

## Changing the Status of Engineers from Technical Position to Management and Offering a Suitable Model

Mohsen Goodarzi<sup>1</sup> and Alireza Anvari<sup>2</sup>

<sup>1</sup>Department of Management, Shiraz Branch, Islamic Azad University, Shiraz, Iran.

<sup>2</sup>Department of Management, Shiraz Branch, Islamic Azad University, Shiraz, Iran.

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**Abstract:** In Iran's industrial-commercial setting, absence of the director of engineering is strongly felt, which causes a weakness in management. As a result, most engineers themselves attempt to move from a technical into a managerial position. This requires examination of the competencies necessary for engineers to make an effective transition to the managerial position, using certain means to achieve managerial competence. The research was conducted having passed through a few stages and being comprised of a quantitative questionnaire. The questionnaire was applied to directors of engineering and human resource and development managers. A total of 116 participants from Farassan Industrial Co. and a number of engineers of Construction Engineering of Fars Department took part in this research.

The results of the required competencies for the transition to the managerial position indicated that interpersonal skills are the most notable features which follow leadership skills. Totally focused commercial skills were given least importance in this regard. The applied techniques invoked the most well-known ideas by which most of the individuals acquired managerial competency through test and error, learning during work, academic education, internet networks and short-term business courses. The results indicated that managers and engineers had a common understanding of the essential skills as there was little disagreement over the means of discovering skill acquisition. The findings were applied to develop a model through which the organization and human resource experts can assist engineers with the transition process.

**Keywords:** job transition, management competencies, methods of detecting position change, interpersonal skills

### 1. Introduction

In Iran's commercial-industrial setting, the absence of efficient directors of engineering has become an issue giving rise to more convoluted problems. Hence, most engineers attempt to move from a technical into a managerial position (Mohammadi, 2011).

It is evident that the transition calls for the examination of the competencies necessary for engineers to make an effective transition to the managerial position and use certain means to recognize and acquire management competency (unlike developed countries, human resource, especially social capital, has still gone unconsidered in third-world countries). Since few studies have been conducted in this respect in Iran, the need to do further research in this area is felt. For this reason, we are required to determine, introduce, and train activities and skills in this regard in order to train directors of engineering due to an urgent and considerable

need for them and their efficiency, so that the transition to such a job position could be realized.

### 2. Research Background

Crosbi (2005) demonstrated that technical and cognitive skills and knowledge account for about 15% of the reasons why an individual makes advances in a job. The remaining 85% of job success is based on a person's ability to recognize and direct individuals.

Molen (2007) pointed out that engineers should pay due attention to the competency of interpersonal skills vital to the acquisition of the managerial role.

Balaji et al. (2009) state that soft skills are made up of the following core components: leadership, teamwork, interpersonal skills, continuous learning capacity, futuristic thinking, decision-making capacity, self-management skills and listening skills.

Nienaber (2010) underscores the fact that management and leadership are closely intertwined. In the modern age, the terms leadership and management are interchangeable. Although the exchange of these terms can cause confusion, the concept of leadership in the organization is analogous with management in the modern era.

Sahni (2011) holds that management education can definitely increase the efficiency of a manager and thus substantially enhance the manager or the engineer's abilities and skills. Human resource organization should develop soft skills and make sure that they take over the core section of the development program and management progress.

Weber et al. (2007) conducted a study consisting of human resource experts and followed the prominence of competency in this context. The results of the study assert that most of the 116 soft technical skills assessed by human resource experts were believed to be important. The value of time index and some activities are considered here so that technical managers could deal with the development of their soft skills.

Weber et al. (2012) hold that many of the competencies and managerial skills can be provided in the form of software program as well as in a stratified fashion for engineers, as specialists and human resource managers have confirmed, in the sense that engineers can teach and apply software-based managerial skills. **3.**

### **3. Research Hypothesis**

The first hypothesis; there is a significant relationship between the competencies required for the transition of engineers from the technical to the managerial position for all middle, senior and executive engineers.

The second hypothesis; there is a significant relationship between learning activities and cognitive activities that engineers take in order to acquire managerial competencies for all middle, senior, and executive engineers.

The third hypothesis: there is a significant relationship between engineers and human resource managers' perceptions of the capabilities that an engineer is required to acquire in the transition from the technical to the managerial position

The fourth hypothesis: there is a significant relationship between engineers and managers' perceptions of learning and methodological activities that engineers require in order to acquire managerial competencies.

