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Research Article

THE COMPARISON OF THE LEVELS OF TECHNOLOGICAL CAPABILITY IN AFTER SALES SERVICES IN AUTOMOTIVE INDUSTRIES: A CASE STUDY OF AFTER SALES SERVICES OF IRAN KHODRO INDUSTRIAL GROUP

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ABSTRACT
One of the main reasons of failing to apply technology for achieving competitive advantages in developing countries firms is the lack of awareness and assessment of the firm technological capability levels, and the utilization of those capability levels to gain relative competitive advantages through technology. It is essential for ISACO Company, as the largest Iranian company of after sales services in automotive industry, to assess its technological capability levels. The present study is going to investigate technological capability levels and the breach placed in each level in Iran Khodro professional company of after sales services, ISACO, using the Technology Need Assessment model. This model assesses firm capability levels in 9 dimensions and 24 indicators and detects the state of the firm in each level.

Keywords: *Technology, Technological Capabilities, Technology Assessment*

INTRODUCTION
In the present world, the role of technology in economic and social development of countries is not a secret. Pioneer countries in modern technology and science not only were attentive to continuous assessment of their own companies and institutions and scientific centers, but also got access to affective strategies to employ exploring human resources, enhance research and findings qualities and pave the way for national and international cooperation through wise assessments. Today, technology is supportive of competitive advantages of countries and acts as a driver for industrial and economic developments. Technology assessment, also, seems to be a significant leading device for technology evolution and development (Chen lo, Mei, 2010)

The major reason behind the failure of developing countries in achieving competitive advantages is the lack of sufficient technological knowledge and awareness of technological companies, and the lack of appropriate capability assessment. The importance of technology development has caused major managers of pioneer companies to set for the recognition and assessment of technological capabilities alongside with the recognition of global technology development and monitoring rivals' efforts, in order to get access to modern technology and moving towards improving technological capabilities of the firm. Therefore, with the recent development of technology in different dimensions and the necessity to employ modern technologies, the need for technology assessment in an organization can be felt more than ever (Khamseh, 2013).

Manufacturing companies and institutions have always been very much involved in executive matters as well as severe changes in the competitive environment. Therefore, using models and methods for long term technology assessment would not work for these firms. In other words, technological managers and experts of companies and institutions, using their experiences and mental ability, can determine the capability of the company in different technology dimensions. Technological capability models seem to be the perfect tools to acknowledge these mental estimations. Regarding the experiences in this field, the models

and methods that are used in the company should have two basic properties: first they should be simple and clear-cut, and second, they should present results in an acceptable short time (Tabtabaian, 2005).

Definitions:

Technology: technology encompasses all knowledge, products, tools, methods and systems that are utilized to offer services and products. Technology is the process of transferring and turning industries into products through knowledge, experience, information and tools (Khalil, Tarogh, 2002).

Technological capabilities: Technological capabilities in the industry include technical, managerial and institutional skills and synergistic performances (lal, Sanjia, 2006).

Technological capability assessment: technological capability assessment is a process through which the current level of capabilities and the technological capabilities of the institution are measured in order to both identify the strengths and weaknesses of the institution and compare the technological capabilities of the institution with ideal level rivals and take action to compensate for undesirable issues (Tabatabaian, 2005).

REVIEW OF LITERATURE:

The U.S government was one of the first to assess science and technology. After initial assessment of 1930s and 1940s, National Science Foundation got in charge of assessing science and technology in early 1950s. In 1962, the organization of economic corporation development offered an applicable guideline for cumulating the statistical data of European countries researches and progresses through a list of definitions provided by NSF. In 1973 National Science Foundation embarked on a new initiative and published scientific indicators which were the results of primitive efforts to expand provincial and academic institution indicators in the U.S. The main purpose of this report was to indentify the strength and weakness indicators of the U.S technology and science, in other words, to reveal the internal sector (companies and scientific studies institutions) capacity and performance in terms of supporting the national goals. The publication of this report won the global attention in a way that several countries and companies took advantage of these indicators as a model. In 1984 the Economic Cooperation and Development organization published a series titled "the science and technology indicators" and in 1998, substituted it with "the main science and technology indicators". Subsequently, The Europe Union issued the "report for Indicators of Science and Technology in Europe" in 1994 (Zolfaqar Nasab, 2004).

