

MEASURING AND COMPARING OF TECHNOLOGICAL CAPABILITIES LEVELS IN IRANIAN AUTOMOTIVE INDUSTRY (CASE STUDY: COMPARISON OF SAIPA AND PARS KHODRO)

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ABSTRACT

Nowadays, along with technology development at various levels and the necessity of using modern technologies, Assessment of technology is required more than ever. Assessment is an intellectual tool or framework which helps to better understanding of the technology and making decision on it. Therefore, in order to develop and apply new technology, the status of the available technology should first be evaluated. In this study, it is tried to measure and analyze the level of technological capabilities in SAIPA and Pars Khodro Companies and compare them with each other. This model is able to measure technological capabilities in three major and nine minor dimensions and determines the status of the capabilities of a given enterprise. Also, by comparing the technological and desired level of these two companies, the rate of technological gap with the optimal level is specified.

Keywords: *Technology, Technology Assessment, Panda and Ramanathen Assessment Model, Technology Capability*

INTRODUCTION

Nowadays, technology has inseparably been linked with the growth and survival of commercial and industrial organizations. Without technology, the personal and social life of human being has been inconceivable. Technology is perceived in two transformational ways; first, the way of achieving better performance in order to satisfy increasing demands of mankind while better performance means more speed, higher capacity, greater saving, greater efficiency, more reliability, need to less effort on the part of labor and more comfort in use; second, in the way of more satisfaction of potential demands of human. Technology increasingly takes greater control over human activities (that were previously done by themselves) and increases the range of activities and facilities for human (Brown, 2003). Since technological development has a direct relationship with economic development in an organization, the level of technological development in the organization can be considered as a sign of its authority. To develop technology, its related technology should first be achieved and then, promoted (Tabatabaian, 2005).

The importance of technological development leads senior organization managers to identify and evaluate themselves and rival companies to achieve new technologies and improve technology capabilities of the organization (Khamseh et al, 2013). Therefore, given the high significance of technological development, senior managers of economic enterprises should continually move to promote the technology capabilities of their organization through properly understanding of the technology capabilities of their organization, identifying technological developments in the world and also, considering competitors' attempt for achieving new technologies (Unido, 2002).

It seems like models of technology capabilities are appropriate tools to confirm such mental estimations. Experience shows that models and methods used in a company should have two properties; first, they should be simple and understandable and second, they should lead to the result in a short and acceptable period of time. On the other hand, evaluating and distinguishing the technology is one of the tasks of

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strategic managers that given the environmental conditions and their abilities and capabilities and assessing weaknesses, necessary strategies and policies be done for organization growth and achieving its aims (Tabatabaian, 2005).

The world is changing and the speed of change increases day by day. New technologies emerge and undermine the business relations. Management systems should be able to deal with these changes.

In order to accomplish competitive advantages of technology, it is not enough to look at it from the perspective of its application as a specialized issue. Also, it is not enough to look at it from the perspective of doing works with reasonable cost. We must know deeper contents on technology to be able to use its competitive advantage. Technology assessment is a mental framework or tool through which enterprises can have an in-depth assessment of technology and in the frame work of their abilities and interests as well as within the framework of the community where it is located (Brown, 2003).

LITERATURE REVIEW

Technology is all knowledge, products, tools, methods and systems served to present a product or service. Technology is the procedure and tool through which objectives are achieved (khalil, 2000) and also, technology is considered as guidelines and aims which lead human to produce skillfully and efficiently (Brown, 1998).

On the other hand, technology capability in industry includes technical, managerial and institutional skills giving enterprises the capability to use technical information and equipment (Lall, 2006). Also, technology capability assessment is a process in which the current level of technological capabilities and potentialities of the organization are measured both to identify all strengths and weaknesses of technology and to compare organizational capabilities of the organization with competitors at optimal level and to act to compensate for adverse cases (Tabatabaian, 2005).

There are various models associated with technology capability assessment that these views and models are classified into three general categories described in Table 1.

Table 1: Classification of various models of technological capability assessment (Radfar et al, 2014)

Models of determining technology gap	Models of assessing the incidence causes of technology gap	Models of providing the guide lines to compensate the technology gap
Atlas of Technology Model Porter's Model Panda and Ramanathen Model Floyd Model Management Technology needs model Technology assessment content Model Technology status assessment Model Economic Value Added Model	Ford Models Lindsay Model Atlas of Technology Model Floyd Model Management Technology needs model Model of Technology capability levels model	Ford Model Lindsay Model Phaal model Garcia-Arreola model Lin model Management Technology needs model Technology and Science Management Information Systems Model Technology needs asseement model

RESEARCH QUESTIONS AND OBJECTIVES

The present study aims to determine levels of technological capabilities in automotive industry in SAIPA and Pars Khodro and compare these two companies in terms of technological capability in various dimensions and determine technological gap in each dimension. This study is applicable in terms of aim and survey study with regard to the method.

