Effect of Information and Communication Technology on Factors Causing Competitive Advantage in Small Industries

Leila Beigloo[1], Nader Bohloli[2] and Majid Vahedi[3]
[1]East Azarbaijan Science and Research Branch, Islamic Azad University,Tabriz, IRAN
[2]Department of Management, Bonab Branch, Islamic Azad University, Bonab, IRAN
[3]Department of Management, Payam Noor University, PO BOX 19395-4697 Tehran, IRAN

Abstract

The present study aims at evaluating effects of information and communication technology on factors causing competitive advantage in small industries of East Azerbaijan Province. According to Hill and Jones model, competitive advantage factors have been defined as supremacy in innovation, quality, accountability to customers, and efficiency. Statistical population of the present study was consisted of managers of small industries of East Azerbaijan province (n=2713). According to Cochran formula, the statistical sample size was estimated 337 persons. The statistical sample was selected using stratified randomized sampling method. The questionnaires were collected and the data was summarized and classified using descriptive statistical methods. Regression test was used to test the research hypotheses. Results of the study indicate to confirmation of all hypotheses. In other words, information and communication technology affects factors causing competitive advantage in small industries of East Azerbaijan Province.

Keywords: Information and communication technology, Competitive advantage, Innovation, Quality, accountability to customers, Efficiency.

Introduction

Information and communication technology is increasingly growing amongst recent evolutions. Quality competition at international level is one of the reasons for paying attention to this technology[1]. To promote quality, companies need several instruments including accomplishment of total quality system which will be realized through improvement of efficiency, creativity, and innovation by human resources, being aware of the customers' requirements, and application of information and communication technology[2]. Almost all studies have already conducted on realization of competitive advantage emphasize that information technology may not be used to realize competitive advantage rather its correct application may result in realization of this important goal[3]. The present study was mainly conducted to answer the question that if a small industry access some modern and advanced technologies (not available for their competitors), does it realize a competitive supremacy? To answer the question, factors causing competitive advantage have been defined as supremacy in quality, accountability to customers, efficiency, and innovation, in accordance with Hill and Jones theory[4]. To evaluate effect of information and communication technology on factors causing internal competitive advantage in small industries of East Azerbaijan Province.

Research literature: The research literature was studied in three parts of information and communication technology, factors causing competitive advantage, and a selection of previously conducted studies.

Information and communication technology: Information technology is defined as collecting, organizing, saving, and publishing of information as voice, image, text, or digit using computer or telecommunication systems and equipments[5]. In 1975 when industrial era was converting to the information one, there were more people dealing with information and its process than industrial workers. In 1970s, information employees consisted more than fifty percent of the labor force[6]. A system providing data or information for users of an organization is known as information system. Similar to all other systems, there are three main operations in this system: i. collecting of input data from the organization inside or outside, ii. meaningfully processing the input data, and iii. providing the people with the processed output information. Feedback is of special importance in information systems. It returns the information to the relevant authorities in the organization so that they can evaluate or modify the input stage[7]. Information and communication technology is a computer-based system facilitating communications, increasing productivity of managers and administrative employees through documentation[8]. Information and communication technology means collection, save, and publishing of information using computer instruments[9]. Information and communication technology may be generally defined as follows: a. Technical definition: Information and communication technology is the same as communicational hardware, production and data processing software infrastructures and technologies, b. Information system-based

definition: A set of technical, software, communicational, information, human, managerial, and system resources used to produce, process, distribute, and apply information[10].

Competitive advantage factors: Colmans believes that an organization may realize competitive advantage through concentrating on inside or outside applications of information technology and reducing the costs by differentiating its products considering better delivery and offering more quick services to its customers[11]. According to Porter's competitive model, competitive advantage is created when exclusive resources and capabilities of the organization are used to develop unique competencies. Fours factors of efficiency, quality, innovation, and accountability to customers play significant roles in competitive advantage and are regarded as its general resources (figure-1).