Table 1: The Categorization of Technological Capability Assessment Models (Radfar, 2011)

Models which Determine the Breach of Technology	Models which Examine Causes for the Breach of Technology	Models which Offer Solutions to Compensate for the Breach of Technology
Technology Atlas model Porter Model Panda and Ramansen Model Fluid Model Technology Need Management Model Technology Content Assessment Technology Situation Assessment Model Economic added value model	Ford Model Lindsay Model Technology Atlas model Fluid Model Technology Need Management Model Technology Capability Levels Model	Ford Model Lindsay Model Fall Model Garsy – Arrola Model Lynn Model Technology Need Assessment Model Information Systems of Technology and science Management Model Technology Need Management Model

Nowadays, different types of technological assessment models are proposed which can be divided in three general categories as in table 1.

The technological capability assessment in ISACO Company was previously carried on via Panda and Ramanson models by Dr. Abbas Khamseh and Davoud Sarafraz. In this study the assessment of technological capabilities in ISACO Company is performed via Technology Need Assessment.

The Introduction of Applied Model in This Study:

The technology Need Assessment model is a means to identify and determine required capabilities for running technology priorities in companies, which examines technological capability levels in 9 dimensions and 24 indicators. The categorization of technological capability dimensions in this model is as follows :

Awareness capability: that is the ability of the company to identify the need to improve technology.

Searching capability: that is the ability of company to recognize technological opportunities and threats.

The capability to create a qualification-oriented environment: that is the ability of company to create a qualification-oriented environment (the distinction among competitors)

Technology strategy capability: that is the ability of company to evaluate and choose an appropriate technological solution.

Technology attainment capability: that is the ability of the company to attain and employ a technology.

The capability of Technology engrossment and utilization: that is the ability of the company to effectively implement and utilize technology.

Acquisition capability: that is the ability of the company to learn from past experiences in order to improve technology and new products.

External links exploiting capability: the ability of the company to communicate with the supply network and exploit external links (universities, Cooperation with an advisory and research institutions, governmental incentives,…) (Khamseh, 2010)

Once the questionnaires were answered by a panel of experts, the scores were summed up and the total score was compared with the values stated in table 2 which would finally demonstrate the capability level of the company. However, for the sake of accuracy, the total score was multiplied by 5 and the scoring operation was conducted through the continuous spectrum.

Table 2: The Determination Forum for Technology Need Assessment Results

Partial Rankings		Classification of Firms	Capability Level	Added Scores	Total audit results
Beginner	1-40	Passive(A)	1	1-120	Your firm is poor and inefficient in all important areas of attaining and exploiting the technology strategy development, and requires an immediate enhancing program.
intermediate	41-80				
advanced	81-120				
Beginner	121-160	Reactive(B)	2	121-240	Your firm is hardly developed in most areas of technology strategy, research, attainment and capacity building, and requires many capabilities to reconstruct this domain.
intermediate	161-200				
advanced	201-240				
Beginner	241-280	Strategic(C)	3	241-360	Your firm is relatively strong in internal capabilities and maintains a strategic approach towards technology, yet moves behind the national technology in some domains.
intermediate	281-320				
advanced	321-360				
Beginner	361-400	Creative(D)	4	361-480	Your firm enjoys a set of fully developed technological capabilities and is able to identify the boundaries of national technology. It acts creatively in some domains and utilizes technology to benefit from competitive advantages.
intermediate	401-440				
advanced	441-480				

Based on this model and according to the categorization of table 2, companies are divided into 4 types in terms of capability levels:
Firm type 1 (passive firm): this type of firm is not well aware of its own requirements for transferring technology or environmental improvements and is not sure which technological capability level needs to be upgraded. Such a firm is unlikely to maintain a stable policy in critical situations.
Firm type 2 (reactive firm): these firms, although, are well aware of the need to technological capability improvement in order to achieve goals of growth and development, would only react to environmental threats and are not able to exploit the events to their advantages.
Firm type 3 (strategic firm): these firms are well cognizant how to improve their technological capabilities, foster a strategic approach and are strongly able to run their projects.
firm type 4 (creative institution): most of these firms (like Microsoft, Ford, etc) earn average or high incomes and are quick in improving their technological capabilities (Khamseh, 2010).