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A) The primary research questions are:

1. What is the level of technological capability of SAIPA?
2. What is the level of technological capability of Pars Khodro?
3. What is the level of technological gap of two companies in three main technological dimensions? What are their differences?

B) The secondary research questions are:

1. What are the levels of strategic capabilities of two companies?
2. What are the levels of tactical technological capabilities of two companies?
3. What are the levels of complementary technological capabilities of two companies?

INTRODUCING THE MODEL USED IN THIS STUDY

Panda and Ramanathen Technological Assessment Model is a tool to identify and determine capabilities required for implementing technological priorities in enterprises and evaluating levels of technological capability in 3 major and 9 minor dimensions. Figure 1 shows the classification of dimensions of technological capabilities based on the model.

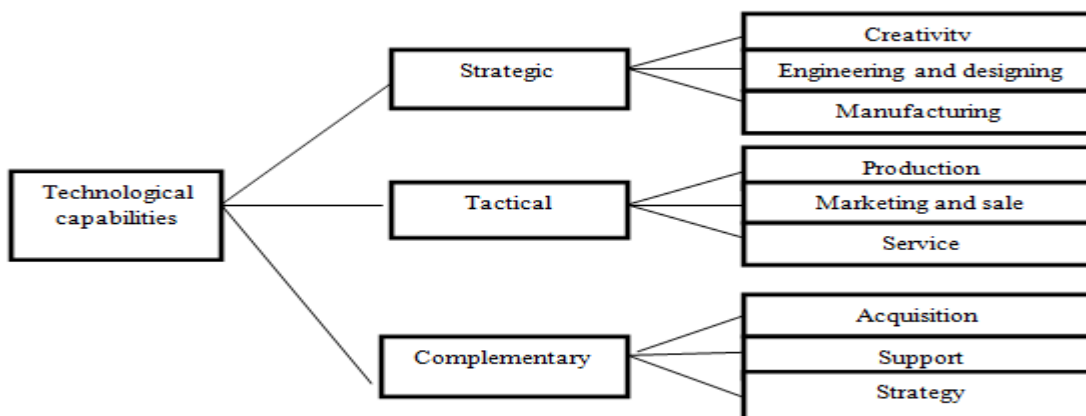


Figure 1: Classification of dimensions of technological capabilities based on Panda and Ramanathen Assessment Model (Radfar et al, 2014)

RESEARCH POPULATION

Individuals of bachelors and higher levels, with above-diploma, and higher degree and work- experience of more than 1 year as experts (Table 2 and 3) comprise the study population. The study population has been specified according to the company conditions at the time of the study.

Table 2: Descriptive parameters of respondents of Pars Khodro (Radfar et al, 2011)

Row	Educational level	number	Mean work-experience
1	Above-diploma	2	4.5
2	Bachelor	22	9
3	M.S	20	11

Table 3: Descriptive parameters of respondents of SAIPA

Row	Educational level	number	Mean work-experience
1	Bachelor	23	11.5
2	M.S	17	11

SUMMARY OF THE FINDINGS

Summary of the findings of secondary questions:

1. What are the levels of strategic capabilities of two companies ?

Figure 1 indicates the level of strategic capabilities in two companies and in comparison with each other, while Table 4 shows the mean levels of their strategic capabilities.

Table 4: Mean levels of strategic capabilities

Elements	The percentage of success for each sub-dimension in Pars Khodro	The percentage of success for each sub-dimension in SAIPA
Creativity capability	63.64	64.06
Engineering and designing capability	65.93	72.9
Manufacturing capability	67.61	71.47
The mean of all strategic capabilities	65.72	69.74