### **4. Research Methodology**

The statistical population of the present research consisted of all engineers available in the Construction Engineering of Fars (Manager and Engineer) Department in Farassan Co. Due to the limitation of the statistical population in this research, the sample size was considered equal to the size of the statistical population. Therefore, the number of the population and the statistical sample was equal to 116 individuals. The present research is applied in terms of purpose and descriptive in terms of data collection. The research methodology was based on survey, for which generalizability is of high importance. In order to examine the internal consistency of the questionnaire items, Cronbach's alpha was used with the help of SPSS software program. To this end, given the results obtained from a primary sample comprised of 30 items, the analysis of the results of the questionnaires was conducted through SPSS software program and Cronbach's alpha. According to the items, the number of the samples was equal to 76%, which is higher than 70%. For this reason, the questionnaire had the necessary reliability. Moreover, in order to examine the validity of the questionnaire, face-content validity was applied. That is, the advisor's comments were used to confirm it.

### **5. Findings**

In order to examine research hypotheses, t-test of two independent samples was used. The results of the tests are shown on tables 1 to 8.

The first hypothesis: there is significant relationship between competencies required for the transition of engineers from technical position to the management position for all middle, senior and executive engineers.

H0= there is no significant relationship between engineers' and human resource managers' perception of capabilities that an engineer is required to acquire in transition from technical to managerial position

H1= there is a significant relationship between engineers' and human resource managers' perception of capabilities that an engineer is

required to acquire in transition from technical to managerial position.

**Table 1.** The t-test results of two independent samples concerning the determining competencies in terms of group

Group	Mean	Standard deviation	Standard deviation
Senior	2.6842	1.16492	0.18898
Middle	3.1538	1.54815	0.24790
Executive	3.0513	1.25549	0.20104
Total	2.9655	1.33795	0.12423

**Table 2.** The t-test results of comparison of the determining competencies in terms of group

Significance level	Sum of squares	Degree of freedom	Mean square	T-value	Significance level
Variance between group	4.677	2	2.339	1.314	0.273
Variance within group	201.185	113	1.780		
Total	205.862	115			

The results of variance analysis in table (2) indicate that the significance level  $\alpha = 0.273$  and the obtained T were estimated to be 1.314. Since the obtained significance level,  $\alpha = 0.273$ , is greater than  $\alpha = 0.05$ , there are enough reasons to reject  $H_0$ , so the  $H_0$  is rejected and  $H_1$  is confirmed.

The second hypothesis: the competencies that engineers require in order to make the transition from the technical to the managerial position are the same for all middle, senior, and executive engineers.

$H_0$  = there is no significant relationship between the competencies that engineers require in order to make the transition from the technical to the managerial position for all middle, senior, and executive engineers.

$H_1$  = there is a significant relationship between the competencies that engineers require in order to make the transition from the technical to the managerial position for all middle, senior, and executive engineers.

**Table 3.** The t-test results of two independent samples with respect to learning and methodological activities to acquire managerial competencies in terms of group

Group	Mean	Standard deviation	Standard deviation
Senior	3.6053	1.22009	0.19792
Middle	3.1538	1.38675	0.22206
Executive	3.2703	1.34678	0.22141
Total	3.3421	1.32257	0.12387

**Table 4.** The t-test results of comparison of learning and methodological activities to acquire managerial competencies in terms of group

Significance level	Sum of squares	Degree of freedom	Mean square	T-value	Significance level
Variance between group	4.205	2	2.102	1.206	0.303
Variance within group	193.245	111	1.743		
Total	197.658	113			

The results of variance analysis in table (4) indicate that the significance level  $\alpha=0.303$  and the obtained T were estimated to be 1.206. Since the obtained significance level,  $\alpha=0.303$ , is greater than  $\alpha=0.05$ , there are enough reasons to reject  $H_0$ , so the  $H_0$  is rejected and  $H_1$  is confirmed.

The third hypothesis: learning and methodological activities that engineers take in order to acquire managerial competencies are the same among middle, senior, and executive engineers.

$H_0$ = there is no significant relationship between learning and methodological activities that engineers take in order to acquire managerial competencies which are the same among middle, senior, and executive engineers

$H_1$ = there is a significant relationship between learning and methodological activities that engineers take in order to acquire managerial competencies which are the same among middle, senior, and executive engineers

**Table 5.** The t-test results of two independent samples concerning the perceptions of competencies in terms of group

Group	Mean	Standard deviation	Standard deviation
Engineers	2.5745	1.47065	0.21452
Human resource managers	3.0000	1.30931	0.33806

**Table 6.** The t-test results of comparison of the level of competency perceptions in terms of group

Significance level	T-value	Degree of freedom
0.321	1.31	60

The test results in table (6) with the assumption of variance equality for two groups indicate that the significance level  $\alpha=0.321$  and the obtained T were estimated to be 1.31. Since the obtained significance level,  $\alpha=0.321$ , is greater than  $\alpha=0.05$ , there are enough reasons to reject  $H_0$ , so the  $H_0$  is rejected and  $H_1$  is confirmed.