PURPOSES, METHOD AND QUESTIONS OF THE STUDY:
The present study is supposed to determine technological capability levels of ISACO Company and identify the breach in each level. This study is a descriptive survey in terms of practical purposes and the methodology. The research questions are as follows:
1- Which level is occupied by each technological capability indicator of ISACO Company?
2- Which level is occupied by ISACO Company's capability of technological awareness?
3- Which level in ISACO Company is occupied by technological searching capability?
4- Which level in ISACO Company is occupied by the creation of qualification-oriented environment from a technological point of view?
5- Which level in ISACO Company is occupied by technology strategy capability?
6- Which level in ISACO Company is occupied by the capability of evaluation and selection of appropriate technology?
7- Which level in ISACO Company is occupied by the attainment of appropriate technology capability?
8- Which level in ISACO Company is occupied by capability of technology engrossment and utilization?
9- Which level in ISACO Company is occupied by technology acquisition?
10- Which level in ISACO Company is occupied by the capability of exploiting external links, associated with technology?
11- To which level do the total technological capabilities of ISACO Company belong?
12- How serious is the beach of technology in these 9 dimensions in ISACO Company?

Statistical Population:
The senior and junior managers and experts of ISACO Company, with bachelor and higher education degrees and more than 3 years working experience as informants, constitutes the population of this study. The population of the study was determined with regard to the company's situation at the time the research was conducted. Therefore, due to the limited number of informants, a total counting method was applied (table 3).

Table 3: Respondent's Descriptive Parameters

Row	Education Level	Number	Working Experience Mean Score (years)
1	BA	24	11.45
2	MA	12	10.25
3	Total	36	11.05

DATA ANALYSIS:

2 types of methods were applied to analyze the research data:

A) Statistical analysis:

In this type of analysis the collected data are summarized and categorized through statistical indicators, in other words, in descriptive data analysis the gathered data are initially summarized and categorized through preparing a frequency table, then are visualized through diagrams. Finally, the data are summarized using other statistical indicators.

B) The analysis associated with informants' judgments

Taking advantage of informants' judgment to analyze data is one of the important decisions making methods in researches with highly significant results. The high percentage of potential errors in other methods of analysis for these types of study may reduce the validity of the results. This method is employed to analyze the data of research questions and offer solutions to the problems.

RESEARCH FINDINGS:

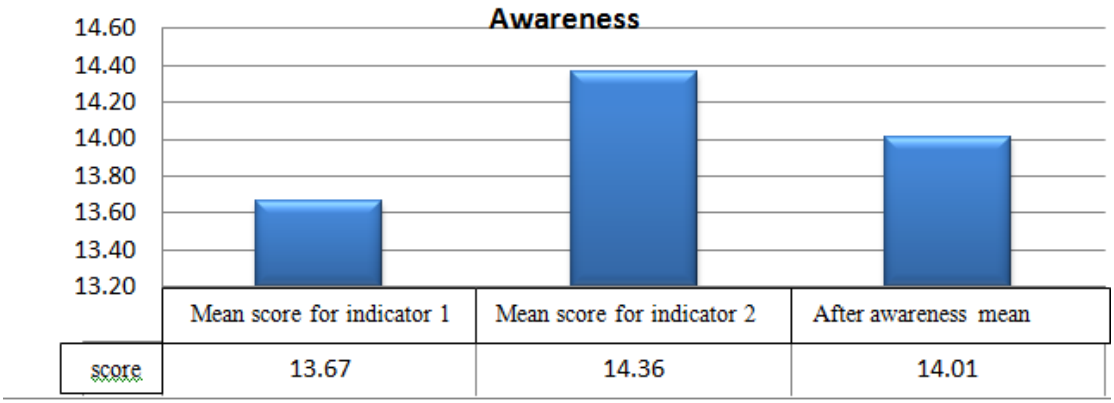

Diagram 1: Indicates the Scores Obtained after Technological Awareness in ISACO Company

