

## **Factors Affecting Training Effectiveness. A Study of Semiconductor Wafer Fabrication Industry in Malaysia**

**Abdullah Lin<sup>1</sup> & Mohd Yazam Shariff**

*College of Business  
Universiti Utara Malaysia,  
<sup>1</sup>s90536@ss.uum.edu.my*

### **Abstract**

*Human Resource Development is one of the key issues for Malaysian companies since the introduction of Human Resource Development Fund (HRDF). This is the fact that rapid changes in the organizations need to develop a more focused and coherent approach to develop and manage people (Kirkpatrick 1979; Senge, 1990). The senior management must consider the important of providing training to the people by understanding and believing that training is one of the important factors in organizational effectiveness. For technological based industry such as in wafer fabrication, the technical training for technical staff is very crucial. Hence, the HR manager must really outline the required training programs focus to the outcomes as well as measuring the effectiveness of the training. Factors that contribute to the training effectiveness must be put into serious consideration so that the amount invested into training is benefited. As such, the objectives of this paper are to review previous literatures and reveal the factors that affect the training effectiveness and outcomes. The scope of this research covers the Semiconductor Wafer Fabrication Companies in Malaysia.*

### **INTRODUCTION**

Management is about getting things done through or with other people (Flippo, 1976; Follet, 1995). On the other hand, Human Resource Management (HRM) is about the policies and procedures which an organization needs to manage its people throughout their working lives and to ensure that they are provided with a safe and healthy environment. HRM is presented as a new and unitary approach where values and policies are developed with an emphasis on making full use of the talents of all people in the organization (Guest, 1990).

As organizations vary in size, goals, functions, complexity, construction, the physical nature of their product, and appeal as employers, so do the contributions of HRM. But, in most the ultimate goal of the HR function is to: "ensure that at all times the business is correctly staffed by the right number of people with the skills relevant to the business needs", that is, neither overstaffed nor understaffed in total or in respect of any one discipline or work grade (Morton, 2004; Mucha, 2004; Hewitt, 2005). In other word, getting the right people at the right time for the right job!

### **SEMICONDUCTOR WAFER FABRICATION IN MALAYSIA**

Semiconductor wafer fabrication (fab) is becoming one of the most demanding and challenging industry in Malaysia. It is not only requires huge investment of money but it is also needs special skills and knowledge to run the fabs. In other words, Malaysia has to develop a pull of resources to meet the wafer fabrication requirements. Semiconductor device fabrication is the process used to create chips, the integrated circuits that are present in everyday electrical and electronic devices. The entire manufacturing process from start to packaged chips ready for shipment takes six to eight weeks.

Starting with a assembly plants, the semiconductor industry has developed into a comprehensive industrial system with vertical and horizontal division of labor. It has gone through various growth stages, involving foreign-capital-based assembly, manufacturing technology transfer, growth of local plants, industrial system expansion and upgrading by industrial cooperation. The corresponding strategies for technology development cover technology introduction, technology transfer and cooperative R&D, with gradually escalating technological capabilities successfully encouraging industrial growth.

## HRD IN MALAYSIA'S SEMICONDUCTOR WAFER FABRICATION

Wafer fabrication companies in Malaysia invested a huge sum to get its workforce ready with the required skills to operate the foundry. To effectively start-up this wafer fabrication plant, a technology transfer training structure was established. This structure is able to receive any technical qualification and background of new hires and quickly turn them into semiconductor processing or equipment engineers. All newly hired personnel, after successfully completing their orientation must attend certain hours of mandatory classroom. This will provide them with the basic knowledge of company systems to effectively begin their on-the-job training.

The role of the human resource development function is to ensure that the current and future knowledge, skills, abilities and performance needs of the workforce are understood and can be achieved within the timeframe required by the organization. This is accomplished through processes and programs designed to address employee training, change and performance management initiatives, and other development needs that may be unique to specific employee groups within the organization.

## LITERATURE REVIEW

Goldstein(1993) defines training as a systematic acquisition of skills, rules, concepts or attitudes that results in improved performance in another environment. Flippo (1976) defines training as the act of increasing the knowledge and skills of an employee for doing a particular job. He further states that “ no firm has a choice of whether to train or not; the only choice is that of method’.