The fourth hypothesis: the engineers and managers' perceptions of learning and methodological activities that engineers require for management competencies and for accepting them are the same.

**Table 7.** The t-test results of two independent samples concerning learning and methodological activities to acquire managerial competencies in terms of group

Group	Mean	Standard deviation	Standard deviation
Senior	3.6842	0.98927	0.16048
Middle	3.0000	1.39548	0.22346
Executive	3.2308	1.24523	0.19940
Total	3.3017	1.24565	0.11566

**Table 8.** The t-test results of comparison of learning and methodological activities to acquire managerial competencies in terms of group

Significance level	Sum of squares	Degree of freedom	Mean square	T-value	Significance level
Variance between group	9.306	2	4.653	3.109	0.048
Variance within group	169.134	113	1.497		
Total	178.440	115			

The results of variance analysis in table (8) indicate that the significance level  $\alpha=0.045$  and the obtained T were estimated to be 3.109. Since the obtained significance level,  $\alpha=0.048$ , is greater than  $\alpha=0.05$ , there are enough reasons to reject  $H_0$ , so the  $H_0$  is rejected and  $H_1$  is confirmed.

Table (9) shows the results of Friedman test with respect to prioritization of indexes of skills required for the managers.

**Table 9.** The results of Friedman test with respect to prioritization of indexes of skills required for the managers

Group	Mean	Standard deviation	Standard error
Interpersonal skills	3.6121	1.20702	0.11207
Leadership skill	3.3707	1.19076	0.11056
Commercial skill	3.3103	1.15721	0.10912
Statistical result	Value =9.52	sig= 0/0000	df =2

Therefore, according to table (9), it can be concluded that interpersonal skills, leadership skills and commercial skills were respectively ranked first to third among the indexes required for managers

**Table 10.** The results of Friedman test with respect to indexes of skill acquisition methodology

Group	Mean	Standard deviation	Standard error
Academic education	3.6041	1.21602	0.10204
Try and error/ learning at work	3.5871	1.19076	0.11024
Statistical results	Value =9.46	sig= 0/0000	df =2

Therefore, according to table (10), it is concluded that the method of necessary management skills through academic education took the first priority, and try and error and learning at work took the second priority with a mean very close to that of the first.

Table (11) shows a summary of rejection or confirmation of research hypotheses.

**Table 11.** A look into the status of research hypotheses

Hypotheses	Significance level	T-value	Statistical result	Statistical result
There is a significant relationship between engineers and human resource managers' perceptions of capabilities that an engineer must acquire in the transition from the technical to the managerial position	0.321	1.31	confirmed H1	Rejected H0
There is a significant relationship between the competencies that engineers need in order to make the transition from the technical to the managerial position among all middle, senior, and executive managers	0.273	1.314	confirmed H1	Rejected H0
There is a significant relationship between learning and methodological activities that engineers take in order to acquire managerial competencies among middle, senior, and executive engineers.	0.303	1.206	confirmed H1	Rejected H0
There is no significant relationship between engineers and methodological activities that engineers need for management competencies and for taking them.	0.048	3.109	Rejected H1	Confirmed H0

## 6. Conclusin

The first hypothesis of the study indicated that there is a significant relationship between engineers and human resource managers' perceptions of capabilities that an engineer is required to acquire in the transition from the technical to the managerial position. Therefore, it can be said that the competencies that engineers require in order to make the transition from the technical to the managerial position are the same for all middle, senior, and executive engineers (directors of engineering).

The second hypothesis of the study indicated that there is a relationship between the competencies that engineers need in order to make the transition from the technical to the managerial position among all middle, senior, and executive managers. Thus, it can be concluded that the learning and methodological activities required for acquiring skills in an attempt to make the transition from the technical to the managerial position are the same among all middle, senior, and executive engineers (directors of engineering).

The third hypothesis of the study indicated that there is a significant relationship between the learning and methodological activities that engineers take to acquire managerial competencies among middle, senior, and executive engineers. The result of the hypothesis indicated that human resource managers' attitude corresponds with that of engineers with respect to the capabilities required for developing and making the transition to the managerial position and there is no difference at all between human resource managers and engineer's attitudes. Additionally, interpersonal skills are the most important factors, and the capability for interpersonal skills and the attention to the employee's affect in relation to building a sense of trust is one of the excellent capabilities received so far, which is in line with the study of Weber et al. (2012).

The fourth hypothesis of the study indicates that there is no significant relationship between engineers and managers' perceptions of learning and methodological activities that engineers need for management competencies and for taking them. The findings of the hypothesis

revealed that there are many similarities at the three managerial levels, as there is a remarkable difference in perceiving the methodology at the three managerial levels as well. Of the 14 methods, 12 methods were perceived at three managerial levels in a similar fashion. The most notable method was that of achievement perception for executive leadership.

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