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Assessment of the Level of Technological Capability of Bahman Diesel Industrial Company

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ABSTRACT

The great importance of technology caused the senior managers to identify the capabilities of their technologists in their organizations and strive to develop the capabilities of Bahman Diesel Group, by identifying the technological advancements in the world and competitors' efforts to attain new technology. Hence, evaluation of technological capabilities is one of the most important sections in any program, because for goal-setting, the current condition and the gap between where the company is, and where it needs to be should be known. Using the expanded Panda and the Ramansen models, this article attempts to evaluate the technological capabilities, and identify the gap in Bahman Diesel Co. This model evaluates the different capabilities of the company on different levels and determines the condition of the co. on each of those levels. This Research shows, through the study of technological capabilities in Bahman Diesel Co. including strategic capabilities and tactical capabilities and complementary capabilities, the highest gap between current and desired level is strategic capabilities.

KEYWORDS: Technology, Evaluation, The Panda and Ramansen evaluation model, Bahman Diesel.

1. INTRODUCTION

The important and key role of technology in the development of in the advancement of industry, economy, and society, in all countries around the world is known to all. The countries that are pioneers in science and technology constantly evaluate the important companies and scientific centers, and based on the results of these evaluations, they go after better quality and ultimately better use of their research manpower to develop cooperation between countries.

Today, technology supports the competing advantage of countries, and is a factor for the development of industry [1].

The close relationship between technological development, progress, and economic development, show the technological development, in other words, the dominance of that company. The company should first achieve the technology and then expand it. [2].

A company that is not fully aware of its strong industrial and technical points, opportunities and threats, is not able to plan correctly. Evaluation of technology in an economic organization has the duty of identifying easier and less expensive technology in that organization, so that it can have a competitive advantage, and that technology can adapt to the culture and structure of that organization. The evaluation of technology examines the stages in creating added value, and the technological gaps in the organization's capabilities, compared with competitors, and identifies the cause of the generation of the gaps, and offer solutions.

Since manufacturing companies are exposed to constant change in the environmental factors (such as procurement, selling, supply chain …), the use of lengthy models and methods for evaluating technology are not applicable, and technical managers and experts of companies and factories can sense the capabilities of that organization in different areas of technology due to their experience in the field. The beneficial evaluation of technology is one of the duties of strategy managers. They should offer strategies and policies necessary to achieve the goals of the organization and its technological development [3].

2. LITERATURE REVIEW

The root of any organization's success is due to its innovation. Competitive advantage may be due to the size and the amount of possessions, however this is to the advantage of organizations that can use their scientific and technical skills and experience to bring innovation in their products or services or ways to develop them [4]. Today scientific and industrial communities have reached the conclusion that organizations can keep their long term advantages by relying on innovation and strengthening and developing innovative activities [5].

Multiple definitions of technology are given as follows. Technology is:

- Any kind of functional science regulated based upon experience or scientific theory that is used in manufacturing, organizations or machinery[6].
- A set of solutions and aims that lead a person to effective and informed production[7].
- A sum of all the sciences, products, tools, methods, and systems that are used to generate a product or service. Technology is the method and the tools that enable us to reach our goals. Technology is the functional science and the tools that help human effort[8].

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- The practical application of science and techniques that respond to one or more needs[9].
- The conversion of science and ideas to new or better products, processes, services, or gaining competitive advantage[10]. Organized science used to make a product or offer a service in industry, agriculture, or commerce and the installation and the upkeep of an industrial factory or equipment or for the management of a company or industry[11].

The technological evaluation method is a process by which the present level of technological capabilities is measured to identify its strengths and weaknesses of the organization and by comparing it to competing organizations, technological gaps are identified.

Today, several different models are used to evaluate the technological capabilities. These models (and viewpoints) are categorized into three groups as explained in the table below:

Table 1. Classification of evaluation models for technologic capabilities

Models that identify technological gaps	Models that evaluate the reason for technological gaps	Models that offer solutions to repair the technological gap
The Porter Model	The Four model	The Ford Model
		The Fall Model
The Panda-Ramansen Model	The Lindsey Model	The Management Model
		The Lin Model
The Atlas Technology Model	The Technological Capability Level Model	
		The Science and Technology Management Information Systems Model
The Technological Needs Management Model		
The Value Model		

3. Method Goals and Research Questions

The aim of this research is to determine the technological capability level of Bahman Diesel Co. and to determine the technological gap in each level. This research is of the Survey Research Methods.

The questions involved in this research are:

1. At what level are the technological capabilities indicators of Bahman Diesel Co.?
2. At what levels are the strategic capabilities of Bahman Diesel Co.?
3. At what levels are the technology tactical capabilities of Bahman Diesel Co.?
4. What is the magnitude of the technological gap in each of the three main dimensions of capability (solution, tactic, and secondary technology)?

4. Introduction of the Model used in the research

The Panda-Ramansen Method is used here to evaluate the technological capabilities [12].