According to figure-2, distinctive competence provides conditions for the company to realize supremacy in efficiency, quality, innovation, and accountability to customers. An organization with distinctive competence may offer higher prices for its products and reach lower prices in comparison with its competitors. Thus, it can achieve very high profit rate considering average profit of the related industry[4].

Realizing supremacy in innovation: Innovation means application of creativity-based modern ideas. Innovation may be manifested as a modern product, service, or solution[12]. Creativity and innovation are such mingled that it may be difficult to be defined independently. In fact, creativity is appearance of a novel thought while innovation is to realize the thought[13].
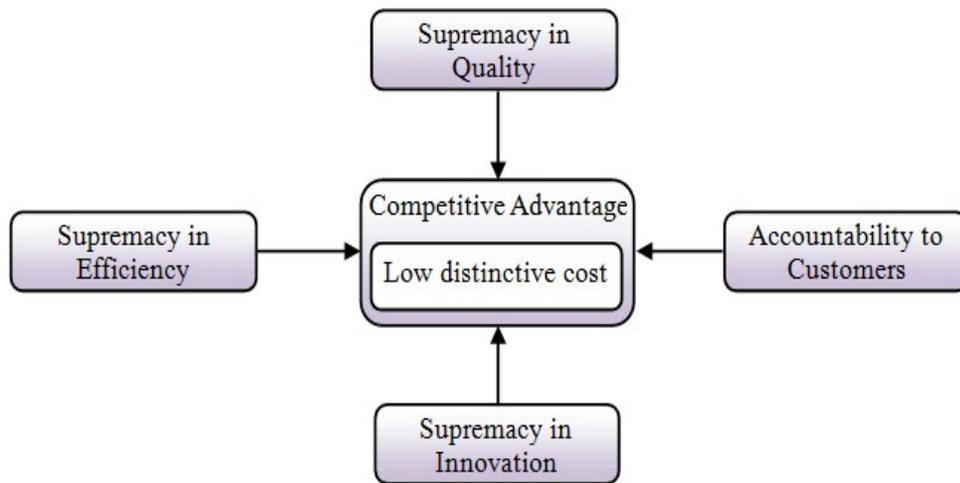

Figure-1
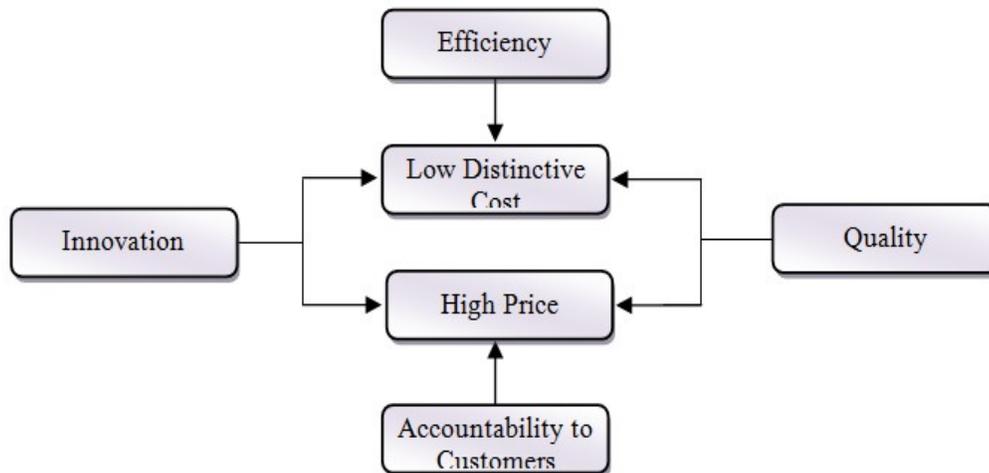**Factors creating competitive advantage[1]**

Figure-2
Effect of efficiency, innovation, quality, and accountability to customers on cost and price of product

