Identify and Categorize Indicators of the Technology Transfer in Kerman Copper Company

Laleh Abbaslu¹, Ali Yaghoubipoor²*

¹MSc. Student of Technology Management, Factually of Management, Department of Management, Sirjan Science and Research Branch, Islamic Azad University, Sirjan, Iran
²Ph.D Public Management, Factually of Management, Department of Management, Sirjan Science and Research Branch, Islamic Azad University, Sirjan, Iran
*Corresponding Author: Ali Yaghoubipoor

ABSTRACT: In the face of rapid technological changes, advanced technology become one of the key drivers increasing the productivity of companies and even countries to compete in global environment, the ability to acquire new technology and its effectiveness is essential for companies. However, it is possible for organizations to measure, is not ready to start and support of technology management, so the key to successful understanding or failure of technology management in organizations, identify and assess the prerequisites that are necessary to promote technology transfer. The purpose of this study is to identify, categorize and determine the status of technology transfer indicators in the Kerman Copper Company. For these important fuzzy screening methods for identifying critical success factors, experts for the category and the harmony one-sample T test used to determine the index.

Keywords: Technology transfer, Indicators, Screening fuzzy, Kerman Copper Company.

INTRODUCTION

The phenomenon of technology transfer and access to technology needs in the different communities of interest. Technology transfer between countries with different levels of technical knowledge with limitations or loss for the less developed, associated. Technology transfer is the transfer of knowledge that contributes to improving the technological capacity of a country. Meanwhile, in another definition of technology transfer, the use of an existing technology, where it has not been used previously (Mehdi Zadeh et al., 2010). Technology transfer is a complex and difficult process and without studying, necessary study not only is not useful but may also lead to waste money and time, and weakening of national technology. Process of technology transfer has some precautionary and preventive measures has to be paid before taking the model of technology transfer. Some of these factors include awareness of the crucial factors needed for technology transfer, knowing failure factor of technology transfer in the past and continuing search for appropriate technology in order to obtain internal situation and communication with existing and older technologies, referred.

However, the most important and most striking difference between today and yesterday's world is high speed of technological change. Technological change severely affected on employment patterns and social change in the 21st century. To decide on the choice of technology, the acquisition of technology, planning technological developments require centralized management, the management of the technology by the scientific and comprehensive study areas related to technology manage one of the country's most sensitive strategic issues. As the technology with astonishing rate around the world is growing, the transfer of technology has become problematic issues to countries and developing regions. It is possible for organizations to measure, is not ready to start and successful support of technology management, so the key to successful understanding or failure of technology management in organizations, identify and assess the prerequisites that are necessary to promote technology transfer. In the face of rapid technological changes, advanced technology become one of the key drivers increasing the productivity of companies and even countries to compete in global environment, the ability to acquire new technology and its effectiveness is essential for companies.
Successful technology transfer as well as have many benefits for all parties, but, various issues such as the complex process of transition, the dynamics of technology, low absorptive capacity of the recipient and require enormous resources, including financial resources, human and physical, has led despite various efforts, transfer technology still remain complex and high-risk. Due to these challenges, companies often follow the schedules, cost management and the pursuit of quality in these projects, and many of these projects fail to achieve the desired results canceled and stopped. This problem has led many studies on the identification of success factors facilitating the transfer of technology, especially in developing countries done (Farsijani & Teimorian, 2009).

Developing countries are having similar characteristics in terms of economic structure, including the composition of production that includes most agricultural and traditional products cited. The transition from traditional production to industrial production and during the process of economic development, appropriate technology imports, accompany with industrial and social development. In such circumstances, naturally imports will pass its upward movement. Especially the country development policy during the period in order to promote and industrial development planned. Developing countries in the transition of economic development, the establishment of infrastructure investment need to import capital goods play an important role in its pathogenesis. Thus, contrary to conventional wisdom, self-sufficiency policies in the early stages do not lead to reduce the import but it is significant and expected impact to create changes in the composition of imports. On the other hand, if the developing countries due to natural and technical cause and lack the resources and factors of production, material and technology equipment required, they can now solve their problems with the import, allowed production and use of goods needed and expand manufacturing productivity (MahmoodZad & Mohseni, 2005).