The following steps are involved in the Panda-Ramansen evaluation: [13]

1. Identifying the stages of creating added value
2. Identifying the technological capabilities needed for creating added value
3. Developing a set of indicators for each of the technological capabilities
4. Finding the technological capabilities of an advanced company and comparing it with the company in question
5. Identifying the gaps that exist via comparison with the advanced company

5. Statistical population

The senior managers, directors, and the managers of Bahman Diesel Co., all with associate, bachelors, or masters degrees, with at least 2 years work experience formed the statistical population for this research.

6.Summary of research results

Question 1: At what level are each of the technological capability indicators of Bahman Diesel Co.?

The response to question 1, according to the summation of the questionnaires is shown in table2.

Table 2. Percentage of success in different strategic aspects

Criteria	Percentage of success
Creativity	75%
Design and Engineering	74%
Distance capability	64%
Average	71%

Question 2: At what levels are the strategic capabilities of Bahman Diesel Co.?

Table 2, and Figure 1 show the scores

Question 3: At what levels are the technology tactical capabilities of Bahman Diesel Co.?

Table 3 and Figure 1 show the technology tactical capabilities of Bahman Diesel Co.

Table 3. Percentage of success in different tactical aspects

Criteria	Percentage of success
Production	72%
Marketing & Sales	81%
Services	79%
Average	77%

Table 4. Percentage of success in different aspects of supplementary technology

Criteria	Percentage of success
Acquisition	75%
Support	74%
Strategic	68%
Average	73%

Table 5. Levels of the capabilities of the company

Dimensions	Criteria	No.	Question	Average indicator	Average of minor dimensions	Average of main dimensions	Average indicator percentage	Average of minor dimensions percentage	Average of main dimensions percentage
Strategic capabilities	Creativity capability	1	Our company is capable of improving current products and processes	14.9	14.975	14.26	75%	75%	71%
		2	Our company is capable of innovating new products and processes	14.13			71%		
		3	Our company is capable of creating new organizational structures	16.25			81%		
		4	Our company is capable of supervising and controlling R&D projects	14.98			75%		
	Engineering and design capability	5	Our company is capable of evaluating projects based on technical, economical, monetary, biological and social aspects	14.73	14.725		74%	74%	
		6	Our company is capable of designing minor changes in processes and products	14.58			73%		
		7	Our company is capable of renewing or regenerating purchased technology	14.13			71%		
		8	Our company is capable of adapting to generated or purchased technology	14.38			72%		
		9	Our company is capable of supervising and controlling contract design and engineering activities	15.83			79%		
	Construction capability	10	Our company is capable of supporting feasibility studies and value engineering	15.15	15.15		76%	64%	
		11	Our company is capable of performing activities related to construction of structures	11.10			56%		
		12	Our company is capable of performing contract work	12.75			64%		
		13	Our company is capable of supervising and controlling construction and setting up	12.45			62%		
Technical capabilities	Manufacturing capability	14	Our company is capable of using and controlling technology effectively in main and supporting processes	13.90	13.9	15.37	70%	72%	77%
		15	Our company is capable of assuring the quality and inspection and control of products	15.83			79%		
		16	Our company is capable of repairing and sustaining damages	13.60			68%		
		17	Our company is capable of planning production and timing repairs	14.08			70%		
	Marketing and sales	18	Our company is capable of identifying customers and declaring prices and purchase conditions	15.33	15.325		77%	81%	
		19	Our company is capable of supplying products or services to customers	16.80			84%		
		20	Our company is capable of planning, supervising, and coordination of marketing and sales activities	16.73			84%		
	Service capability	21	Our company is capable of identifying problems, performing corrections, or discontinuing a product	15.73	15.725		79%	79%	
		22	Our company is capable of offering technical advice to customers	16.55			83%		
		23	Our company is capable of performing studies relating to customers' needs and their satisfaction	15.48			77%		
		24	Our company is capable of supervising and coordination of service and the timing of the work of service personnel	15.08			75%		
Supplementary capabilities	Acquisition capability	25	Our company is capable of identifying, evaluating, and finalizing the conditions for the acquisition of technology	13.65	13.65	14.63	68%	75%	73%
		26	Our company is capable of identifying, evaluating, and finalizing the conditions for monetary funding	15.78			79%		
		27	Our company is capable of identifying, evaluating, and finalizing the conditions for securing human resources	15.53			78%		
		28	Our company is capable of planning, supervising and coordination of securing resources	15.25			76%		
	Support capability	29	Our company is capable of offering educational programs	15.85	15.85		79%	74%	
		30	Our company is capable of strategic planning	15.55			78%		
		31	Our company is capable of networking and information support	15.85			79%		
		32	Our company is capable of maintaining a high level of security	15.58			78%		
		33	Our company is capable of selling technology	11.55			58%		
	Strategic capabilit	34	Our company is capable of routing technology	12.48	12.475		62%	68%	
		35	Our company is capable of decision-making and execution	15.18			76%		
		36	Our company is capable of making the organizational activities uniform	13.38			67%		
				14.72			74%		

Question 4: At what levels are the supplementary technological capabilities of Bahman Diesel Co.?
Table 4 and Figure 1 show the scores
Question 5: At what levels are all the technological capabilities?
A summary of all the technological capabilities are shown in Table 5.