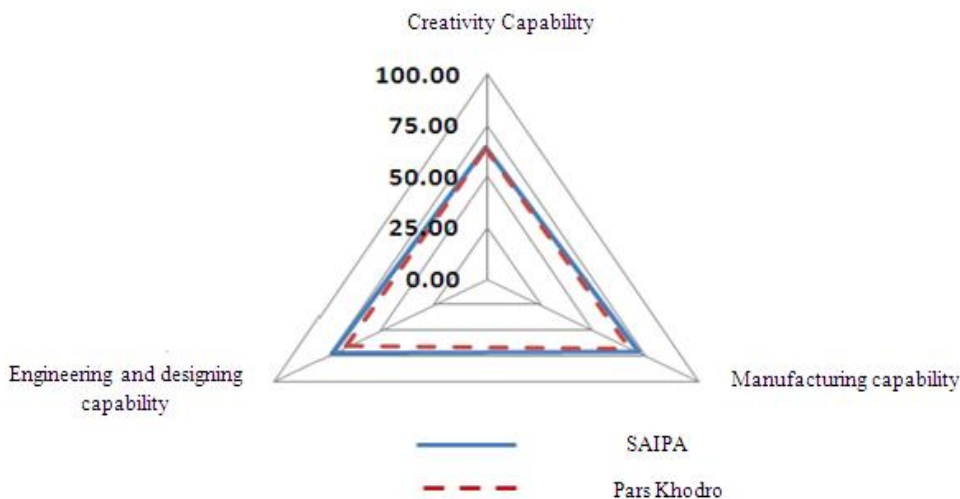


Figure 1: Comparative diagram of strategic capabilities for two companies

2. What are the levels of tactical capabilities of two companies?

Figure 2 shows the level of tactical capabilities for two companies and in comparison with each other and Table 5 indicates the mean levels of their tactical capabilities.

Table 5: Mean levels of tactical capability

Elements	The percentage of success for each sub-dimension in Pars Khodro	The percentage of success for each sub-dimension in SAIPA
Production capability	71.31	74.25
Marketing and sale capability	66.06	78.21
Service capability	66.06	66.31
The mean of all Tactical capabilities	68.19	72.44

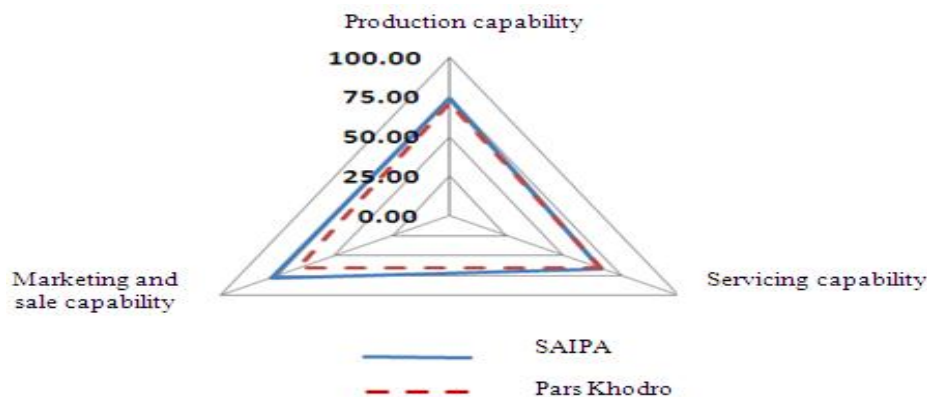


Figure 2: Comparative diagram of tactical capabilities for two companies

3. What are the levels of complementary technological capabilities for two companies?

Figure 3 indicates the level of complementary capability for two companies and in comparison with each other and Table 6 shows the mean levels of their complementary capabilities.

Table 6: Mean levels of complementary capabilities

Elements	The percentage of success for each sub-dimension in Pars Khodro	The percentage of success for each sub-dimension in SAIPA
Acquisition capability	66.9	72.53
Support capability	63	66.1
strategy capability	55	63.04
The mean of all complementary capabilities	62.32	67.48

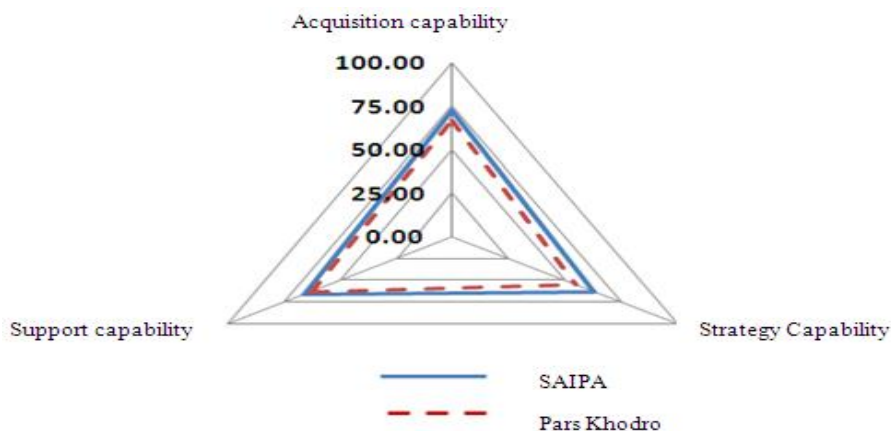


Figure 3: Comparative diagram of complementary capabilities for the organization

Summary of findings of the primary research questions :

1. What is the level of technological capability of SAIPA?
2. What is the level of technological capability of Pars Khodro?