However, due to the specific characteristics of the copper industry and consequently the Kerman Copper company in the country, development in different parts of the industry has led to changes in other sectors of the economy, particularly employment and income as well as other industries, particularly steel, tooling, and so on. Thus, given the special status of the copper company in Iran’s macroeconomics, the study is factors affecting the transfer of technology in the company examined. The aim of this study is to answer two questions: What are measures affecting the transfer of technology in the Kerman copper industry? How is status of indicators affecting the technology transfer in the Kerman copper industry?

A review of previous research

In each study one of the factors which the researcher to identify strengths and weaknesses and helps to understand the trends of previous research, is review literature or prior studies or research. Review of literature given better vision for scrutiny study. Review of literature will discuss in this section. Ghasemi Ostad et al (2014) in a study on prioritization of factors affecting the success of technology transfer by reverse engineering in the aircraft engine industry did. This study using 15 experts in the field and fuzzy Delphi method identify factors affecting the success of technology transfer by reverse engineering in air motor industry and then by members of population by the network analysis process ranked. The three components of the technical knowledge redesigned, technical knowledge of production and organization’s relationship with the original country has the most important among 10 components selected. Mehdizadeh and Hassani (2014) in a study on ranking factors affecting the success of technology transfer with emphasis on the country steel industry did.

This study aimed to analyze the aspects of technology, as well as ranking factors affecting the success of technology transfer in the country's steel industry. In this study, to collect data two survey and analytical methods used after studying the literature of the most important and successful factors affecting the transfer of technology and the key factors influencing their success, were identified. Due to these factors, we designed a questionnaire and using the scoring method, the degree of importance of each factor was determined by experts at the end of the data collection was done using the Wilcoxon test these factors ranked.

Karbassian et al (2011) in a research ranked appropriate methods to technology transfer in Arak petrochemical industry. In this study, the indicators identified for each of the independent variables and hypotheses based on the effectiveness of independent variables on the dependent variable that is selection method the technology transfer formed. Then, using the chi-square test and Friedman test the effect of independent variables on the dependent variable was analyzed and five hypotheses was confirmed with 95% confidence, then use the results of hierarchical analysis and individual method in group decision-making processes ranked ways to technology transfer in Arak petrochemical industry.

Bager Zdadeh and Meftah (2011) study factors affecting the success of the technology transfer Screw compressor industry in the Iranian companies have done. The results show 78.9% of the people affected by role of management and economic conditions of the country, 57.89% of the people affected by environmental conditions of the country, 73% of the people affected by human resources (experts and technical staff), 84.21% of the people affected by the important role of research and development in the success or failure of technology transfer have expressed at a high level. The average factor of management 4.1, research and development factor 4, environments conditions factor 3.7, economic conditions factor 3.8 and human resources 4.2 obtained. ANOVA analysis showed that there are significant differences between the factors affecting the success of technology transfer in the compressor industry in Iran. Duncan grouping of
management factors, research, development, human resources, and significantly more effective than economic and environmental conditions factors.

Sabeti and Razavi (2011) in study identifying and ranking success critical factors in the technology transfer of information systems for the automotive industry in Iran. In this study, the identification of the existing framework for technology transfer of information systems and indicators for each of the classes in this framework, we try to have organizations who desire to transfer this technology evaluated and ranked. The class considered for this index includes three categories of organizational, tactical and technical factors. Some of the key success factors that were identified include; commitment and support of organization senior management, a clear understanding of business objectives and the needs of the organization, preparation of organization and appropriate infrastructure IT (organizational factors) a strong project manager team and appropriate specialists (tactic factors) inadequate training, user involvement in the project and retain trained personnel (technical factors). The research among experts in the field of IT and IS related companies in the automotive industry, such as Pars Khodro companies, Sazeh Gostar Saipa have been occurred. These enterprises experience technology transfer of information systems such as MES and ERP in their organization.

Khayat (2015) in a study examined the factors affecting the transfer of technology on the food production industry in the Philippines country. In this study, using varimax rotation introduced to assess the 29 indicators and the data analysis in the areas of technology transfer shown that relation of transport 4 equations to the construction of the state influence on technology features lead to effective technology transfer. Bigliardi et al (2015) in a study examined the factors affecting the performance of technology transfer offices in the field of Italian food conducted and this study examine the relationship between variables and the results of both internal and external factors for technology transfer has stated in addition, it was shown that this index directly and indirectly affected.