Question 6: What is the magnitude of the technological gap in each of the three main dimensions of capability?
Considering the current status and the desired status (100%), it can be said that between these two states in three technological capabilities of Bahman Diesel Co., gaps do exist, the amount of which is shown in Table 6 and Figure 2.

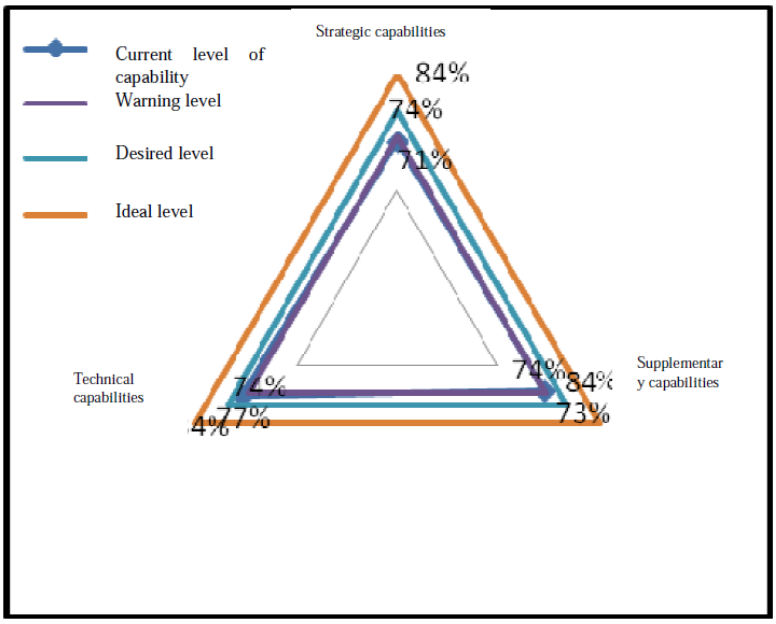

Fig. 1. Diagram example

7.Results and analysis:

Among all the capability indicators, "Activities related to structures" indicator with 56% had the lowest, and the "Supplying the product with customer service" and the "Regulating marketing and sales activities" indicator with 84% had the highest scores.

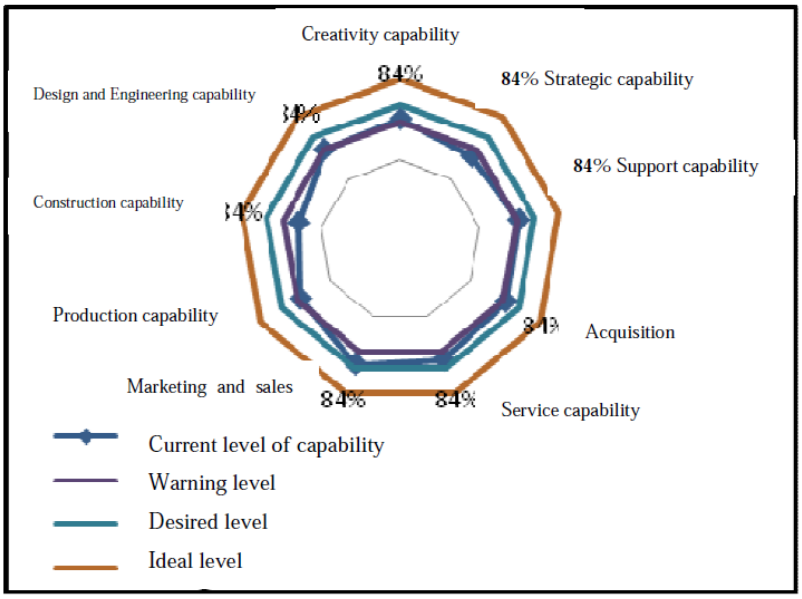

Fig. 1. Diagram example

In the main dimension of strategic capabilities, the minor dimension, **Construction** with 64% had the lowest, and **Creativity** with 75% had the highest scores. The minor dimension, **engineering design** scored 74%. Small convergence is seen between the minor dimensions.

Table 6. The levels of technological capabilities of the company

Main dimension	Minor dimension	Percentage of minor dimension capabilities	Percentage of main dimension capabilities
Strategic technological capability	Creativity	75%	71%
	Construction	74%	
	Engineering & design	64%	
Technology tactical capability	Production	72%	77%
	Marketing	81%	
	Service	79%	
Supplementary capabilities	Acquisition	75%	73%
	Support	74%	
	Strategic	68%	

In the main dimension of **supplementary capabilities**, the minor dimension, **acquisition**, with 75%, had the highest, and the minor dimension, **strategic**, with 68%, had the lowest scores. In the **support** dimension, with a score of 74%, shows a higher convergence relative to the other two dimensions.

Table 7. Technological capabilities in different dimensions

Technological capability	Current level	Desired level	Gap between desired level and current levels
Strategic	71%	100%	29%
Tactical	77%	100%	23%
Supplementary	73%	100%	22%

The summation of the results shows that **tactical capabilities** with 77%, was the most capable dimension, and **strategic capabilities** with 71%, had the least score, and **supplementary capabilities** with 73% was between the other two.

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