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Given the results obtained from the perspectives of the study according to Table 7 and Figure 4 including the mean and percentage of scores for technological dimensions' capability and indicating that technological capabilities of SAIPA and Pars Khodro are 69.81% and 65.33% compared to optimal level (100%), respectively.

Table 7: Mean scores of levels for technological capability

Main dimensions	Sub-dimensions	Pars Khodro (Radfar et al, 2011)		SAIPA	
		The percentage of success for each sub-dimension	The percentage of success for each main dimension	The percentage of success for each sub-dimension	The percentage of success for each main dimension
Technological – strategically capability	Creativity capability	63.64	65.72	64.06	69.74
	Engineering and designing capability	65.93		72.9	
	Manufacturing capability	67.61		71.47	
Technological – tactical capability	Production capability	71.31	68.19	74.25	72.44
	Marketing and sale capability	66.06		78.21	
	servicing capability	66.06		66.31	
Technological – complementary capability	Acquisition capability	66.9	62.32	72.53	67.48
	support capability	63		66.1	
	strategy capability	55		63.04	
Total technological capabilities		65.33		69.81	

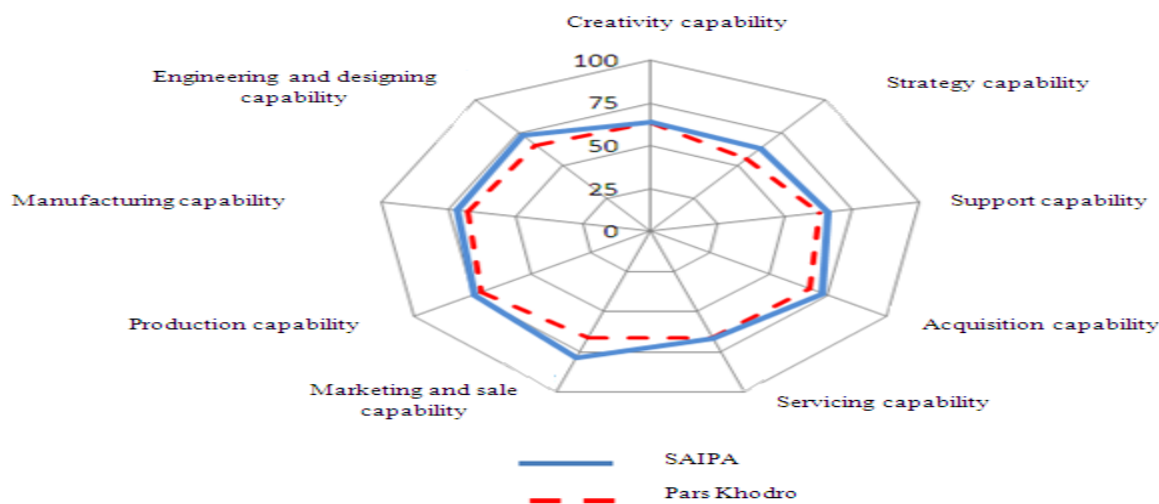


Figure 4: Comparative diagram of sub-dimensions of levels of technologic capability of two companies

3. What is the level of technological gap of two companies in three main technological dimensions? What are their differences?

Given the available - and optimal levels, it can be said that there is a difference between these two levels in both companies evaluated in terms of technological capabilities of the organization that the value and difference between two companies in each of main dimensions are given in Table 8 and figure 5.

Table 8: Quantitative rate of gap between available - and optimal levels

Technological capabilities	Pars Khodro		SAIPA	
	Available level	The gap between available- and desired levels	Available level	The gap between available- and desired levels
Strategic Technological capabilities	65.72	34.28	69.74	30.26
Tactical technological capabilities	68.19	31.81	72.44	27.56
Complementary technological capabilities	62.32	37.68	67.48	32.52
Technological capabilities	65.33	34.67	69.81	30.19