Hinrichs Bramley (1991) defines training as any organisationally initiated procedure, which is intended to foster learning among organisational members in a direction contributing for organisational effectiveness. Bramley (1991) summarises training as:

- A systematic process with some planning and control rather than learning from experience;
- Being concerned with concepts, skills, and attitudes of people treated both as individual and as a member of the various groups;
- Being intended to improve performance in the present and the following job and through this should enhance the effectiveness on the part of the organisation in which the individual or group works.

Koehorst and Verhoeven (1986) agree the above finding in their study of improving training effectiveness in Netherlands. The new training cycle which is an endless belt of training and development which shows how validation is intrinsically linked to design and delivery, evaluation is linked to objectives and outcomes, and results linked to the organisational needs (Reeves, 1994).

Considering training as adult education and part of the ongoing process in organizational change, such programs would have to be framed as a process of learning and development (Longenecker, Simonetti & LaHote, 1998) by creating a design that meets the needs of the organization and targeted participants, and providing a feedback system to redesign and adjust further iterations of the program based on organizational and participant perspectives and needs (Bozionelos & Lusher, 2002; Stevens, 1996; Stumpf, 1998; Arnone, 1998).

The common view is to complete the cycle of training. Bramley (1991) suggests that it is integral to the cycle and has the key role of quality control of the cycle by providing feedbacks on:

- a) the effectiveness of the method used
- b) the achievement of the objectives set by trainers and trainees
- c) whether the needs originally identified, both at organisation and individual levels, have been met.

Effectiveness is the extent to which an activity fulfils its intended purpose or function. It is a measure of how well the learning objectives have been met. Fraser (1994, p. 104) defines effectiveness as a measure of the match between stated goals and their achievement. It is always possible to achieve ‘easy’, low-standard goals. In other words, quality in higher education cannot only be a question of achievements ‘outputs’ but must also involve judgements about the goals (part of ‘inputs’). Erlendsson (2002) defines effectiveness as the extent to which objectives are met (‘doing the right things’).

Engaging in the measurement of educational effectiveness creates a value-added process through quality assurance and accreditation review and contributes to building, within the institution, a culture of evidence

(Vlăsceanu, Grünberg & Pârlea , 2004). Wojtczak (2002) defines effectiveness in the context of medial education as a measure of the extent to which a specific intervention, procedure, regimen, or service, when deployed in the field in routine circumstances, does what it is intended to do for a specified population. In the health field, it is a measure of output from those health services that contribute towards reducing the dimension of a problem or improving an unsatisfactory situation. West (1999) argues that in relation to training, as opposed to education, one way of looking at the issue of effectiveness is in terms of whether there are 'identifiable economic outcomes'. A broader definition still focuses on the extent to which training 'meets its objectives'. Descy and Westphalen (1998) define this more precisely as training that 'meets its objectives as defined by its funding body'. This is a useful definition since it is undoubtedly the funding body that ultimately decides whether or not training will be made available. Whilst this is a useful test, there are two points to bear in mind. First, it is not always the case that the funders' precise objectives are transparent, although their general aims may be. Second, whilst the funders may have objectives, it is only by relating the extent to which these are perceived to have been met – by the various stakeholders (e.g. individuals, enterprises) – that one can really understand the extent to which the training has been effective. There may also be unintended consequences of training that aid an individual's employability – for example, improving 'soft skills' such as an individual's self-esteem, motivation or ability to work in a team.

Although employee training has become more prevalent today than 15 years ago, many companies conduct training simply for appearance sake (Hughey & Mussnug, 1997), instead of focusing on adult learning and development (Wills, 1994; Hollenback & Ingols, 1990; Humphrey, 1990; Kolb's, 1984), experiential learning (Whetten & Clark, 1996); and cognitive abilities (Carter, 2002). Saiyadain and Juhary (1995) conducted a study on managerial training in Malaysia and their findings on training effectiveness showed that most organisation seem to lack the formal mechanisms to access training effectiveness. They suggested that top management attitude is important for training to be effective.

The success of learning can be measured from the outcomes shown after the training, such as the behaviour, skills and knowledge of the participants. The more specific and measurable these objectives are, the easier it is to identify relevant outcomes for the evaluation. Based on the learning objectives, outcome measures are designed to assess the extent to which learning and transfer should develop.