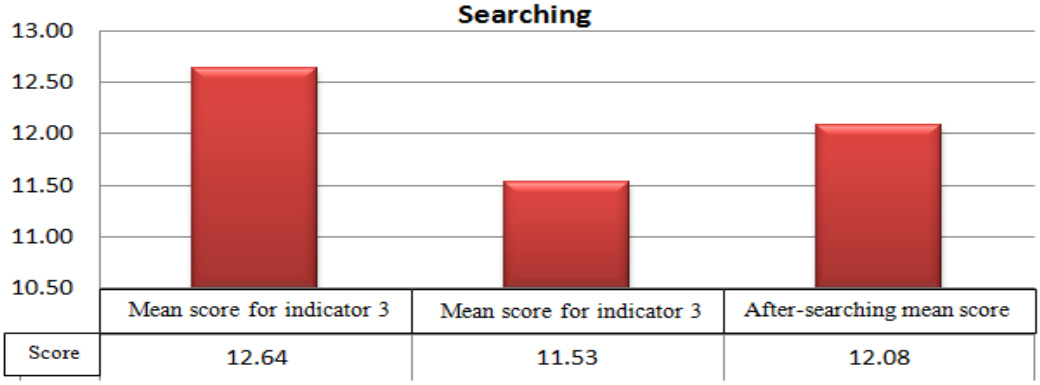

Diagram 2: Indicates the Scores Obtained after Technology Searching in ISACO Company

Technological Capability Dimensions	Question Number	Key Questions	Score out of 100	The Breach of Technology Degree
Awareness	1	Our firm is well aware of the most important business technologies.	68.33	31.67
	2	Technology plays a vital role in the business strategy of our firm.	71.81	28.19
Searching	3	Our firm is totally prepared to assess technological opportunities.	63.19	36.81
	4	Our company is able to evaluate technology weaknesses with no problem.	57.64	42.36
Creating a Qualification-Oriented Environment	5	Our company is equipped with particular technological capabilities and is able to use them.	64.03	35.97
	6	Our company is aware of external and internal technological resources.	66.11	33.89
Technology Strategy	7	The management team in our company is skillful in formulating strategies to achieve business goals.	64.72	35.28
	8	Our company is cognizant of its main technological priorities.	65.14	34.86
	9	Our company carries a proper perspective to develop technology.	65.14	34.86
Assessment and Selection of Technology	10	Our company is sure how to choose its required technology.	61.94	38.06
	11	Our company is informed of superior technology resources.	63.61	36.39
Technology Attainment	12	Our company is successful in attaining technology from external resources.	53.33	46.67
	13	Our company connects with the foreign suppliers of significant technologies.	51.67	48.33
Technology Engrossment and Utilization	14	Technological activities of our company . (engineering, researching and developing) are affectively organized.	56.94	43.06
	15	Our company conducts clear processes of technology projects.	54.03	45.97
Acquisition	16	Our company has got a suitable system to assess technology projects.	58.19	41.81
	17	Our company is attentive to future projects and examines them.	59.31	40.69
	18	We've got the ability to learn from one technology to the other.	59.72	40.28
Exploiting External Links	19	Government policies encourage us to invest in technology.	51.11	48.89
	20	We take advantage of advisory companies'/ advisors' help to assess technology.	57.50	42.50
	21	We benefit from outside people' help to develop our technology.	54.86	45.14
	22	We get help from other companies to perform our technology strategies.	55.97	44.03
	23	We count on universities to run main technology projects.	44.86	55.14
	24	We cooperate with governmental research centers in conducting significant projects.	39.86	60.14

