

## Effective Management Development Must Prepare Engineers for Top Level Global Management Tasks

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Large corporations are struggling for survival. The reasons vary. For some, it is the march of global competition into markets once dominated by the United States. For others, it is the impact and push toward deregulation and a freer economy. For still others it is a court decree that forces them to divest themselves of major operations, which may become rivals in the marketplace. But whatever the reason for struggling in today's business environments, the result is the same: increased competition. Fully one-third of the organizations listed in the Fortune 500 in 1970 have ceased to exist in 1988 (Bolt, 1989). Many others which have continued in business have done so only after surviving bankruptcies or mergers. Such a change rate is not surprising because the competitive marketplace is volatile and strategies for competition are changing at a dramatic rate. The restrictions of access to unique technology are declining as technology becomes less and less proprietary and therefore available to several competitors in the same market. A corporation can no longer rely solely on exclusive technology. Harsh realities of this new competitive environment have dictated new rules for corporate managements. Many have downsized their companies to streamline operations.

According to Grotelueschen (1986), professional development of managers is important to executive success and organizational competitiveness, and it is imperative that only quality management development programs are offered and evaluated for effectiveness.

As professional knowledge increases in complexity and practice circumstances change, professionals are being held accountable for maintaining and developing proficiency in the quality of services they provide. At the same time, they must justify time spent away from their professional duties in CPE (Continuing Professional Education). Since justification for participation must come from expected program benefits, participants must be

assured of high program quality. (Grotelueschen, 1986)

This paper will apply a comprehensive evaluation research method which is drawn from published researches in educational research methods as applied to management development of engineering executives for providing leadership to organizations. This paper will give an example of effective management development program evaluation and review technique using demographic profiles of executives and examine the impact of decision making styles, learning styles, and importance/competence of managerial skills.

### History of Management Development

In a 1988 study of corporate management efforts, Lyman W. Porter of the University of California at Irvine and Lawrence E. McKibbin of the University of Oklahoma argued that it was a serious mistake for corporations to put other needs ahead of personnel development. Corporate management development was judged a necessity to help top people learn new principles of effective management. Porter has observed, "You can't run business like you did in the 1940's" or even the '80s or '90s.

Purdue University Engineering/Management Program is a program which purports to develop competent managers. This study will investigate the effectiveness of the Purdue University Engineering/Management Program in developing managers' leadership competencies. Leadership effectiveness which is attributable to the program will be summarized and analyzed regarding increased competence in managerial skills, decision making styles, and learning skills linked to participants' various academic and professional responsibilities.

Growth, development and change are inevitable and natural phenomena that affect



managers by either enabling them grow sharper or cause them to lose their effectiveness. Managers can develop abilities needed to lead organizations or they can continue current practice that may render them obsolete.

### **The Research Questions**

This research examines management education from a quality assurance perspective, paying attention to measurable ends of such education.

The purpose of this research was to evaluate the effectiveness of the Purdue University Engineering/Management Program (EMP) as the managers were impacted by the program. Evaluation criteria established from the stated objectives of the program (taken from the brochure), were used as bases for measuring knowledge, skills and attitudinal change.

This evaluation study attempted to measure those changes that occurred in the knowledge skills and attitudes, from before to after the program.

Further research questions of the study were:

1. How well did the program experiences meet the 'needs' of the managers?  
Evidence used to answer this question was gathered using a follow up questionnaire.
2. What were the impacts of these experiences on attending managers and on their corporations?

The impact of the training on the managers and their organization was analyzed. The impact was assessed using Kirkpatrick's ( 1987) four levels of evaluation of the training program for effectiveness.

### **The Importance of the Study**

The importance of the research lies in determining the usefulness of a professional education program for practicing managers. The managers need development programs due to continued obsolescence of their knowledge, skills and abilities. Managers' growth is needed if they are to stay competitive in a rapidly changing technological environment. Personal and professional development due to executive education programs must be objectively measured to uncover to what degree or level the stated objectives of the program met the needs of such managers.

The instruments have been designed to gather evidence regarding how well participants were served by the program and to serve the following needs for the managers' development:

- . Need for lifelong learning
- . Need for corporate education
- Need for management development
- . Need for executive development and succession
- . Need for program effectiveness evaluation
- . Need for bridging theory and practice

### **Review of Related Literature**

Management development literature was studied with a selected review of the background and history of management development. Literature reveals that U.S. corporations recognize the need for development of managerial resources for an organization's growth and survival. More globally competitive companies have decided to re-gain competitive advantage by strategic human resources management effectiveness through rigorous management development programs.