Training evaluation should be considered before the actual training occurs.

According to Phillip (1991) evaluation is undertaken for several purposes, which are:

- To determine whether a program is accomplishing its objectives
- To identify the strengths and weaknesses of the HR process
- To determine the cost/benefit ratio of an HR programme
- To decide who should participate in future programmes
- To test the clarity and validity of tests, questions and exercises
- To identify which participants benefited the most or at least from the programme.
- To reinforce major points made to the participants
- To gather data to assist in marketing future programmes
- To determine if the programme is appropriate
- To establish a database, which can assist management in decision-making

To identify whether the objectives of the training is achieved by evaluation, the contemporary model calls for evaluation at various stages and thus allows for feedback throughout the training process and not just at the end.

Since the introduction of Tyler's (1942) evaluation model, many other models have emerged, each reflecting the evaluation requirements of its time. McCoy and Hargie (2001) list some existing models: goal-free evaluation (Scriven, 1967); Campbell's (1969) scientific approach; illuminative evaluation (Parlett & Hamilton, 1977); utilization-focused evaluation (Patton, 1986); the responsive mode that takes into account environmental and stakeholders' needs (Cronbach, Ambron, Dornbusch, Hess, Hornik, Phillips, Walker & Weiner, 1980); fourth generation evaluation (Guba & Lincoln, 1989); and realistic evaluation (Pawson & Tilley, 1997). Goal-based and systems-based approaches are predominantly used in the evaluation of training (Philips, 1991). Various frameworks for evaluation of training programs have been proposed under the influence of these two approaches. The most influential framework has come from Kirkpatrick (1959; 1975; 1979; 1994; 1998). Kirkpatrick's work generated a great deal of subsequent.

Kirkpatrick's model follows the goal-based evaluation approach and is based on four simple questions that translate into four levels of evaluation. These four levels are widely known as reaction, learning, behaviour, and results. Even though there are many evaluation models available, Kirkpatrick's model is more popular and easy to follow. Kirkpatrick states that there are four levels of evaluation;

- Level 1 – Learning
- Level 2 – Reaction
- Level 3 – Behaviour
- Level 4 – Result

## **METHODOLOGY**

Quantitative Method was used in this study including distribution of questionnaire to participants and interview with selected people such as engineer and manager. They are selected based on their capability to response and make judgement to the questions asked by the researcher. This is to further support and validate the data obtained from the questionnaire.

The quantitative method is used because the reality is objective, out there, and independent of researcher. The research is based primarily on deductive forms of logics and theories and hypotheses are tested in a cause-effect order. Moreover, the goal is to develop generalizations that contribute to theory that enable the researcher to predict, explain, and understand some phenomenon (Creswell, 1994). The use of survey method precludes the ability to establish the casual priorities of the independent and dependent variables (Niehoff et al, 1990). Also to determine the existence of cause and effect relationship thus to demonstrate variation between the independent variables and dependent variables (Cook and Campbell, 1976). Closed-ended format was used in order to make the respondents feel easier to answer and to increase the number of completed responses and also to make data analysis convenient and more objective (Sekaran, 1992).

The research model guided the construction of the questionnaire. The questions are set in English only because all the participants can understand English. The questionnaires have been distributed to them through meeting, email and hardcopy. As a start, the questionnaires were tested to 25 people comprising of technician, engineer and manager. The questionnaires were self-administered through mail and personal meeting. In addition, the researcher also conducted interview with a few of them to validate the data collection.

The questionnaire consists of four main parts; the demographic questionnaires, the factors affect training effectiveness, the overall performance or training effectiveness or outcomes and respondent comment.

Training effectiveness and outcomes are measured through a self-report of the trainees. Merzoff (1987) support the findings of previous researches that self-report is an effective method of obtaining information on training effectiveness provided that response-shift-bias is eliminated. Hence, respondents in this research are required to indicate their agreement or disagreement with the statement using the five-point scale. This interval scale allows us to compute the mean and standard deviation of the responses on the variables, thus allowing us to measure the magnitude of the differences in the preferences among the individuals.

The five-point scale are as follows:

- 1- Strongly disagree
- 2- Disagree
- 3- Neutral
- 4- Agree
- 5- Strongly Agree

To compute the data collected from the survey, SPSS Version 16.0 for Window was used. The regression analysis and frequency data were used to analyse the results of the survey.

