Management Science Letters 2 (2012) 1913–1920

Contents lists available at GrowingScience

Management Science Letters

homepage: www.GrowingScience.com/msl

Technology change priorities influencing competition quality promotion: Case study of Iran Keaton Polyester Manufacturing Company

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A R T I C L E I N F O

Article history:
Received March 22, 2012
Accepted 20 June 2012
Available online
June 21 2012

Keywords:
Technology change
Competitive quality
CAPTECH Methodology

A B S T R A C T

In the changing world with various customers' demands the businesses tend to improve their advantages to beat their rivals by means of better quality, lower prices and so. For Iranian polyester market quality is of crucial importance and is achieved through changing and updating technologies. According to highly regarded model of CAPTECH, which is recommended by UNIDO, technology parameters are defined in each phase and not generally as a whole. In the end the biggest gaps are defined. The main goal is to prioritize the main parameters affecting Iranian polyester company's quality. In order to fulfill our goal, 20 high and medium managers were questioned for this paper. The questions were gathered according to UNIDO samples. After a qualitative and quantitative test we concluded that the biggest gap is for supply chain(56.91) and the lowest gap is for combination phase(43.97).

1. Introduction

Technology is defined as having the knowledge to improve the quality of products and services (Ellul, 1964). The complexity and ambiguity of the competitive environment and industries in the global economy and the role of technology in reducing operational charges has entered countries, organizations and competitors in a new phase of economic development. Competitive quality is a defining factor for a country, organization or a group to help it compete with the rivals (Dupe, 1990). Technology is assessed by the strength of the firm's products which are estimated according to their quality, price and usefulness for the customers. Whenever the customers' expectations are not met or the quality is feeble, the final score is low. In order to improve technology the goals and the strategy must be defined and after that a comprehensive change management is to be implied. Technology change and technology improvement are not valuable for them, the value of technology change is the increase in the company's competitive advantages. He emphasized the importance of quality, quantity, supply and demand in the production; he reiterated the value of innovation and quality in final products.

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doi: 10.5267/j.msl.2012.06.031

2. Literature review

Chan (2000) presented a fuzzy algorithm to define technology advantages in the fuzzy environment. His main goal was to define the implications of the fuzzy theory in economical assessments. He asked decision makers to present the importance of the various factors not just in numbers but in full description by words. The descriptive parameters were divided from "too high" to "too low". The final results were in fuzzy numbers and after prioritizing the final numbers each technology was attributed to a definite weight. Because the final fuzzy numbers had some ambiguity because of the environmental uncertainty, the cash flow was a triangular fuzzy model and the angles were the most probable, the most pessimistic and the most optimistic quantity, respectively.

Law et al. (2000) presented an instrument to evaluate the needed technology in the needed time. By this instrument, the new technology is evolved and improved to transform the scant capital into maximum competitive advantage. It must be noted that a comprehensive evaluation of technology demands lots of time and money. Nikula et al. (2010) analyzed some data concerning the effects of technology change and by gathering some data suggested that software technology change follows the general change research findings as characterized by the technology S-curve and the Classic Change Curve. In addition, the framework of their method emphasized that such frameworks could present critical questions for management to address when embarking on and then running such projects. Amy (2010) assumed that countries must update their technologies constantly so as to compete in a competitive global industry. Having new technology to product competitive products and enabling workers and engineers to work with the new technology and the needed know-how is of grave importance according to Amy. The main goal of Amy's study was preparing a sound framework to assess and evaluate the new technology. He concluded that a suitable and reliable technology base enables companies to procure and obtain the best new technology and supply the customers and therefore having a competitive advantage.

Vecchiato and Roveda (2010) explained how to handle the effect and response uncertainty of technology and social drivers of change and discussed some technological forecasting and social change. Savioz and Blum (2002) emphasized the use of standard parameters to measure the firm's competitive capability. They concluded that the products must be assessed on a global scale according to the global competition. Competitive advantage is a new determinant and not an old commercial standard. Regarding foreign products, multi-national companies must have a unique parameter to analyze the best time to enter the global competition.

