
Management of Technology in Iran

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This Paper Presented In IMSAM (Aug. 1995) Conference Chios - Greece

Introduction

Technology as defined by tools and instruments has always been considered as a part of our daily life. Given the dynamic opportunities and threats, the importance of accepting and applying new technologies has taken an important role. The dimensions of the world around us have become so wide that no economic activity is possible without giving due attention to technology.

But even then, possession of technology by itself is not enough. Management of technology is an important factor which makes competitive advantage possible. Overall, in most developing countries including Iran, role of technology management is not clear. As a result it is approached in a non - systematic and non - conceptual manner.

The principles of technology management including production process and technology transfer have either been forgotten or not considered at all. At the operational level, technology management is approached in a manner that works against achievement of long - term goals. As such, there is a need to redefine

the role of technology management at both operational and strategic levels. Most technology transfer to developing countries has been limited to hardware introduction without giving any value to software, knowledge, and human resource requirements. As a result, most developing countries are extensively depend on technology - exporting countries. Some of the reasons for such dependency include:

1. The technology transfer process to developing countries does not permit the local user to make any challenges.

2. Research and development as the key factors for successful transfer of technology have been set aside or given little consideration.

Problem Definition

The field of management of technology is continuing to evolve. Today, technology presents important new opportunities for manufacturing and service organizations. But if its potential is to be realized, companies must take a more holistic approach to managing resources. The different functional areas of a business must no longer be viewed as separate, but must be

managed as an integrated in whole.

The challenge is not the expansion of frontiers, but understanding the dynamics of renewal. To remain competitive, it is necessary for all parts of a business unit, not just manufacturing, to adapt to new developments. This is where management of technology becomes essential.

Significance of the Study

The impetus for change and the need to reorient manufacturing processes to create a more flexible and innovative operation, makes the notion of management of technology, of fundamental importance. As skinner (1985) States: "the history of manufacturing leadership shows that basic changes in management focus and characteristics were brought about by major developments in technology and markets".

There are signs that many companies have begun to realize that management and not technology alone will be critical in responding to the challenge. A recent survey of the auto - industry revealed that while managers were putting their faith in "hard - side" elements before, they now consider the "soft - side" factors are described as the way a business is organized, and how it is run, what is viewed as important, and how people are treated.

Definition of Management of Technology

Researchers are hesitant on how to

conceptualize management of technology and as such, there is no clear - cut and widely accepted definition of the topic.

Despite lack of consensus on concept of management of technology, there is general agreement that:

- a) Technology advancement is inevitable.*
- b) The process is necessary for (manufacturing) survival.*
- c) Technology carries considerable unknown risks;*
- d) The advent of new technology will create a greater need for cooperation among business, government, and labor.*
- e) The costs, benefits, and values of technology will have to be continually reexamined by firms in particular and by society in general.*

In this paper the following definition will be used:

"Management of technology links engineering, science, and management discipline, to address the planning, development, and implementation of technological capabilities to shape and accomplish the strategic and operational objectives of an organization."

Management of technology is generally based on a systems approach which distinguishes between "anticipating the need for future technological developments and the implementation of full - fledged integrated systems of automation.

A systems approach allows a strategic decision outlook similar to the large - scale view point taken by the Japanese with respect to automation. Further, a systems approach is inherently flexible, as it allows for the incremental alignment of new technology and infrastructure while taking into account future developments.

Management of Technology Factors

The core of management functions, that is, management of technology encompasses a wide range of issues concerning the development, acquisition, and implementation of technological skills. It bridges the existing gap between the field of management and the field of engineering and science. Its basic thrust is to mesh technical and non - technical resources of companies to enable them to compete, and improve the quality of work life.

To implement any form of automation, the right mix of people, equipment, and software systems are required. The challenge is to create an organization different from the old model. The new organization must be an institution that "can tolerate and handle pluralistic values and measures for its success. Firms must be conscious of various stakeholders and measures of success, that are prevalent and necessary in today's business environment, in order to use the factory as the competitive weapon. Both theoretical and applied management literature

suggest that problems with the adoption of new technology could develop from a number of sources:

- 1. Technical factors such as the appropriateness of the particular new technology.*
- 2. Structural factors such as reporting relationship, information and control systems, reward systems, and staffing.*
- 3. Behavioral processes such as decision - making systems, leadership styles, and conflict and power processes.*
- 4. Strategic factors such as top management values, financial resources, the fit between firm's strategy and structure, and competitive environment.*

The key to technology development is held by management. Generally speaking, management has the required power and resources to achieve the pre-defermined goals.

