A STUDY ON THE EDUCATING AND TRAINING OF THE TECHNOLOGICAL COMPETENCIES FOR MANPOWER AT THE MANUFACTURERS IN TAIWAN, R.O.C

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Abstract — *The major purposes of this study were to discuss the status and requirements of the competencies of technology of manpower, and to understand the ways and contents about the educating and training for technological manpower (college graduates at the department of mechanical engineering) at the manufacturers in Taiwan. Based on the review of literature, and collected data through questionnaire surveys method. The samples of this study included 80 personnel managers, 160 first-line managers, and 160 workers of 80 organizations of manufacturer. The return of survey questionnaires included 28 personnel managers (35.0%), 51 first-line managers (31.9%), and 44 workers (27.5%). The data obtained from this study, through means, t-test, and One-way Analysis, could be concluded mainly as follows: (1) Technological manpower require the competencies of produce skills (13 competencies), R&D skills (11 competencies), and marketing skills (13 competencies). (2) According to the views of personnel managers and first-line managers, workers (college graduates at the department of mechanical engineering) must be enriched in the competencies of produce skills, R&D skills, and marketing skills through educating and training. (3) Workers also express they need enriched in the competencies of produce skills, R&D skills, and marketing skills through educating and training.(4) There were some significant differences of the views among the workers in the different background about the requirements of training. (5) According to the views of workers, the educating and training courses provided from the manufacturers can enhance their technological competencies.*

Index Terms—*Educating and Training, College Graduates, Mechanical Engineering, Technological Competencies.*

INTRODUCTION

Employee training and management development are attempt to improve current or future employee performance by increasing an employee's ability to perform his job [1]. Today, many outstanding firms are use training and development (T&D) to make their organizations more productive and successful [2].

According to a recent survey in United States [3], due to many employees lack of skills, 40% manufacturers reported serious difficulties in upgrading their production technology. Also, 37% manufacturers are having difficulties reorganizing jobs because their employees are have problems learning new skills.

Training and development is also very important to organization in Taiwan because they are rapidly incorporating new technologies [4]. Many enterprises emphasis educating and training that can enhance workers' technological competencies. The goals of technical and vocational education are to cultivate the skills of craftsmen for our national construction, economic development, and the development of society. At the same time, the career development of the students educated for technical skills is also taking into consideration.

So, it is very positive signification to know junior college graduates entered the work world, whether have enough competencies of technology at manufacturer. Besides, it is very important to know the ways and contents about the educating and training for technological manpower at the manufacturers, and how many training courses can enhance their work abilities.

THE PURPOSE OF THE STUDY

The main purpose of the study as follow:

- To understand the status of the competencies of technology of manpower at manufacturer.
- To explore the requirements of the competencies of technology of manpower at manufacturer.
- To understand the ways and contents about the educating and training for technological manpower at the manufacturers in Taiwan.

LITERATURE STUDIES AND RESEARCH TOOLS

According to the content analysis of college courses at the department of mechanical engineering in Taiwan, develop the inventory of "the competencies of technology of manpower at manufacturer" which included three phases (37 items) as table 1 [5].

The ways of educating and training for the technological manpower at manufacturers are: on-the-job training (O.J.T.) and off-the-job training (Off J.T.). The methods of on-the-job training for the technological manpower at manufacturers are: job guidance, job rotation, special assignment, duty team, and document study. The methods of off-the-job training for the technological manpower at manufacturers are: lecture, reading, group discussion, audio-visual method,

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brain storming, case study, KJ method, and spot visit [6, 7, 8, 9, 10].

IMPLEMENTATION OF THE RESEARCH

Based on the review of literature, and collected data through questionnaire surveys method. The samples of this study included 80 personnel managers, 160 first-line managers, and 160 workers of 80 organizations of manufacturer.

The return of survey questionnaires included 28 personnel managers (35.0%), 51 first-line managers (31.9%), and 44 workers (27.5%).

SURVEY FINDINGS

The data obtained from questionnaire survey of this study, through means, t-test, and One-way Analysis, could be found as follows:

