuration](Web-access URL)

**Figure 2: On-Line Learning Configuration**
INITIAL RESULTS AND DISCUSSION

The whole program is in its third-year stage. 30 students, from business as well as engineering backgrounds, have been granted with completion certification and they have all got job offers with relatively attractive compensation. Yet how students as well as teachers in Ta-Hwa would react to this FTP in the long run remains to be seen. Still, there are a few points worthy of further notice:

• Interdepartmental interactions among teachers are increasing, and information sharing (such as teaching tips, cases material) is a common thing.
• School budgeting process is being run on a more rational and systematic way. Priority is now assigned to those hardware and software investment, which can be fitted into the whole FTP program.
• Schedule of online-learning materials (text and cases) are being developed on schedule. Teachers from above three departments benefit once again by re-arranging their teaching outlines and notes. This gives them a rather rare chance to reflect upon how to modularize their teaching schedule, so students from different backgrounds can learn in a self-paced mode.

ACKNOWLEDGEMENT

We want to thank efforts from Profs. Chang Huei-wen, Chung Chin-hwa, and Lo Wen-yang, who have been research leaders for the three departments during the execution of this FTP program, their contribution has made possible this FTP project. Grant from our Government and Ta-hwa is also highly appreciated.

REFERENCES

http://60.248.109.214/joomla/Netnew