Management of Technology in Iran

Exploratory studies on Iranian industries indicate that most companies lack the required coordination between technology units. This problem has been developed as a result of the source variety for purchasing machines and hardware. The process technologies and hardware in most production facilities are in an acceptable form but other non - machine parts including management, organization, and human skills, have not been developed to an acceptable level.

Lack of coordination within technology units in some Iranian industries like paper and textile had been reported by the Iranian Institute of Planning and Budget in an study done during 1989. The results of the study (redundent and misleading) also reported that only the process machinery and hardware purchased by Iranian industries are somewhat new, other supporting technologies including management and softwares have not been changed in any considerable manner.

Research Method

The basic objective for performing this study was to evaluate the application of management of technology in Iranian electronic industries. This evaluation was done using a 34 - item survey questionnaire.

The survey of industry involved 247 top managers, from which, 197 were involved in military electronic industries and the other 50 were involved in domestic (non - military) electronic industries. This survey provided the groundwork for evaluating other important issues involved within the study. In addition to the above survey, personal observations of the industry provided the backbone for further evaluations.

Data Analysis Techniques

Analysis of the collected data was done in two ways; statistical method and simulation method.

Within the statistical method, two types of data were collected- primary and secondary. Primary data were collected by using questionnaires, interviews, and direct observations, statistical data banks from different countries, UNIDO publications, and UN publications.

Statistical Analysis Results

A factor analysis of the 34 - item questionnaire provided the in following four categories: hardware, software, human skills and work environment. By using the collected data, the following regression model was developed:

$$Y = 0.77771 + 0.25026X3 + 0.2077X1 + 0.16055X4 + 0.15181X2$$

$$F = 0.000 \quad \text{and} \quad R = 0.45085$$

$$X1 = \text{Hardware}$$

$$X2 = \text{Software}$$

$$X3 = \text{Human skills}$$

$$X4 = \text{Work environment}$$

Regression analysis, analysis of variance, and student t - tests on the collected data reveal that skills and abilities of human resources have the greatest impact on management of technology. Other resources including technical knowledge, organizational structure, and hardware take secondary importance after human resources. Currently, most of the available budget has been invested in hardware.

Simulation Results:

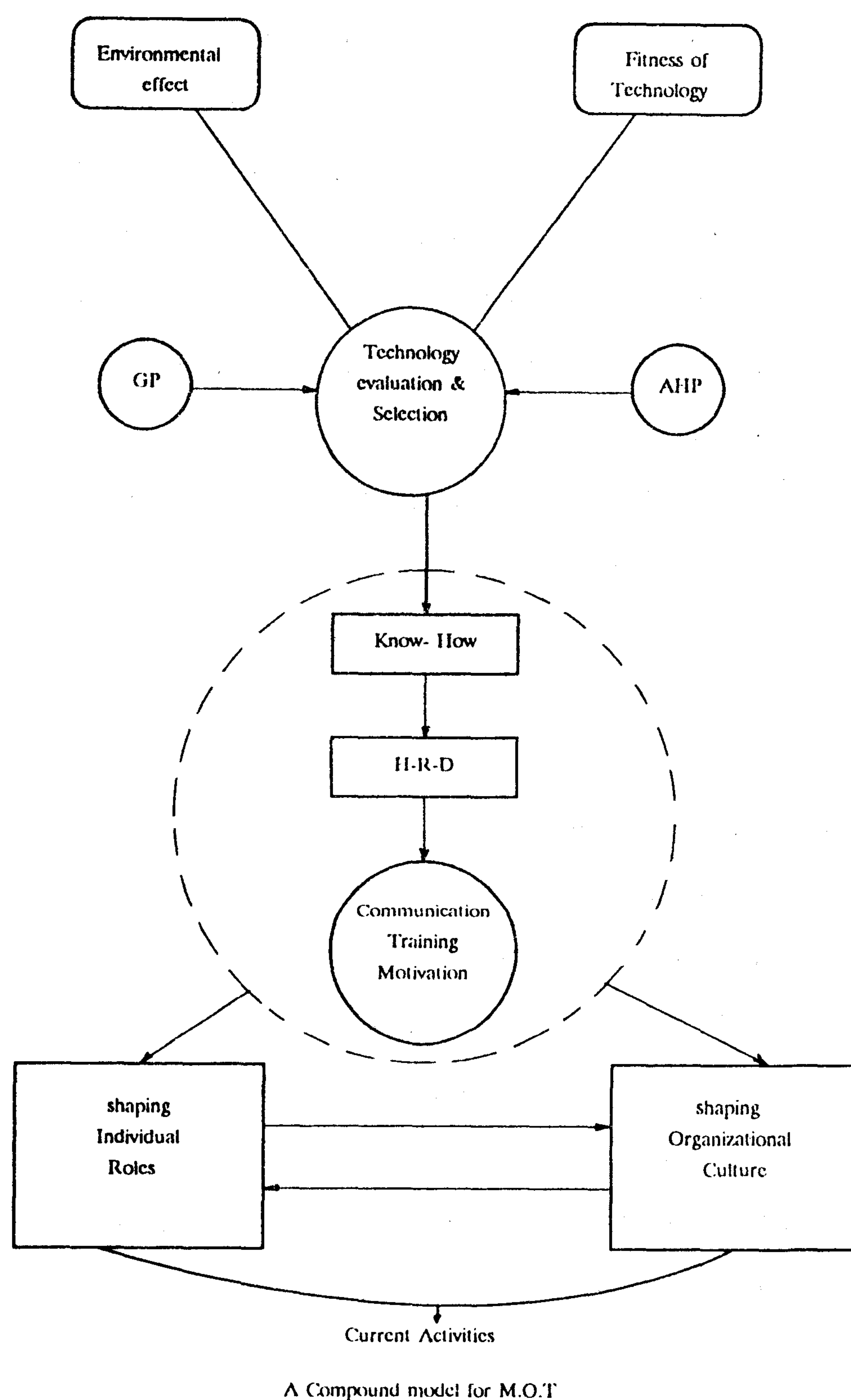
On the basis of the data collected by this study,

a compound model composed of four models can be offered. Since management of technology is a complex and unknown phenomenon, as such, strategic and operational issues should be taken into consideration. At the strategic level, two models were designed:

1. Technology Fitness Evaluation Model: This model considers the intra - organizational factors. Using the specified evaluation factors, the status of technology in each organization can be determined within various perspectives.

2. Environmental Factor Model: Analysis, selection and technology application have a direct effect on environmental factor analysis. In this model, various factors including economic, technical, sociological, and political issues that directly effect technology in conjunction with the push - pull concept were evaluated. This model measures the risk involved with the application of each type of technology. The above two models are applicable at the strategic decision making level. Operationalevaluations must be performed after completion of strategic evaluation.

3. Goal programming model using AHP: in this operational model, mathematical modelling was given the most attention. As such, tangible and intangible goals take part in selection of technology. Therefore, the best programming technique for management of technology is goal programming. Using this technique, intangible goals were analyzed by AHP technique.



4. Statistical Model: Statistical evaluations within electronic industries show that human resources are the most important conclusion that achieved, through multiple regression models, one and two - way ANOVA, and student t - test. Personal observations, interviews, and other evaluations indicate that greater involvement of human resources can only be made possible through training, communication, and motivation.

Conclusions

Advancement of technology can not be expected within the short term projects, it should be regarded a long - term one.

Application of management of technology within electronic, textile, petrochemical and steel industries have allowed them to overcome their rivals. In addition, sociological and grounding economic changes within the Islamic Republic of Iran during the past decade moved Iran from a consuming country to one that exports many of its productions. Fortunately during recent years, the government has been placing greater emphasis on joint cooperation between industry and educational institutions.

The devoted budget for university researches have been increased, and the number of contracts between universities and industries also shows a considerable increase. New laws have also helped with regard to the above matter. For example, by law, one percent of the revenues generated by all industries should be spent on cooperation with universities, and 15 percent of the total budget of the Ministry of Industry should be spent on agreements between industries and universities. Some benefits of such expenditures including:

- 1. Advancement of mutual research projects*
- 2. Consulting activities have advanced in terms of quantity and quality.*

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