- **The status and requirements of the competencies of technology of manpower:** Most of manpower's technology competencies are acceptable, but still have 12 items technology competencies are not good. And, all of manpower express they need enriched in the competencies of produce skills, R&D skills, and marketing skills through educating and training(please refer to table 1, table 2).
- **The ways about the educating and training for technological manpower:** Most of manufacturers in Taiwan use the methods of on-the-job training(OJT) for the technological manpower are: job guidance(f=42, 95.5%), special assignment(f=29, 65.9%), document study(f=25, 56.8%), job rotation(f=22, 50.0%). And Most of manufacturers in Taiwan use the methods of off-the-job training(Off-JT) for the technological manpower are: lecture(f=26, 59.1%), case study(f=23, 52.3%), and spot visit(f=22, 50.0%)(please refer to table 3).
- **In terms of produce skills, the contents of educatin and training courses are:** process use(f=39, 88.6%), drafting(f=38, 86.4%), machine operation(f=38, 86.4%), product planning & control(f=38, 86.4%), material selection(f=37, 84.1%), machine design(f=37, 84.1%), computer application(f=37, 84.1%), machine maintenance(f=36, 81.8%), capacity of safety & health(f=36, 81.8%), plant management & layout(f=36, 81.8%), program design(f=33, 75.0%), awareness of machatronics(f=33, 75.0%), and engineering experiment(f=29, 65.9%)(please refer to table 4). All of these courses can enhance technological competencies efficiently for manpower(please refer to table 4).
- **In terms of R&D skills, the contents of educatin and training courses are:** product design(f=36, 81.8%), cost analysis(f=32, 72.7%), data collect(f=31, 70.5%), scheme of product(f=31, 70.5%), testing(f=31, 70.5%), process analysis(f=30, 68.2%), knowledge of patent(f=29, 65.9%), planning writing(f=29, 65.9%), document writing(f=29, 65.9%), theme decision(f=28, 63.6%), and performance appraisal(f=27, 61.4%)(please refer to table 4). All of these courses can enhance technological competencies efficiently for manpower(please refer to table 5).
- **In terms of marketing skills, the contents of educatin and training courses are:** aware of produce function(f=31, 70.5%), sale technique(f=30, 68.2%), information network use(f=30, 68.2%), product information providing(f=30, 68.2%), awareness of enterprise culture(f=29, 65.9%), marketing net setup(f=29, 65.9%), market survey(f=28, 63.6%), demand evaluation(f=28, 63.6%), advertising making(f=28, 63.6%), sale technique(f=28, 63.6%), and custom service f=28, 63.6%)(please refer to table 4). All of these courses can enhance technological competencies efficiently for manpower(please refer to table 5)

TABLE I
THE DEGREE OF TECHNOLOGICAL COMPETENCIES OF MANPOWER

Phase	Items	Degree
Produce skill	Drafting	3.250 ?
	Material selection	2.955 ?
	Process use	3.901 ?
	Machine operation	3.000 ?
	Engineering experiment	2.659 ?
	Machine design	2.841 ?
	Machine maintenance	3.205 ?
	Product planning & control	3.045 ?
	Capacity of safety & health	3.227 ?
	Plant management &layout	3.159 ?
	Computer application	2.727 ?
	Program design	2.364 ×
	Awareness of mechatronics	2.364 ×
R&D skill	Theme decision	2.614 ×
	Data collect	2.841 ?
	Knowledge of patent	2.727 ?
	Scheme of product	2.886 ?
	Product design	2.727 ?
	Planning writing	2.545 ×
	Process analysis	2.773 ?
	Testing	2.568 ×
	Cost analysis	2.705 ?
	Performance appraisal	2.659 ?
	Document writing	2.705 ?
Marketing skill	Market survey	2.682 ?
	Demand evaluation	2.682 ?
	Trademark building	2.523 ×
	Advertising making	2.432 ×
	Awareness of consumer behavior	2.568 ×
	Sales technique	2.500 ×
	Marketing planning	2.432 ×
	Marketing net setup	2.295 ×
	Information network use	2.636 ×
	Awareness of enterprise culture	2.841 ?
	Awareness of product function	3.227 ?
	Product information providing	3.114 ?
	Custom service	3.159 ?

? Technology competence is acceptable
×Technology competence is not good

TABLE II
THE EDUCATING AND TRAINING REQUIREMENT OF TECHNOLOGICAL MANPOWER (N=44)

Phase	Items	Degree
Produce skill	Drafting	3.909 ?
	Material selection	3.841 ?
	Process use	3.909 ?
	Machine operation	3.705 ?
	Engineering experiment	3.682 ?
	Machine design	3.886 ?
	Machine maintenance	3.727 ?
	Product planning & control	3.864 ?
	Capacity of safety & health	3.864 ?
	Plant management &layout	3.795 ?
	Computer application	4.045 ?
	Program design	3.932 ?
	Awareness of mechatronics	3.977 ?
R&D skill	Theme decision	3.795 ?
	Data collect	3.886 ?
	Knowledge of patent	3.705 ?
	Scheme of product	3.955 ?
	Product design	3.955 ?
	Planning writing	3.705 ?
	Process analysis	3.818 ?
	Testing	3.659 ?
	Cost analysis	3.705 ?
	Performance appraisal	3.659 ?
	Document writing	3.568 ?
Marketing skill	Market survey	3.591 ?
	Demand evaluation	3.500 ?
	Trademark building	3.477 ?
	Advertising making	3.523 ?
	Awareness of consumer behavior	3.636 ?
	Sales technique	3.659 ?
	Marketing planning	3.705 ?
	Marketing net setup	3.682 ?
	Information network use	3.750 ?
	Awareness of enterprise culture	3.795 ?
	Awareness of product function	3.659 ?
	Product information providing	3.591 ?
	Custom service	3.568 ?