Reeda et al. (2000) studied the relationship between TQM and the competitive advantages. They concluded that TQM results in quality-based or price-based advantage for a company. On the other hand, the complexity embedded in TQM is a very reliable hindrance not to let the rivals and competitors to copycat. Nasierowski (1991) studied the relation of Mexican company's technological progress and increasing its quality. His study was both qualitative and quantitative and reiterated the importance of technology progress, higher skill and expertise.

Sultan (2007) investigated the effective parameters, demand, industries and the firm's structure. Regarding global situation, information technology is an essential approach to obtain competitive advantage and market superiority. His competitive advantage framework includes internal and external environment, Porter's factors, value chain, strategy, competitive advantage and change management. He concentrated on small and medium size firms and presented new approaches for technology, organizational strategy, entrepreneurship, the founding of organization, clusters and activities to increase the firm's technology level. The main parameters emphasized by him were firm's survival, the process of the survival, and the firm's accountability, respectively. Moors (2005) distinguished the role of technology strategies in the firm's basic innovation in the aluminum industry. He concluded that the availability of research and technology network, different realms of knowledge and expertise, and chain of the future events are the main determinants of a sound and comprehensive technology strategy.

3. Conceptual framework

A lot of frameworks have been designed but our framework is based on UNIDO model, which was presented by Hejazi and Binesh (2009). By studying small and medium size companies, they defined 8 parameters and determinants influencing the quality of the technologies in the businesses. Because of the limitations in the quality priorities, the parameters were prioritized according to their strengths and weaknesses. Change in each parameter results in the change of the whole technology.

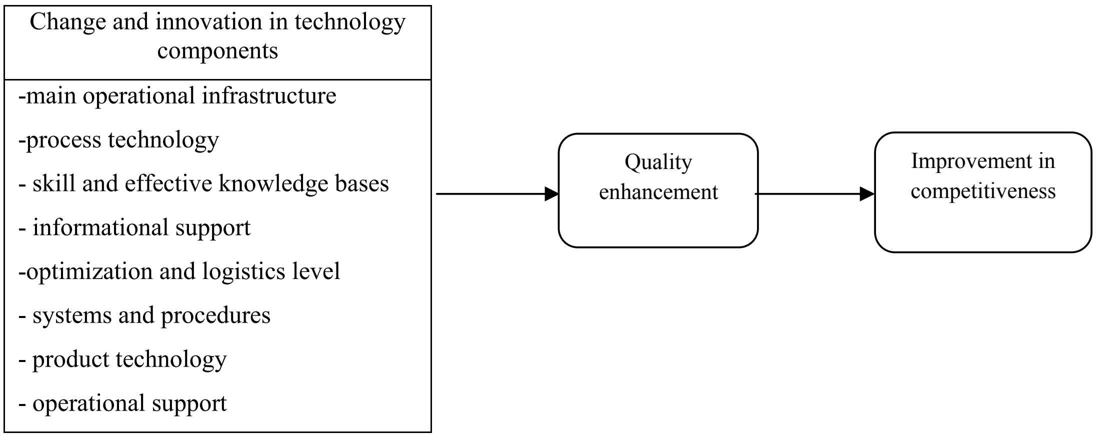

Fig. 2. CAPTECH model for competitive quality

4. Research method

The current research was done in a specific realm and its goal was the improvement of practical knowledge and the know-how. The technology parameters were categorized in order of precedence according to their weaknesses. Our main goal was to define the influence of technological parameters on the competitive advantages and capabilities of the businesses. Data was gathered according to standard CAPTECH questions asked from 20 average and medium Iranian polyester managers. In the end, we used K-value and Friedman test to prioritize the main factors and parameters.

5. Findings

In this section Chi-Squre test was performed to define the level of significance of technology parameters on competitive quality.