## **RESEARCH FRAMEWORK**

The aim of this study is to identify the factors that affect the effectiveness and outcome of training programs of wafer fabrication companies. Data analysis for this study is a quantitative type. The

effectiveness level and the outcome of the trained employees are analysed based on the data gathered from the employees of the participation companies. Therefore, in this research, the theoretical framework of the outcome and effectiveness of the training program is the dependent variables, while factors to successful of training will be the independent variables. The moderating variables would be the demographic.

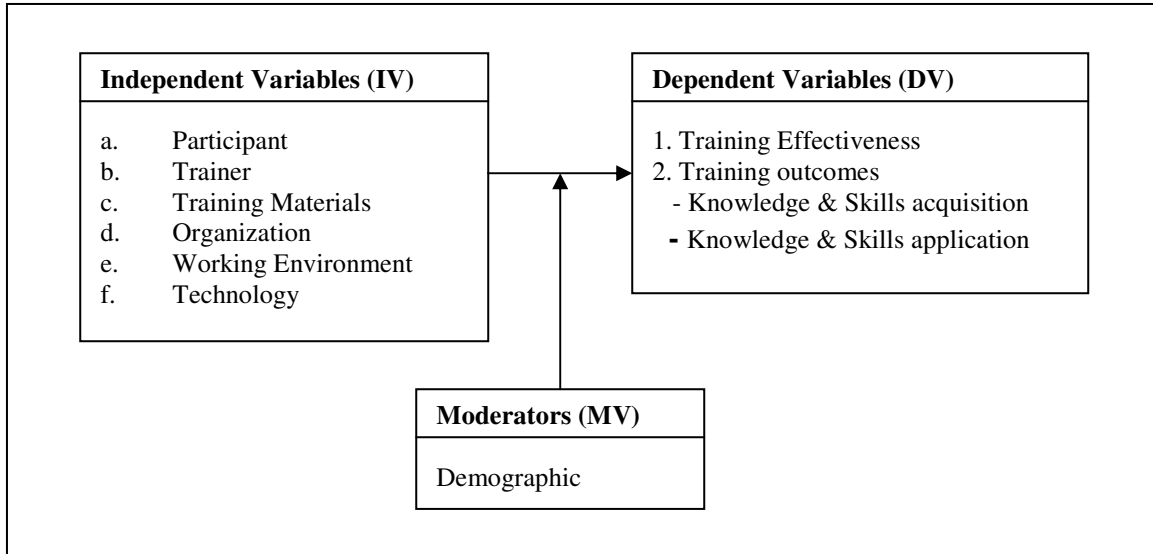


Figure 1: Research Framework

## RESULT

For a pilot test, 25 sets of questionnaire have been distributed to Silterra’s employees covering from Technician to Senior Engineer. All of them are from Operation department that includes module engineering sections, quality section and engineering support section. The survey took an about one month so that the participants have enough time to response to the survey. Out of 25 sets, only 22 sets were fully complied with the requirements. Two sets of survey were found incomplete or improperly marked and one set was not returned. The response rate was 96 percent and the rejected rate was 12 percent.

Each factor was assigned with 7 questions and each training outcome and effectiveness was assigned with 10 questions. The result of the reliability test of Factors, Training Outcomes and Training Effectiveness indicated that majority of Cronbach Alphas were above 0.8. Thus, this indicates positive result of the reliability test. In other word, the data was reliable.

The evaluation of the findings are divided into 10 sections - 7 sections on the factor, 2 sections on the training outcomes, and 1 sections on the training effectiveness. Table 7.1 and 7.2 showed some samples of the results.

Table 7.1: Summary of the means for Factor - Participant

FACTORS AFFECT TRAINING EFFECTIVENESS & OUTCOMES		Mean of
<b>A. Participant</b>		Variable = <b>3.76</b> Standard Deviation = <b>0.677</b>
1	I take the initiative to attend the training	3.95
2	I have the prior skill before attending program	3.32
3	I have the prior knowledge before attending the program	3.45
4	I believe that I can perform better job after attending the training	4.09
5	I take the opportunity for positive change by attending the training	4.05
6	I don't enjoy attending this training - (recoded for analysis)	4.00
7	I was informed about the objectives of this training	3.41

The variable mean was 3.76 and the mean of standard deviation was 0.677 indicated that most of the respondents ‘agree’ that participant is one the factors affect the training effectiveness.