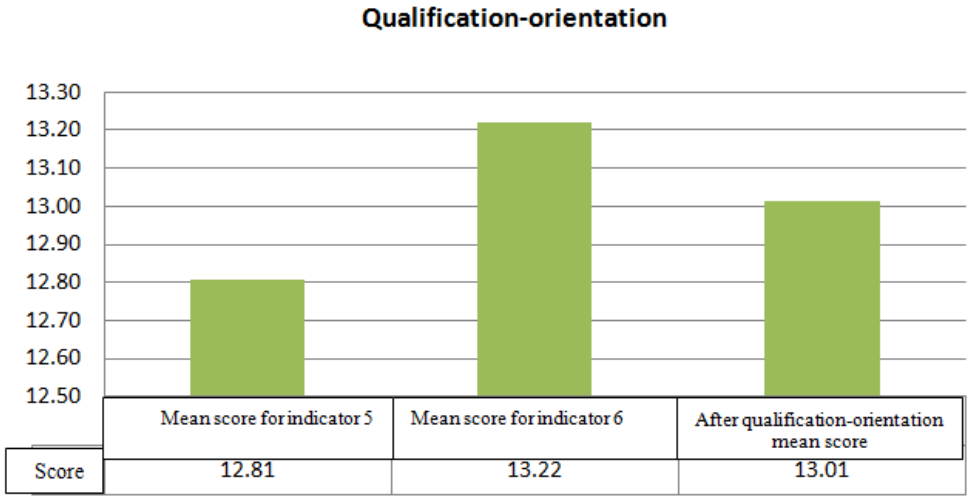

Diagram 3: Indicates the Obtained Scores of Qualification-Oriented Environment from a Technological Point of View in ISACO Company

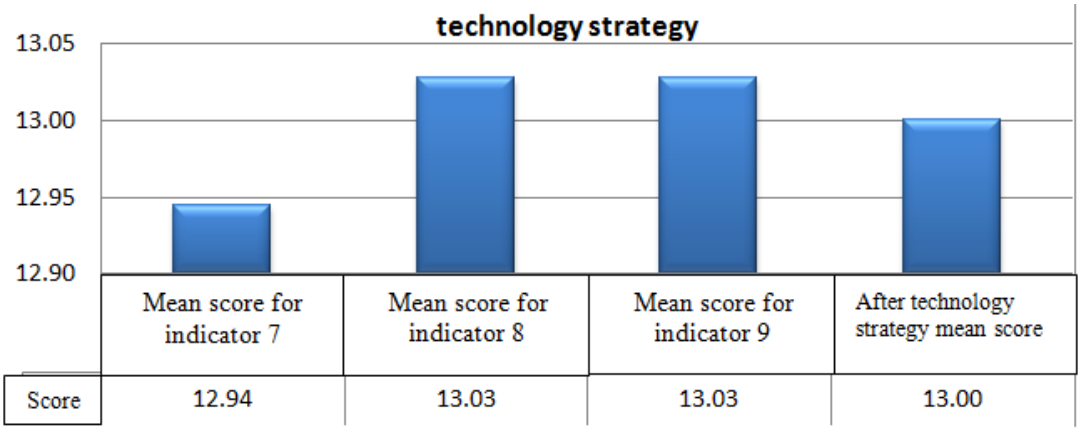

Diagram 4: Indicates the Capability of Technology Strategy in ISACO Company

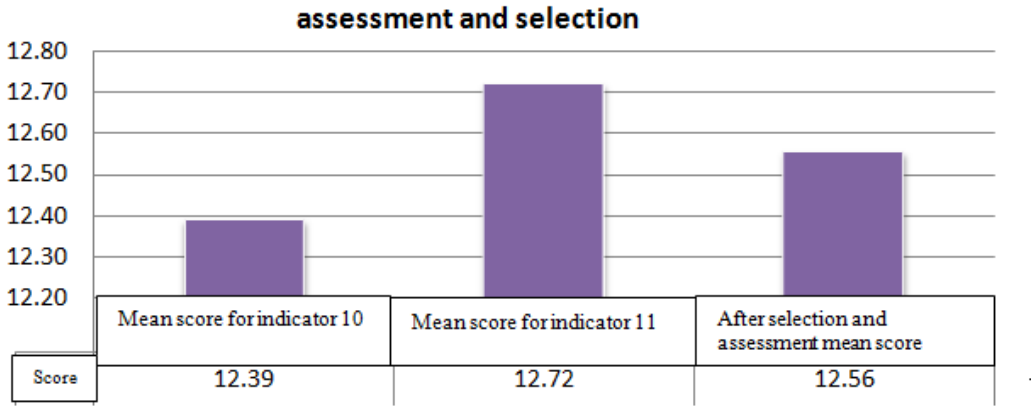

Diagram 5: Indicates the Capability of Evaluating and Selecting Appropriate Technology in ISACO Company