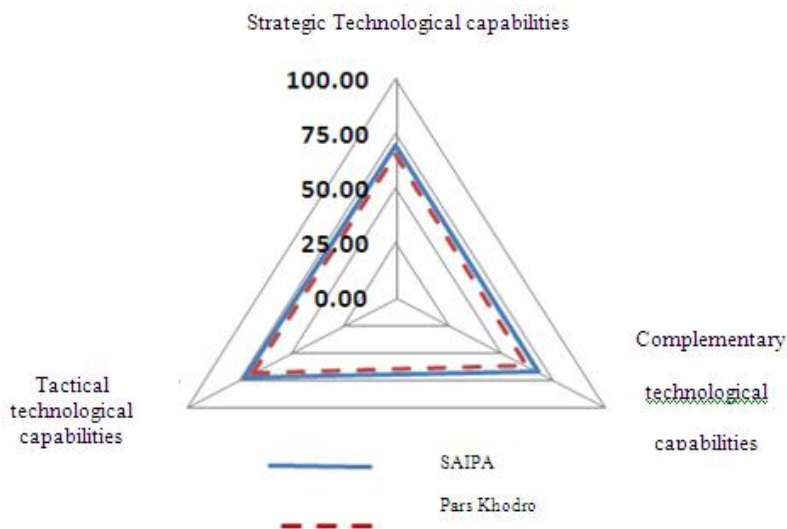


Figure 5: Comparative diagram of radar for levels of technological capability at different dimensions

According to the results obtained from assessing the level of technological capabilities, companies can be classified in 4 categories according to Table 9.

Table 9: Classification of companies according to the levels of technological capabilities

Total distinguishing results	Total scores	Classifying enterprises
In all important areas including acquiring exploitation and development of technology strategy, your company is weak and inefficiency and needs a major and immediate development program	0-25	Passive (A)
In most strategically area including research, acquisition and technology and innovation, your company was weakly developed and needs many capabilities for reconstructing these areas.	26-50	Reactive (B)
The company is relatively capable in internal abilities and has a strategic approach towards technology and innovation but the company's technology level is lower than national technology level in many fields.	51-75	Strategic (C)
The company has some advanced technological abilities and can recognize national technology's area. The company has innovative approach in some fields and use technology and innovation to get competitive advantages.	76-100	Creative and innovative (D)

Since the overall level of technological capabilities is equal to 69.81% and 65.33% in SAIPA and Pars Khodro, respectively, according to the classification of the above table, both companies are classified as strategic companies or group C.

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DISCUSSION AND CONCLUSION

According to Table 7:

- Among from the main dimension of strategic capabilities in Pars Khodro and Saipa, creativity capability is the lowest sub-dimension with 63.64% and 64.06%, respectively while the manufacturing capability with 67.61% and engineering and designing capability with 72.9% have the highest scores in Pars Khodro and Saipa, respectively.
- Among from the main dimension of tactical capabilities, the production capability with 71.31% and marketing and sale capability have the highest sub-dimension in Pars Khodro and Saipa, respectively. In Pars Khodro, marketing and sale and servicing capabilities with 66.6% and in Saipa, servicing capability with 66.31% have the lowest scores.
- Among from main dimensions, the complementary capabilities in Pars Khodro and strategic capabilities in Saipa with 55% and 63.06% respectively have the lowest sub-dimensions and acquisition capability in Pars Khodro and Saipa has the highest score with 66.9% and 72.53%, respectively.
- Summary of the results showed that in both Pars Khodro and Saipa, the tactical capability is the strongest level of capability with 68.19% and 72.44%, respectively and complementary capability is the lowest with 62.32% and 67.48%.

According to Table 8:

- Examining the results indicates that in terms of technology capability, SAIPA with 69.81% is at the highest level compared to Pars Khodro with 65.33% and in SAIPA with the 4.48%, the technological gap with the desired limitation is less than that in Pars Khodro that it is not very high while in both companies, the available level is far from optimal level.

REFERENCES

- Brown, E., 2003.** Assessment and prediction of technology. translated by Bushehri, A.R. and Malekifar, A., Publishing by Karane Science.
- Khalil, T. 2000.** Management of Technology: The Key to Competitiveness and Wealth Creation. McGraw-Hill.
- Khamseh, A. Mohagheghi, M., 2013.** Assessment of Technological Capability in Iranian Automotive Industries through Developing the Model. Online Journal of Natural and Social Sciences, vol.2, No. 3(s), 1730-1736.
- Lall, S. 2006.** Technology policies and market incentive. Research Bureau of Sharif University of Technology.
- Radfar, R. 2011.** Assessment of the level of technological capability of automotive industry. First International Conference – Fifth Technology Management Conference.
- Radfar R., Khamseh, A., Shieh E., Saghebi M., 2014.** Assessment of technological capability level of Iranian pharmaceutical industry. Indian journal of science research 1(2): 556-562.
- Tabatabaeian, S.H.A, 2005.** Assessment of enterprise -level of capabilities. Arian Publication.
- Unido 2002.** Technology Need Assessment for developing countries, www.unido.org