Black's (1979) study showed the importance of management development in developing leadership. Schrader ( 1985) reports that companies have realized that management development programs are an investment in a company's future leadership. The EDA study's findings on management development focused on strategy, productivity, leadership, and global competition. Cervero (1984) provides a rationale for his evaluation framework which includes workshop design and implementation, learner participation, learner satisfaction, learner knowledge, skills and attitude, application of knowledge after the workshop, and impact of application of learning. Bolt's (1989) research concluded that companies have realized the challenge of executive function and the benefits of management development.

A study of literature has also shown that several criteria of effective evaluation must be applied : timeliness, appropriate methodology, relevant focus, influence on program improvement, issues and leverage for desired change, scope of evaluation, reproducibility, worth of evaluation and the ethical dimension of evaluation (Dessler, 1984)

To summarize, the key questions that Brickenoff ( 1983) asks regarding the management development program evaluation are:



1. What is the focus of the evaluation?
2. What questions are we trying to answer?
3. How will you collect the information needed to answer the questions?
4. How will you analyze and interpret the information?
5. How will you communicate the findings of the evaluation?
6. How will you manage the work?
7. How will you tell if your evaluation work is any good?

Evaluation of the effectiveness of a management development program in terms of strict measures of organizational and individual performance is a powerful means of getting a firm to think critically about the purpose of intervention (Swanson and Sleezer, 1987). In the process, the decision makers often ask, "Why did we approve this intervention for our managers?" At that point, corporate decision makers are usually ready to think about training as a means to some large business goal, and evaluation as a way of helping to make wise decisions along the way. Barnard (1968) has appropriately said of evaluations and decision making, the fine art of decision making which consists in not deciding things that are not now pertinent, not deciding prematurely, not deciding things that cannot be made effective, and in not deciding those things that others should make. Program Evaluation and Review Technique correctly implemented is PERTinent, relevant and effective, so that responsive program evaluation in the future should equip the professional manager to develop linkages between thought and action and knowledge and behavior.

### Methodology

#### Instruments: Evidence on validity and reliability of instruments

The study proposed to use three managerial survey instruments to measure perceptions of management skills, leadership attitudes and problem framing and diagnosing behaviors. A fourth managerial classification and demographic questionnaire has been designed and field tested with program faculty. Pilot study has been conducted in concurrence with and approval of Purdue's sixteen member engineering and faculty from colleges of Business and Engineering, Continuing Engineering Education, and Executive Education. Pre-test Instrument set- 1 has four kinds of questions for Skills

(Q-1), Attitude (Q-2), Learning Behavior (Q-3), and Background Variables (Q-4). This instrument collected quantitative data that were analyzed using inferential statistics. Post-test Instrument set- 1 used the same questionnaire designated as Q- 1, Q-2, Q-3, Q-4, for statistical analysis. An interview guide, Q-5 will be used for qualitative analysis of the program effectiveness. Questionnaire set Q-1, Q-2, Q-3, Q-4 was administered to an equivalent comparison group of managers nominated by the attending managers. Instrument set- 1 with Q-1, Q-2, Q-3, Q-5 was administered to program faculty and administrators to learn about their judgments and to determine key program design and delivery objectives. The Kolb learning style profile of faculty determines respondents' active teaching and active learning preferences. These faculty styles were compared with those of attending managers for a match. The Instrument-2, called Composite Program Evaluation for administration and physical facilities was used for evaluating the program's overall learning environment. Instrument-3, a questionnaire designed in consensus with Purdue faculty for evaluating teaching, was used for evaluation of individual instructors in a very detailed manner to determine aggregate instructional program effect and individual faculty performance.

#### 1. Knowledge, Skills, Attitude Instrument (Harvard Study)

This survey instrument was designed by Mary Jane Knudson (1989) who did a similar study on "Leadership Development for the Middle Managers of Higher Education: Harvard's Management Development Program." Knudson's questionnaire was validated by her doctoral dissertation committee (comprised of eminent educational leadership professors like K. Patricia Cross). She then field tested the instrument with a ten-member program faculty from Harvard Graduate School. She then collected data from 85 participants for Harvard's Management Development Program using pre-, post-, and comparison group ratings by educational leaders of Harvard University. Written permission has been granted by Knudson for the use of her instrument.