Tseng and Raudensky (2014) in a study evaluating the performance of the technology transfer of America university research offices stated that with regard to reporting on technology transfer in America universities offices and in the field in the past few years to assess the performance of this process has provided little information. The researcher has tried to assess the performance of the information technology transfer by information success factors explain this transition and challenge major issues. Mamat and Roslan (2012) in research as key elements in the effective transfer of technology in manufacturing industry expressed in this research is trying to be a comprehensive examines the factors affecting the success of technology transfer in this industry. In this article, we have tried to review the history of technology transfer and various factors involved in the transfer from the perspective of different researchers. In this paper, we study the theoretical foundations associated with the transfer of knowledge and technology to study the factors affecting the transfer has been effective. In this model, performance and management measures attended. The structural and behavioral aspects of the management of staff rose. In addition, it used AHP technique.

Initial research variables

Conceptual model of this research based on the model provided by the MehdiZadeh et al (2010), and slightly modified by including experts and academics professor view offered, because the research conducted in the steel industry and the public index of transfer of technology in the industry has expressed. However, in this research aims to extract indicators affecting the Kerman Copper industry, so this model is the closest model to this research, the base model are:

Table 1. Primary variable research.

<table>
<thead>
<tr>
<th>No</th>
<th>Factor</th>
<th>Sub factors</th>
</tr>
</thead>
</table>
| 1  | Effective and efficient management | 1. Complete transfer of information on the of equipment and technology suppliers  
2. Fine-setting contracts and technology transfer  
3. Check the performance and monitoring imported technology  
4. Consider further collaboration to ensure greater benefits are technology transfer  
5. Select the most appropriate transfer method in accordance with the organization's condition  
6. Agreement on the receiver and transmitter capabilities in manpower  
7. Consider the cultural differences |
| 2  | Close cooperation between research centers and industry | 1. Collaboration of government, industry, academia,  
2. Cooperation with Technology Park |
| 3  | According to research and development activities | 1. Internal training programs  
2. Pay attention to teaching and research and core development  
3. Localizing and modifications in technology transfer  
4. Training programs abroad |
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| **Access to sufficient market** | 1. There is a domestic large market in country of receiver technology  
2. Ensure access to the international market and competitive conditions in the market |
| **Active government support** | 1. Determine the appropriate technology selection criteria by state  
2. To provide practical information on foreign technology by the state to local companies  
3. State support and the lack of legislation, red tape and good diplomat relations with the countries of the technology |
| **Good functionality and technology absorption capacity of the recipient country** | 1. Pay attention to features such as: human resources, capital, natural resources, land, etc.  
2. Adapt imported technologies to the goals, values, possibilities and needs of the country |
| **Willingness and ability transmitter and receiver technology** | 1. The existence of a national determination to address organizational barriers  
2. Preparation and the ability of the parties to the transfer of technology |
| **Export Development police** | 1. Adopt policies to facilitate and encourage the development of export and import of new technologies |

**METHODOLOGY**

In this study, library method, mainly to study literature, research history, familiarity with the experience and knowledge of the methods used for and prioritize the factors affecting the transfer of technology. To determine factors affecting the technology transfer field method used. This study in term of aim is an applied research and in term of data collection is descriptive-analytical of the branch survey.

**Population:** The study populations who are expert in the field of technology transfer and in the production line of copper company are decision maker. According to the personnel report of these are 35 people. According to sampling method all sample will be 35.

**Data collection tools:** Two questionnaires used in this study are; fuzzy screening questionnaire to identify five options Likert scale questionnaire to get feedback on the status of variables. The validity of the questionnaire by experts confirmed. To verify the reliability of the questionnaire T-test of Cronbach's Alpha test used.

**Methods of data analysis:** To analysis of expert’s view the fuzzy screening, to determine the factors affecting the transfer of technology one sample t-test used.

**Fuzzy screening:** Multiple Attribute Decision Making problems needs assessment and determines the value of functional materials and phenomena studied, which require screening, identification and selection and key and important indicators of assessment. Screening issues with large subset (X) the set of possible options begin. The process of selecting a subset a of x, is called screening process. Each option requires substantially less information that indicates its suitability as the best option; described in the next study from which to choose a subset A of X is used.