H_0: Technology parameters have no effect on the competitive quality of the organization

H_1: Technology parameters have some effects on the competitive quality of the organization

Table 1
Technology parameters- χ^2 values

Parameters	Sample Size	χ^2	Degree of Freedom	Level of Significance	H0 Supported / Not Supported
BASIC OPERATING INFRASTRUCTURE	30	67.52	5	0.000	Not Supported
PRODUCT TECHNOLOGY	30	51.54	5	0.010	Not Supported
PROCESS TECHNOLOGY	30	69.93	5	0.000	Not Supported
SKILL & KNOWLEDGE BASE	30	31.55	5	0.000	Not Supported
SYSTEMS & PRACTICES	30	15.32	5	0.009	Not Supported
INFORMATION SUPPORT	30	46.28	5	0.008	Not Supported
LOGISTICS & OPTIMISATION LEVEL	30	33.88	5	0.000	Not supported

According to the results in the table above, the significance level for the technology parameters at the 95% confidence interval has less than 5% margin of error. Therefore, the H_1 is supported and thus, all the parameters of technology have an influence on the competitive quality in the Iran Keaton Company.

H_0: Production phases have no effects on organizations 'competitive quality

H_1: Production phases have some effects on organizations 'competitive quality

Table 2

The results of χ^2 test to measure the effects of production phase on organization's competitive quality

Parameter	Sample size	χ^2	Degree of freedom	Level of significance	H_0 supported/not supported
Phase 1: supply	30	86.92	6	0.000	Not supported
Phase 2: quality control	30	76.85	6	0.000	Not supported
Phase 3:production	30	86.32	6	0.010	Not supported
Phase 4:	30	83.87	6	0.000	Not supported
Phase 5:test	30	43.03	6	0.000	Not supported
Phase6: cooling	30	17.13	6	0.008	Not supported
Phase 7:combination	30	33.84	6	0.007	Not supported
Phase 8:depletion	30	38.59	6	0.000	Not supported

According to the results in the table above, the significance level for the working phase's parameters at the 95% confidence interval has less than 5% margin of error. Therefore, the H_1 is supported and thus, all the working phases have an influence on the competitive quality in the Iran Keaton Company.

5.1. Measuring the differences between the parameters of technology

H_0: There are no significant differences/relationships between the parameters of technology that affect quality in different stages.

H_1: There are significant differences/relationships between the parameters of technology that affect quality in different stages.

Table 3

Friedman test Friedman test to define the level of significance of the technology parameters

Technology parameters	Score averages
Basic operational infrastructure	5.75
Product technology	4.42
Process technology	5.85
Knowledge and skill	3.85
System and practice	2.82
Informational support	2.75
Logistic base	2.58

Table 4

Friedman test

Number of samples	χ^2	Degree of freedom	Level of significance
30	86.921	6	0.000

The Chi-Square significance level observed from the Friedman's test in the table above (Sig=0.000), at the 95% confidence interval with a degree of freedom (df=6) has less than 5% margin of error. Therefore, the results strongly reject H_0 and support the research hypothesis.

Table 5
Technology parameters priorities in the second phase

Technology parameters	Score averages
Basic operational infrastructure	5.53
Product technology	4.28
Process technology	5.85
Knowledge and skill	4.38
System and practice	2.98
Informational support	2.68
Logistic base	2.60

Table 6
Friedman test

Number of samples	χ^2	Degree of freedom	Level of significance
30	86.921	6	0.000

The Chi-Square significance level observed from the Friedman's test in the table above (Sig=0.000), at the 95% confidence interval with a degree of freedom (df=6) has less than 5% margin of error. Therefore, the results strongly reject H_0 and support the research hypothesis.

Table 7
Friedman test-technology parameters priorities in the third phase

Technology parameters	Score averages
Basic operational infrastructure	6
Product technology	4.58
Process technology	4.47
Knowledge and skill	3.40
System and practice	3.15
Informational support	2.72
Logistic base	2.68

Table 8
Friedman test

Number of samples	χ^2	Degree of freedom	Level of significance
30	86.32	6	0.000

The Chi-Square significance level observed from the Friedman's test in the table above (Sig=0.000), at the 95% confidence interval with a degree of freedom (df=6) has less than 5% margin of error. Therefore, the results strongly reject H_0 and support the research hypothesis. Therefore, we can conclude that there is a difference between technology parameters in this phase.