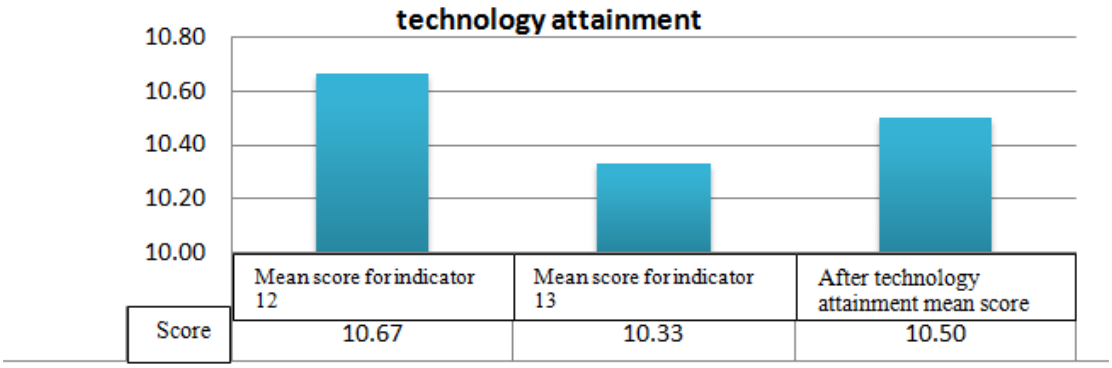

Diagram 6: Indicates the Capability of Technology Attainment in ISACO Company

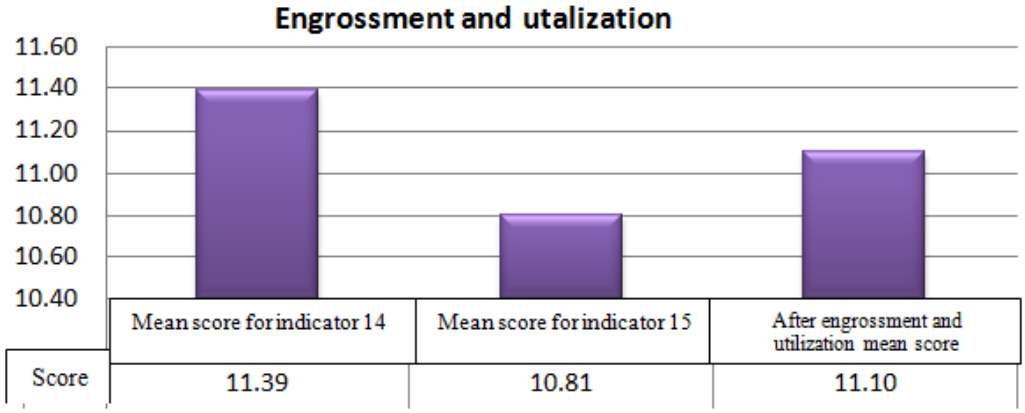

Diagram 7: Indicates the Capability of Technology Engrossment and Utilization in ISACO Company