**Table 7.2: Summary of the mean – Training Effectiveness**

<b>TRAINING EFFECTIVENESS</b>		<i>Mean of Variable = 3.87 Standard Deviation = 0.664</i>
1	The objectives were clearly stated and discussed	3.86
2	Each objective was achieved successfully	3.68
3	The objectives aligned with my job function	3.64
4	The training has help me to utilize my potential	3.91
5	I believe this training has made me and others to be a better worker	3.86
6	I believe those who attend this training would perform better after attending this training	3.68
7	I can align my career development to meet company’s objectives	3.77
8	The training program is a waste of company time and money – ( <i>recoded for analysis</i> )	4.18
9	I am confident that I have the ability to succeed in my work.	4.14
10	Overall, I was satisfied with the course	3.95

The variable mean was 3.87 and the mean of standard deviation was 0.664 indicated that the respondents were quite agreed that all factors identified in this study contributed to the training effectiveness. From the pilot study majority of the respondents indicated that factors such as participants, trainers, training material, training program, organization, working environment, and technology are the factors that effect training effectiveness and training outcomes.

**Summary of overall findings**

The summary of all the findings is shown in Table 7.3. The result shows that not all the factors affect the training effectiveness.

**Table 7.3: Summary of the overall findings**

<b>Factors Affects Training Effectiveness</b>	<b>Reaction -</b>	<b>Learning - Knowledge &amp; Skill Acquisition</b>	<b>Behavior – Knowledge &amp; Skill Application</b>	<b>Result - ROI</b>
Participant	<b>Yes</b>	<b>Yes</b>	No	No
Trainer	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Training Material	<b>Yes</b>	No	<b>Yes</b>	No
Training Program	No	<b>Yes</b>	No	No
Organization	No	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Working Environment	Yes	No	<b>Yes</b>	<b>Yes</b>
Technology	No	No	<b>Yes</b>	<b>Yes</b>

**DISCUSSION**

The above results (Table 7.3) revealed that not all the factors stated in this study affect the training effectiveness. For instance, factors such as participant and training program were not had impact to behaviour and result (training effectiveness). On the other hand, trainer characteristics will have an affect to training effectiveness. This study shows that trainer plays an important role to ensure the class is lively and

interesting. This is because, Malaysian training culture still require trainer to boost up the training environment otherwise the training will not effective (Abdullah, 1996). The author would like to address that the above result is only a preliminary study and the result may not represent the actual situation. As such, the next study will have bigger sample size so that the result will be more significant to represent the entitle population.

## CONCLUSION

Outcome and effectiveness of the training is about quality issues – the quality of diagnostic; the specificity of learning objectives; the way the training design is put together to match the particular needs of the learners; the crucial element of managerial reinforcement afterwards. The main objective in this study is to find out the factors that affect the training outcome and effectiveness of the training program. The effectiveness is referred to whether the objectives are met or not. It is also important to remember that effectiveness typically is concerned with getting employees to do their jobs better: that is the direct purpose of the training (Newby, 1992). The result of this research revealed that all factors discussed have an impact to the training outcomes and training effectiveness. Overall result is positive means those factors are important for training managers to emphasize so that the training conducted is effective. It is also provides an answer to top management to ensure all factors are well taken care so that suitable actions plan can be taken to improve the effectiveness of the training.