**One-sample t-test:** One sample t-test is a test of review average and the branches of parameters test. In this study, this test used to check the status indicator. In addition, according to the 5 options questionnaire number average 3 considered.

**Research Data Analysis**

The purpose of the analysis is a set of methods that help describe the facts, identify patterns, and develop our interpretations and hypotheses to test proposed (Levine, 1996). In this section, to answer research questions, data collected and analyzed for each step taken.

**The degree of importance of index by academic experts:** The first step is determining aij row. For example, in the form Aij calculated, as already noted, the following equation q is the number of points on the scale chosen here because the range 7 each fuzzy screening questionnaire (insignificant to extremely important) is equal to 7, r indicate the number of experts participating in the decision-making process, which is equal to 35, K is the number of experts required.

\[
\begin{align*}
b(k) &= \text{Int} \left[ 1 + \left( \frac{q - 1}{r} \right) \right] \\
b(1) &= \text{Int} \left[ 1 + \left( \frac{7 - 1}{35} \right) \right] \approx 1 \\
Q_{A} (k) &= S_{b(k)} \quad \Rightarrow \quad Q_{A}(1) = S_{1}
\end{align*}
\]
RESULTS

At this stage, the final parameters selected for further study. Recruiting for the indicators is that, experts in the row for the index arranged in descending order from left to right. In the selection of row named MIN row, the minimum \( q_{\text{row}} \) and row before (experts), and MIN row formed. The default determined by the respective professors row MIN have an OU, the index will be required. We repeat this for all parameters. According to the description given in Table 2 the result of this phase of the research are inserted characteristics and used for continued research.

Table 2. Final Indices.

<table>
<thead>
<tr>
<th>No</th>
<th>Factor Name</th>
<th>Sub factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Effective and efficient management</td>
<td>1. Complete transfer of information on the of equipment and technology suppliers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check the performance and monitoring imported technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Consider further collaboration to ensure greater benefits are technology transfer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Select the most appropriate transfer method in accordance with the organization's condition</td>
</tr>
<tr>
<td>2</td>
<td>Close cooperation between research centers and industry</td>
<td>1. collaboration of government, industry, academia, Technology Park</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. cooperation with Technology Park</td>
</tr>
<tr>
<td>3</td>
<td>According to research and development activities</td>
<td>1. Internal training programs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Pay attention to teaching and research and core development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Localizing and modifications in technology transfer</td>
</tr>
<tr>
<td>4</td>
<td>Access to sufficient market</td>
<td>1. There is a domestic large market in country of receiver technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. ensure access to the international market and competitive conditions in the market</td>
</tr>
<tr>
<td>5</td>
<td>Active government support</td>
<td>1. To provide practical information on foreign technology by the state to local companies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. State support and the lack of legislation, red tape and a good diplomat relations with the countries of the technology</td>
</tr>
<tr>
<td>6</td>
<td>Good functionality and technology absorption capacity of the recipient country</td>
<td>1. Pay attention to features such as: human resources, capital, natural resources, land, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Adapt imported technologies to the goals, values, possibilities and needs of the country</td>
</tr>
<tr>
<td>7</td>
<td>Willingness and ability transmitter and receiver technology</td>
<td>1. The existence of a national determination to address organizational barriers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Preparation and the ability of the parties to the transfer of technology</td>
</tr>
<tr>
<td>8</td>
<td>Export Development</td>
<td>1. Adopt policies to facilitate and encourage the development of export and import of new technologies</td>
</tr>
</tbody>
</table>

In this section t-test results presented in Table 3.

Table 3. Results of one-sample t-test.