Table 9
Technology parameters priorities in the fourth phase

Technology parameters	Score averages
Basic operational infrastructure	6.28
Product technology	4.30
Process technology	4.90
Knowledge and skill	3.47
System and practice	3.55
Informational support	3.03
Logistic base	2.47

Table 10

Friedman test

Number of samples	χ^2	Degree of freedom	Level of significance
30	86.87	6	0.000

The Chi-Square significance level observed from the Friedman's test in the table above (Sig=0.000), at the 95% confidence interval with a degree of freedom (df=6) has less than 5% margin of error. Therefore, the results strongly reject H_0 and support the research hypothesis. Therefore, we can conclude that there is a difference between technology parameters in this phase.

Table 11

Technology parameters priorities in the fifth phase

Technology parameters	Score averages
Basic operational infrastructure	4
Product technology	4.35
Process technology	4.40
Knowledge and skill	4.02
System and practice	4.70
Informational support	2.88
Logistic base	3.65

Table 12

Friedman test

Number of samples	χ^2	Degree of freedom	Level of significance
30	40.03	6	0.000

The Chi-Square significance level observed from the Friedman's test in the table above (Sig=0.000), at the 95% confidence interval with a degree of freedom (df=6) has less than 5% margin of error. Therefore, the results strongly reject H_0 and support the research hypothesis. Therefore, we can conclude that there is a difference between technology parameters in this phase.

Table 13

Technology parameters priorities in the sixth phase

Technology parameters	Score averages
Basic operational infrastructure	5
Product technology	5
Process technology	4.65
Knowledge and skill	4.27
System and practice	3.40
Informational support	3.08
Logistic base	2.60

With the k value of 17.13, and the freedom degree of 6, the results strongly reject H_0 and support the research hypothesis. Therefore, we can conclude that there is a difference between technology parameters in this phase.

Table 14
Technology parameters priorities in the seventh phase

Technology parameters	Score averages
Basic operational infrastructure	6.02
Product technology	4.65
Process technology	4
Knowledge and skill	3.08
System and practice	4.08
Informational support	2.65
Logistic base	3.95

With the k value of 25.61, and the freedom degree of 6, the results strongly reject H_0 and support the research hypothesis. Therefore we can conclude that there is a difference between technology parameters in this phase.

6. Conclusion

In this section we present our final results after performing Friedman and X^2 tests. The priorities are submitted in each phase, respectively:

- Phase 1 (supply phase): process technology, basic operating infrastructure, product technology, skill and knowledge base, information support, system and practice, logistic level
- Phase 2 (quality control): Process technology, basic operational infrastructure, skill and knowledge base, product technology, information support, system and practice, logistic level
- Phase 3(production): Basic operational infrastructure, process technology, skill and knowledge base, information support, product technology, system and practice, logistic level
- Phase 4 Basic operational infrastructure, process technology, skill and knowledge base, information support, product technology, logistic level, system and practice
- Phase 5(test): Basic operational infrastructure, process technology, skill and knowledge base, information support, product technology, logistic level, system and practice
- Phase 6(cooling): Basic operational infrastructure, product technology, process technology, skill and knowledge base, information support, logistic level, system and practice
- Phase 7 (combination): basic operational infrastructure, product technology, process technology, skill and knowledge base, information support, logistic level, system and practice
- Phase 8(depletion): basic operational infrastructure, process technology, product technology, skill and knowledge base, information support, logistic level, system and practice

According to our findings, the combination phase is the most important phase and must be noted as the main priority. In the combination phase the basic operational infrastructure has the biggest gap and therefore has to be regarded as the most important parameter so as to improve the technology level of the company. The production phase is the second important phase and its main parameters are basic operational infrastructure, product technology, process technology, logistic level, skill and knowledge base, system and practice and information support, respectively.

Acknowledgment

The authors would like to thank the experts who participated in our survey and shared their insights. We would like to also thank the referees for their constructive comments on earlier version of this paper.

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