#### 2. Hersey and Blanchard's Leadership Effectiveness and Attitude Description (LEAD)- questionnaire

The above leadership development questionnaire was developed by famous leadership theorists Hersey and Blanchard. under the banner of



Situational Leadership Resource Guide (1988). The purpose of this instrument is to evaluate a manager's perception of his/her own leadership style in terms of "telling", "selling", "participating" or "delegating", and to indicate whether the style is appropriate in various situations. The questionnaire has been used in the managerial effectiveness studies, leadership profile typing, management development and training effectiveness, and for researches leadership program evaluation and effectiveness. Many research papers have been cited in Burroughs in defense of these instruments, their validity and use. Paul Hersey, Developer of Situational Leadership says in Leadership/Situational Leadership Brochure:

Because managers must manage a wide variety of people, their personal managerial skills or style are not the most critical factors for success; what matters is how well they can recognize and adapt to what is needed to manage the people who work for them at the moment (p. 58).

J. William Pfeiffer, President, University Associates, in a preface to Situational Leader by Paul Hersey (1994) observes:

...What has long been needed is a system for managing people that is both conceptual and practical. An easy to grasp system with a scope that is broad enough to permit its application to a wide range of situations is essential. Such a model will promote precise language in which managers could both understand and act upon the problems they experience in managing their people. This new approach must build on the existing language of management so that learning it and using it are easily mastered. Furthermore, this model must have face validity that allows it to be accepted and implemented from the executive suite to the first level of supervision. The situational Leadership model, developed by Dr. Paul Hersey and his colleagues at the Center for Leadership Studies, meets these criteria. The vitality and acceptance of this approach is demonstrated by the large number of training programs that are now utilizing the model throughout the world (p.5).

The Burroughs Manual of Test Questionnaires (7th edition) gives almost twenty references of publications using this instrument. Management and HRD specialists, and trainers use it to determine the effectiveness of leadership development programs and interventions. Dissertations have used this instrument for researches

leading to Leadership Styles and managerial effectiveness. In this dissertation study, the LEAD-self will be used for pre- and post- test comparisons of attending managers. A comparison group will also take LEAD-self profile tests. After three months the LEAD-self will again be administered to the attending managers. The difference in self-perceptions of the managers before and after the program is of important consequence in terms of program effectiveness as compared with their perceptions after three months, as a residual effect of the program.

### 3. Kolb Learning Styles Inventory (LSI)

The following evidence is taken from Learning Style Inventory. 1985: Technical Specifications, Boston: McBer & Company (1994 supplement):

The learning style inventory revised in 1985-- "LSI 1985", for short-- is an improved version of the original learning style inventory developed by David A Kolb. Like its predecessor, LSI 1985 is designed to help individuals assess their ability to learn from experience. The revised LSI includes improvements designed to enhance the scientific measurement specifications and the inventory's practical uses in education and counseling.

The four basic scales and two combination scores all show very good internal reliability as measured by Cronbach's Alpha ( $n=268$ ). The combination scores show almost perfect additivity (1.0) as measured by Tukey's test (p.4).

June 1994 compilation of "Bibliography of Research on Experiential Learning Theory and the Learning Styles Inventory (LSI)" has about 375 publications. In summarizing the results of experiential learning theory and its implications, and Dixon (1982) says:

In planning the methodologies and techniques to be used in a training program, four major considerations must be taken into account: content, external constraints, skills and preferences of the faculty and learning styles of the participants... The viability of an organization as a whole may rest on the ability of the employees to continue to learn. Learning is more effectively carried out when the individual understands his or her learning style (pp. 1-3).

This research has used the LSI instrument for the above purpose of determining learning styles



of managers, and preferences of faculty. Training is more effective if learning style of the participants and faculty preferences are matched. Lumsdane (1995) has used this technique in long range creativity training of engineers using Kolb Learning Cycle-LSI instruments and has compared its effectiveness with other instruments like Hermann Brain Dominance Inventory (HBDI).

#### 4. Demographic Profiles Inventory

Demographic Profile Inventory of managers has been designed with reference to the format suggested by the Research and Development Journal. The faculty of the Purdue executive development program have approved this with a rigorous field test and by consensus. Modifications suggested by the Purdue E/MP faculty during its design between December 1994-March 1995, have been incorporated into the questionnaire. A similar questionnaire in short form with about ten questions was used by Knudson in her Harvard Leadership Study of Middle Managers in Higher Education. The Purdue study will look carefully into managerial background variables for applying higher level discriminant analysis. Thus the questionnaire has many more and detailed background questions which were critical to forming good hypotheses.