<table>
<thead>
<tr>
<th>No</th>
<th>Factor Name</th>
<th>Mean value</th>
<th>Sig.</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Effective and efficient management</td>
<td>3.69</td>
<td>0.000</td>
<td>0.875</td>
<td>1.911</td>
</tr>
<tr>
<td>2</td>
<td>Close cooperation between research centers and industry</td>
<td>3.83</td>
<td>0.000</td>
<td>0.345</td>
<td>0.987</td>
</tr>
<tr>
<td>3</td>
<td>According to research and development activities</td>
<td>3.81</td>
<td>0.000</td>
<td>0.455</td>
<td>1.080</td>
</tr>
<tr>
<td>4</td>
<td>Access to sufficient market</td>
<td>4.01</td>
<td>0.000</td>
<td>0.467</td>
<td>1.001</td>
</tr>
<tr>
<td>5</td>
<td>Active government support</td>
<td>3.98</td>
<td>0.000</td>
<td>0.760</td>
<td>1.876</td>
</tr>
</tbody>
</table>
Good functionality and technology absorption capacity of the recipient country 4.34 0.000 0.609 1.623
Willingness and ability of transmitter and receiver technology 3.89 0.000 0.234 0.845
Export Development police 4.21 0.000 0.345 1.203

In one sample t-test to check the status indicator at first, pay attention to value the significant level. If the significance level for this test is greater than 0.05 the average value is equal to the average default, but if significance level is less than 0.05 equality assumption of the average value determined by the mean value obtained in this study is rejected. The next step is to determine whether the average value is greater than 3 or smaller should look to the minimum and maximum results, so that if the minimum and maximum to be positive average number is larger than 3 if negative is smaller than 3.

In light of the above, and with reference Table 3, as can observed significance level for all elements is smaller than 0.05 that show inequality the average of the number 3. Carefully to the minimum and maximum parameters are obtained for every eight positive factor must say every eight factors identified technology transfer in the Kerman Copper company has good condition and they are larger than the average set by the 3.

CONCLUSION

Today, technology is the golden key needed to compete in the world of business and economic growth organizations and nations. Years ago, people like Joseph Schumpeter need to invest in the use and development of technology rose. Solo new technologies for more efficient ways of doing things to create new aspects and human activities presented. Thus, the possibility of improving the quality of goods and services, increase productivity, reduce time launch of new products to market and the satisfaction of human needs is endless. Offering different products and services to market, technological developments, and changes in the way of planning, implementation, monitoring and evaluation of technical change, each considered as an opportunity to increase capability, competitiveness and growth of industry. In this way, technology, implementation and proper enjoyment of it always, is the best field of socio-economic benefits. Today, despite the theories need more than ever before is the possibility of growth and continuous improvement based on the development of technology know (Ansari & Zare, 2009).

As a successful and appropriate technology, transfer can significantly affect the economic development of a country's technical and financial, as well as an inappropriate technology transfer has a negative impact on the economy and business conditions and the company become away from its competitive advantage. So it is important for corporate executives who are looking for technology transfer that all aspects of the organization and be able to create competitive advantage. For this reason, managers need, as well as the factors affecting the transfer of technology and consider it in its decision.

In fact, this study is to identify and investigate the factors affecting the transfer of technology, helps to some managers in the decisions that they want to transfer their technology. In this study, the early models studied and a model chosen to be close to the research and for evaluating the effectiveness of screening indicators used. The index of mining by experts and academia experts and copper industry in eight categories called technology transfer. In the next step, using t-test performed to determine the dimensions or factors.

Suggestions

According to the results of research suggestions given below:
- Management and technology transfer centers that can fulfill those described in the previous proposal. It is noteworthy that these centers must for any industry, and in particular, the industry made up of people with experience in technology transfer projects used.
- Skilled labor in the country should be fostered to absorb the transferred technology is made possible. For this purpose, the country's education system, including high schools, technical schools and higher education and should be revised and the training of human resources required to build research capacity to absorb technology and the creation of the country to be strengthened.
- Provide local technology transfer models for copper using the parameters extracted.
- Test the model to other companies producing copper and comparison with results.
- Implementation of the model in a certain environment and comparison with results.
- Conduct a feasibility study, like MES and evaluate the readiness of the industry's technology transfer company.
REFERENCES


Bager Zdadeh M, Meftah  J, 2011. To investigate the factors affecting the success of technology transfer Screw Compressor industry in Iranian companies, beyond the management. 16: 125-154.


Karbassian M, Javanmardi M, Khaboshany A, Zanjirchi SM, 2011. the design of an integrated approach interpretive structure model (ISM) and Fuzzy TOPSIS-AHP for the selection and ranking of providers agile. Production management and the second period. 1: 107-134.