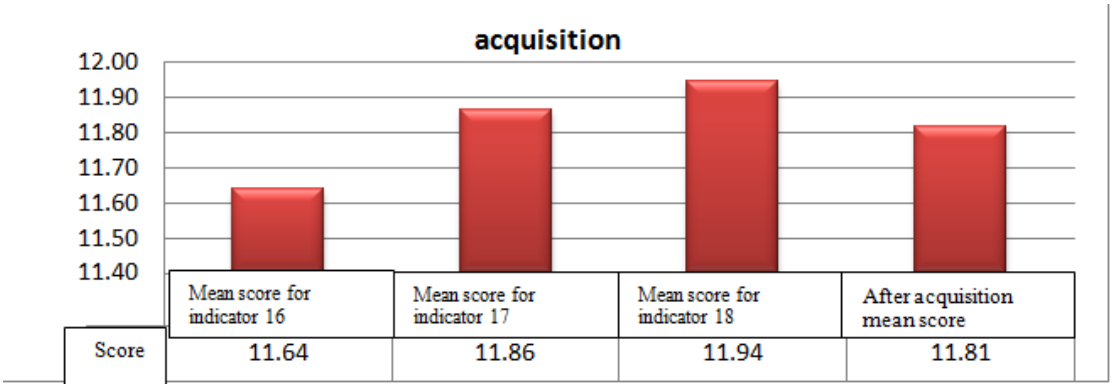

Diagram 8: Indicates the Level of Technology Acquisition in ISACO Company

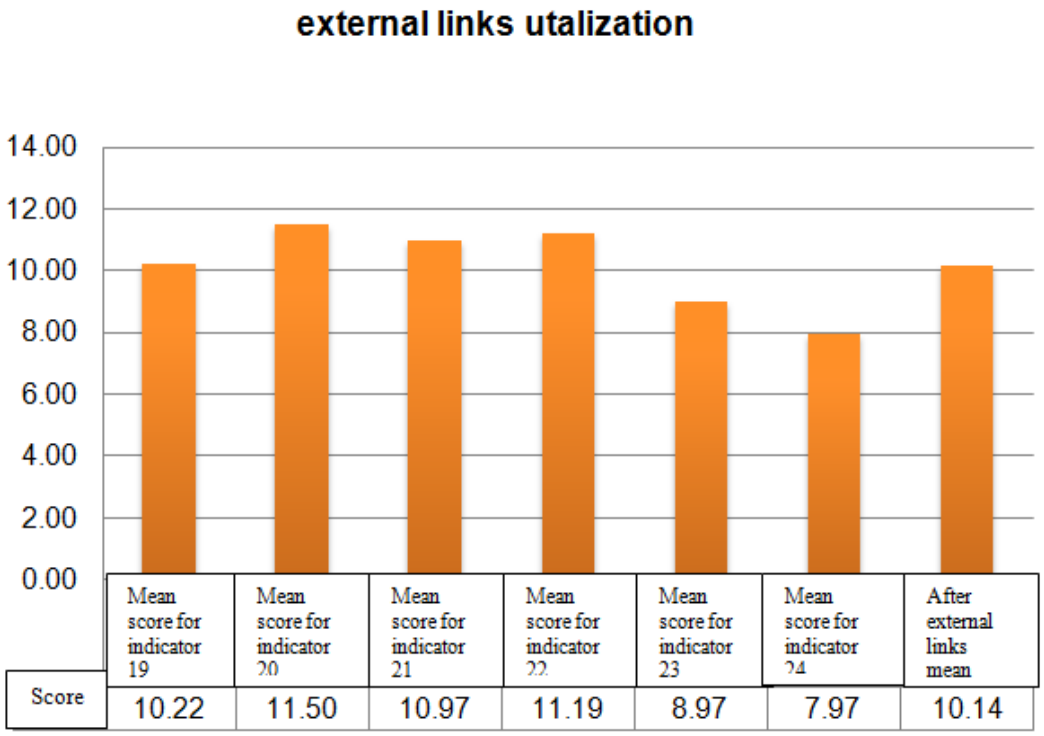

Diagram 9: Indicates the Capability of Exploiting External Links Associated with Technology in ISACO Company

Given the current level and optimum level (100%), it can be concluded that these two levels are different in each of 9 dimensions of technological capability in ISACO Company. the difference degree is stated in table 5 and diagram 10.

Table 5: The Quantitative Amount of Breach between Current and Optimum Level of Capability in Each of the Dimensions (per cent)

Technologic capabilities	Mean score for capability percentage (current level)	Optimum level	The degree of technology breach
Awareness capability	70.07	100	29.93
Searching capability	60.42	100	39.58
Creating a qualification-oriented environment	65.07	100	34.93
Technology strategy	65	100	35
The assessment and selection of technology	62.78	100	37.22
Technology attainment	52.50	100	47.5
Technology engrossment and utilization	55.49	100	44.51
acquisition	59.07	100	40.93
Exploiting external links	50.69	100	49.31
Total mean score	60.12	100	39.88