## REFERENCES

- Abdullah, A (1996), Going Glocal: Cultural Dimensions in Malaysian Management, MIM, Kuala Lumpur.
- Arnone, M. (1998), Corporate Universities: a viewpoint on the challenges and best practices, *Career Development International*, Vol. 3 No.5, pp.199-205.
- Brinkerhoff, R.O., Montesino, M.U (1995), Partnerships for training transfer: lessons from a corporate study, *Human Resource Development Quarterly*, pp.263-74..
- Cronbach, L.J., Ambron, S.R., Dornbusch, S.M., Hess, R.D., Hornik, R.C., Phillips, D.C., Walker, D.F., Weiner, S.S. (1980), Toward Reform of Program Evaluation, Jossey-Bass, San Francisco, CA, .
- Flippo, B. Edwin (1976), Principles of Personnel Management, 4<sup>th</sup> Ed., McGraw-Hill Book Co, New York.
- Follet, P. Mary (1995), Mary Parker Follett Prophet of Management, Lightning Source Inc.
- Guest, D.E (1990). Human resource management and the American dream. *Journal of Management Studies*, Vol. 27 No.4, pp.377-97
- Hewitt Associates. (2005). Homepage of the HEWITT. *Companies measure employees, not themselves, with performance plans* [Press Release]. Retrieved June 3, 2006, <http://www.hewitt.com>.
- Hiltrop, J.M, Despres, C, Sparrow, P (1995). The changing role of HR managers in Europe, *European Management Journal*, Vol. 13 No.1, pp.91-8.
- Kirkpatrick, Donald (1959). Techniques for evaluating training programs, *Journal of the American Society of Training Directors*, 13, 3-26.
- Kirkpatrick, Donald (1975). Technique for Evaluating Program: Level 1,2,3 and 4. Evaluating Training Programs, ASTD.
- Kirkpatrick, Donald (1979). Techniques for evaluating training programs. *Training and Development Journal*, 33(6), 78-92.
- Kirkpatrick, D.L. (1994). Evaluating Training Programs: The Four Levels, Berrett-Koehler, San Francisco, CA, .
- Kirkpatrick, Donald (1998). Evaluating training programs – The Four Levels. 2<sup>nd</sup> Edition, Berret-Koehler Publisher, Inc., San Francisco, CA.
- Koehorst, Piet and Verhoeven, Willem (1986). Effectiveness and Efficiency in Industrial Training, Part 2: How to improve effectiveness, *Journal of European Industrial Training*, pp 11-16.
- Longenecker, C.O., Simonetti, J.L., LaHote, D. (1998). Increasing the ROI on management education efforts, *Career Development International*. Vol. 3 No.4, pp.154-60.
- McCoy, M., Hargie, O.D.W. (2001). Evaluating evaluation: implications for assessing quality. *International Journal of Health Care Quality Assurance*, Vol. 14 No.7, pp.317-27
- Morton, L. (2004). Integrated and integrative talent management: A strategic HR framework. New York: The Conference Board, Inc

- Parlett, M., Hamilton, D. (1977). Evaluation as illumination, in Parlett, M., Dearden, G. (Eds), Introduction to Illuminative Evaluation: Studies in Higher Education, Pacific Soundings Press, Berkeley, CA, pp.9-29.
- Pawson, R., Tilley, N. (1997). Realistic Evaluation, Sage, Thousand Oaks, CA,
- Phillips, J.Jack (1991). Handbook of Evaluation and Measurement Methods, 2<sup>nd</sup> ed., Gulf Publishing Company: Houston, USA.
- Prickett, R. (1998), Firms complain of quality short fall among students, *People Management*, No.July 9, pp.10.
- Reeves, Martha (1994). Evaluation of Training, Pelanduk Publication: Petaling Jaya.
- Roffe, I.M. (1999). Innovation and creativity in organisations: a review of the implications for training and development, *European Industrial Training*, Vol. 23 No.4/5, pp.224-38.
- Saiyadain, Mirza and Haji Ali, Juhary (1995). Managerial Training and Development in Malaysia, Malaysian Institute of Management: pp. 57, 72-73.
- Schuler, R.S (1989). Strategic human resource management, *Human Relations*, Vol. 42 pp.157-84.
- Senge, M, Peter (1990), The Fifth Discipline: The Art and Practice of the Learning Organisation, Bantam Doubleday Dell Publishing Group, New York.
- Stevens, P. (1996), What works and what does not in career development programmes, *Career Development International*, Vol. 1 No.1, pp.11-18
- Stumpf, S.A. (1998). Corporate universities of the future. *Career Development International*, Vol. 3 No.5, pp.206-11.
- Ulrich, D. (1997). Measuring human resources: an overview of practice and prescription for results, *Human Resource Management*, Vol. 36 No.3, pp.303-20.
- Vlăsceanu, L., Grünberg, L., and Pârlea, D., (2004). Quality Assurance and Accreditation: A Glossary of Basic Terms and Definitions (Bucharest, UNESCO-CEPES) *Papers on Higher Education*, ISBN 92-9069-178-6.