The background variable classifications of managers match closely with background profile information suggested by Research and Development magazine which surveys engineers and managers by important background variables. Classifications for coding are precise so data can be coded into computer scan sheets for easy data base entries.

#### 5. Instructor and Course Appraisal

A new computerized version of Instructor and Course Appraisal was designed by the faculty of E/MP and was approved by the Purdue Graduate School of Business and Engineering, and by the Continuing Engineering Education and the Executive Education departments. Exclusively the instructor and course appraisal instrument was designed for the management development program. Along with fifteen Likert type questions, the Instructor and Course Appraisal questionnaire has three qualitative questions. The questions are classified as follows: clear understanding, effective style, preparation and knowledge, stimulation of interest, clear objective, contribution to professional growth, classroom discussion and role play, strength of the course,

assigned readings, student recommendation to others, instructor motivation, explanation of difficult material, interesting course assignments, overall course rating, and overall instructor rating. The responses will be analyzed for individual and collective impacts on students.

#### 6. Composite Program Evaluation

This Composite Program Evaluation Questionnaire has been adapted from the Training and Development Handbook by Craig. It was used to summarize reactions to program planning, learning environment management, lodging, meals and comfort for learning, physical facilities, computers for aid of training, and conference management effectiveness. Using this questionnaire, administrative evaluation of the program was conducted through the help of program planners and directors. Open ended questions asked what changes the student would like to suggest for future course offerings and program effectiveness.

#### 7. Faculty Interview Protocol

This interview guide has been designed to gather qualitative evidence regarding program design, methods of instruction and faculty perception of effectiveness. It has been field tested and faculty have given input. A final version has emerged after rigorous modifications.

The strength of this interview guide is to elicit responses of faculty perceptions of the design of the program and how faculty felt students benefited from it regarding the students' professional development. The qualitative dimension of this interview will be compared with the quantitative evaluation for accuracy of conclusions.

#### 8. Participant Interview Protocol

This interview guide seeks the same information from the participants as from the faculty. Data gathered will be used to determine perceptual differences between different stakeholders of the program. Students' perceptions will be compared with the faculty's and administrators' perceptions. The clarity of design and purpose of the Participant Interview Protocol has been approved by the Purdue program faculty. Normally the instrument will be used with participants during social hours, or it will be returned with the post-survey. Since the program directors insisted that the participants may not be

inconvenienced during social hours or in the evenings, they were advised by the program administrators to return the questionnaires with their pre- or post-survey responses.

### **B. Data Collection**

Background information from ninety-eight managers representing a broad spectrum of industry (there were ninety nine registered and paid for, but one did not attend) was collected during the program. Information included: level of education, length of management experience, years in present job, type of industry, and gender. Data were collected to know whether or not the training was required as a corporate strategy linking to continuing professional education of managers for promotability (please see instrument) etc. Three other instruments were used : Skills (Harvard study), Leadership Profile (Hersey Blanchard), and Learning Skills Inventory (Kolb). The skills questionnaire asked the participants to judge the importance of, and their current competence in, certain skills. The LEAD questionnaire identified different managerial situations in which executives make decisions. The Learning Skills Inventory collected information pertaining to the methods used in learning and in analyzing day-to-day job situations.

For the purpose of comparison, each of the managers attending will identify a peer who could not attend the program or did not participate because of certain barriers to participation. These non-participating peers responded to all the instruments used with the participants. There were three sets of data collected-- pre-, post-, and three-month-post on the job. Data were also collected from the comparison group survey. Individual courses, instructors, and the comprehensive program were also evaluated by workshop participants. Faculty members were interviewed using a structured interview guide.

### **C. Research Design**

The quantitative data collected were analyzed statistically by SPSS package using F-tests and T-tests and Analysis of Variance tests. Variables analyzed included years of formal education, years of experience, age, position, gender, etc. as independent variables. Importance of Skills, and Competence of Skills were used as dependent variables (mean scores of self perception of importance and competence). Mean scores of

Leadership Profile Index and of Learning Style Inventory Index were analyzed as correlates of professional development dependent upon Importance of Skills and Competence of Skills. Pre, Post, 3-month post and comparison group inventory were separately analyzed. This analysis revealed whether or not some of the hypotheses formed are significant at a particular probability level.

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