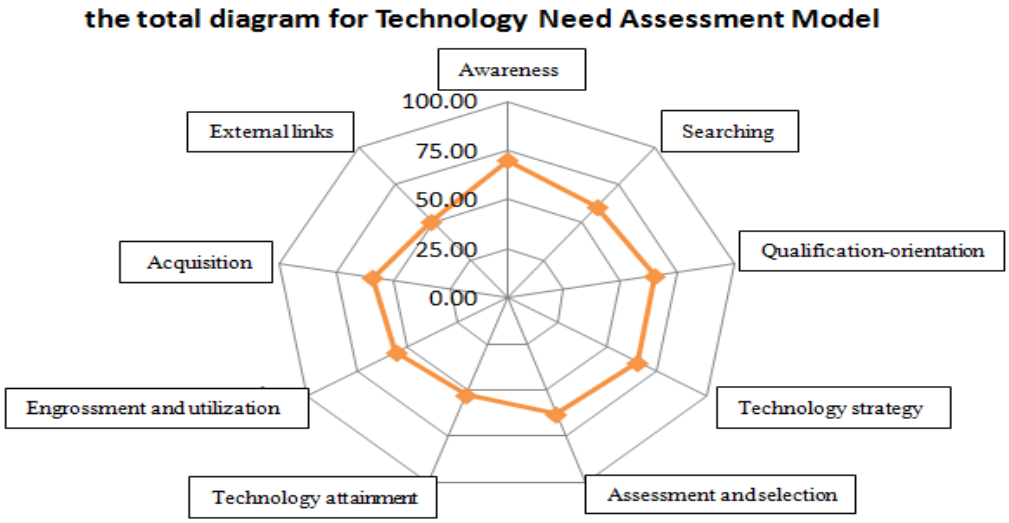

Diagram 10: The Total Diagram Obtained from Technology Need Assessment Model

DISCUSSION AND CONCLUSION:

Among all indicators of technological capability levels measurement, the indicator "exploiting external links", obtained the minimum score of 50.69 percent and the indicator "awareness", enjoyed the maximum score of 70.07 percent. The summary of results states that awareness capability is the most capable dimension and external links exploiting capability is the least capable one. Other capabilities also occupy a place between these two capability levels. However, some sort of convergence and relative symmetry is observable among different capability levels.

The sum of all mean scores of 24 questionnaire questions was 281.81. thus, regarding table 2 and diagram 11 that demonstrate the place of technology capability implementation in companies, ISACO Company is placed in C area, that is the area of middle way strategic institutions.

The firms of type C (strategic), carry an agreeable and appropriate perspective of how technological capability developments occur in their company. These firms are equipped with high abilities to run their projects and maintain a practical approach towards expanding capability levels. Maintaining a clear attitude towards priorities, these firms are able to formulate strategies and enhance growing internal capabilities associated with management and technical domains. Although Type C companies are able to respond quickly and effectively to new environmental technology rules, these companies require new policies to boost innovations in the leader sectors. They may also need to get better access to capital goods and services. firms type C also benefit from Strategic awareness focused on the latest technologies that are needed for the medium and long periods of time. They also may need small and average firms and institutions, and other less developed companies. These companies encompass technology boundaries in many domains and gradually move towards being a type D company that is a highly creative company. (4)

According to table 6 and diagram 10, the company technological capabilities seem to be different from the optimum level by 39.88% on the whole and the maximum breach occurs in external links dimension and the minimum breach happens in awareness breach. Thus, the senior leaders of the company should set up to alleviate the existing breach of technology through proper programming and introducing enhancement projects.

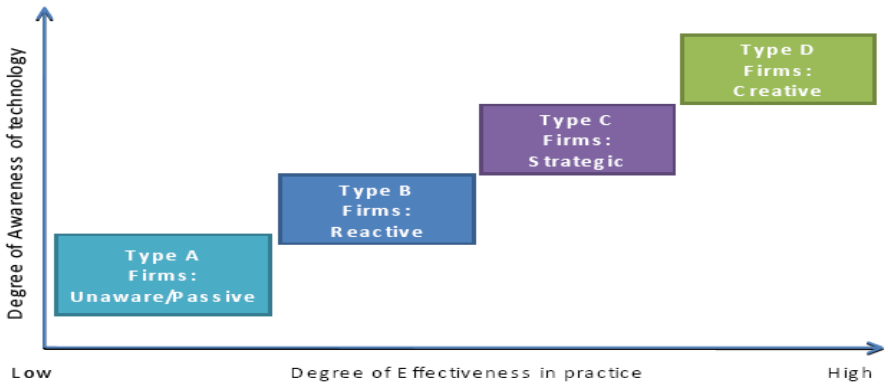

Diagram11: The Places Occupied by Technology Capabilities in Companies

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