? Require educating and training

TABLE III
TRAINING WAYS AND METHODS AT MANUFACTURER (N=44)

Ways	Methods	F	%	Ranking
On Job Training (O.J.T.)	Job guidance	42	95.5	1
	Job rotation	22	50.5	4
	Special assignment	29	65.9	2
	Duty team	18	40.9	5
	Document study	25	56.8	3
Off-the-job training (Off J.T.)	Lecture	26	59.1	1
	Reading	16	36.4	6
	Group discussion	20	45.5	5
	Audio-visual method	14	31.8	7
	Brain storming	21	47.7	4
	Case method	23	52.3	2
	KJ method	14	31.8	7
	Spot visit	22	50.0	3

TABLE IV
THE EDUCATING AND TRAINING COURSE RUN AT MANUFACTURER (N=44)

Phase	Competence Items	Training course run No. of company (%)
Produce skill	Drafting	38 (86.4)
	Material selection	37 (84.1)
	Process use	39 (88.6)
	Machine operation	38 (86.4)
	Engineering experiment	29 (65.9)
	Machine design	37 (84.1)
	Machine maintenance	36 (81.8)
	Product planning & control	38 (86.4)
	Capacity of safety & health	36 (81.8)
	Plant management &layout	36 (81.8)
	Computer application	37 (84.1)
	Program design	33 (75.0)
	Awareness of mechatronics	33 (75.0)
R&D skill	Theme decision	28 (63.6)
	Data collect	31 (70.5)
	Knowledge of patent	29 (65.9)
	Scheme of product	31 (70.5)
	Product design	36 (81.8)
	Planning writing	29 (65.9)
	Process analysis	30 (68.2)
	Testing	31 (70.5)
	Cost analysis	32 (72.7)
	Performance appraisal	27 (61.4)
	Document writing	29 (65.9)
Marketing skill	Market survey	28 (63.6)
	Demand evaluation	28 (63.6)
	Trademark building	27 (61.4)
	Advertising making	28 (63.6)
	Awareness of consumer behavior	26 (59.1)
	Sales technique	30 (68.2)
	Marketing planning	28 (63.6)
	Marketing net setup	29 (65.9)
	Information network use	30 (68.2)
	Awareness of enterprise culture	29 (65.9)
	Awareness of product function	31 (70.5)
	Product information providing	30 (68.2)
	Custom service	28 (63.6)

TABLE V
THE EFFICIENCY OF EDUCATING AND TRAINING COURSE RUN

Phase	Competence Items	Efficiency No. of company (%)

Produce skill	Drafting	35 (92.1)
	Material selection	26 (66.7)
	Process use	25 (64.1)
	Machine operation	25 (65.8)
	Engineering experiment	21 (72.4)
	Machine design	25 (67.6)
	Machine maintenance	25 (69.4)
	Product planning & control	23 (60.5)
	Capacity of safety & health	26 (72.2)
	Plant management &layout	25 (69.4)
	Computer application	25 (67.6)
	Program design	22 (66.7)
	Awareness of mechatronics	22 (66.7)
R&D skill	Theme decision	19 (67.9)
	Data collect	20 (64.5)
	Knowledge of patent	19 (65.5)
	Scheme of product	21 (67.7)
	Product design	22 (61.1)
	Planning writing	19 (65.5)
	Process analysis	20 (66.7)
	Test ing	23 (74.2)
	Cost analysis	20 (62.5)
	Performance appraisal	19 (70.4)
	Document writing	20 (69.0)
Marketing skill	Market survey	20 (71.4)
	Demand evaluation	20 (71.4)
	Trademark building	20 (74.1)
	Advertising making	20 (71.4)
	Awareness of consumer behavior	20 (76.9)
	Sales technique	20 (66.7)
	Marketing planning	20 (71.4)
	Marketing net setup	20 (69.0)
	Information network use	21 (70.0)
	Awareness of enterprise culture	20 (69.0)
	Awareness of product function	21 (67.7)
	Product information providing	21 (70.7)
	Custom service	21 (70.7)

CONCLUSIONS

According to the survey findings, have major conclusions as follows:

- Technological manpower require the competencies of produce skills (13 competencies), R&D skills (11 competencies), and marketing skills (13 competencies).
- According to the views of personnel managers and first-line managers, technological manpower (college graduates at the department of mechanical engineering) must be enriched in the competencies of produce skills, R&D skills, and marketing skills through educating and training.
- Workers also express they need enriched in the competencies of produce skills, R&D skills, and marketing skills through educating and training.
- According to the views of workers, the educating and training courses provided from the manufacturers can enhance their technological competencies.
- In Taiwan, manufacturer's personnel managers and first-line managers pay much attention to provide educating and training courses. These courses improve workers' technological competencies efficiencely.

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