Realizing supremacy in quality: Total quality management concept is the most important strategy to realize supremacy in quality[14]. In total quality management pattern, quality is determined relying on customer satisfaction, customer satisfaction in comparison with competitors, customer retention, market share, quality of outputs and products, promotion rate of productivity, reducing or eliminating of wastes, and quality of material suppliers[15]. At present, the companies should consider promotion of their products and services quality in order to retain their customers and realize competitive advantage[16]. Quality is defined as a set of activities, processes, actions, and interactions provided to the customers to solve their problems[17]. A product is of high quality if it is compatible with needs and requirements of customers[18]. Quality is the most important distinguishing factor at manufacturing and trade world[19]. Services quality means concentrating on what is delivered to the customers[20]. Different studies demonstrated that services quality leads to satisfaction and fidelity of customers[21]. In fact, customers satisfaction from the received services and promotion of services quality by the organization are tow important indexes in evaluating the organization performance[22]. Customer satisfaction is a positive feeling created in every person once goods are used or services received[23]. Customer satisfaction, therefore, is the customer's perception during a valuable relation or transaction and a price equal to ratio of services quality to price and costs of the customer [24]. Thus, client or customer satisfaction is feeling or attitude of goods or services applicant[25].

Supremacy in accountability to customers: Realizing supremacy in accountability to customers includes appreciating the customers and taking actions to improve efficiency of production process and quality of the organization products[2]. Priorities and tastes of people are regarded as a factor for final selection of customers considering available limitations and restrictions[26]. If you do not allocate any time to meet your customers, you encourage them to turn to your competitors. Cost of attracting new customers is six times more than that of retaining of the older ones[27].

Realizing supremacy in efficiency: It should be noted that realizing supremacy in quality plays a significant role in realizing supremacy in efficiency. Realizing savings resulted from scale and effects of learning are a way to realize supremacy in efficiency. Scale-based saving is reduction of costs of every unit of product which is related with bigger output size. Capability to allocate fixed costs to extra size of production is regarded as one of the scale-based saving resources[2].

History of previously conducted studies: Kheirabadi studied "Use of information and communication technology at higher education (a case study: virtual learning environment at Royal Holloway of London University)". The research tried to answer some possible challenges in order to find power points and challenges of using these technologies at higher education

environment[28].

Shoaei evaluated "Effect of information and communication technology on factors causing internal competitive advantage by employees of Telecommunication Co. of East Azerbaijan Province". The results suggest that use of information and communication technology by employees affects factors causing internal competitive advantage at Telecommunication Co. of East Azerbaijan Province[11].

Ghaffari compared "performance of teachers passed training course of information and communication technology and the untrained ones of Tabriz during school year of 2004 in Iran". The research used Independent T-test to compare two groups of teachers considering their performance, acquaintance level with computer software, educational aids, software used in education, attitude toward information and communication technology courses. Also, Two-way analysis of variance was used to compare integrated effectiveness of gender, educational field, marital status, educational degree, and passing training courses of information and communication technology[29].

Dastranj evaluated "Effects of information technology on organizational structure of companies affiliated by Iranian industries development and renovation organization" and concluded that there is a positive relation between information technology and concentration on strategic decision-making and non-concentration on tactical decision-makings. Meanwhile, there is a positive relation between information technology and control, perpetuity, and height of the organization pyramid[30].

Shaemi Bozorgi studied "Effect of information technology on organizational structure in service and industrial institutes of Isfahan (Iran)". According to the results, information technology directs the organization toward non-concentration pattern and provides more opportunities for lower levels of organization to participate in continuous decision-making[31].

Saraffi conducted a study known as "Feasibility study of establishing of electronic commerce (E-commerce) in Isfahan Petrochemical Industries (Iran)". According to the findings, the organization is not at an appropriate level considering hardware and software equipments. Transaction system of the organization corresponds with E-commerce standards at its lower-than-moderate level[32].

Theoretical frame of research: Hill and Jones theory was used as theoretical frame of the present study to evaluate effect of information and communication technology on factors causing internal competitive advantage. According to this theory, the factors include: i. supremacy in innovation: every modern method in organization operations or the methods used to produce the organization products. ii. supremacy in quality: high quality services and goods are defined as reliable ones such that it guarantees that the mentioned services and goods well do.
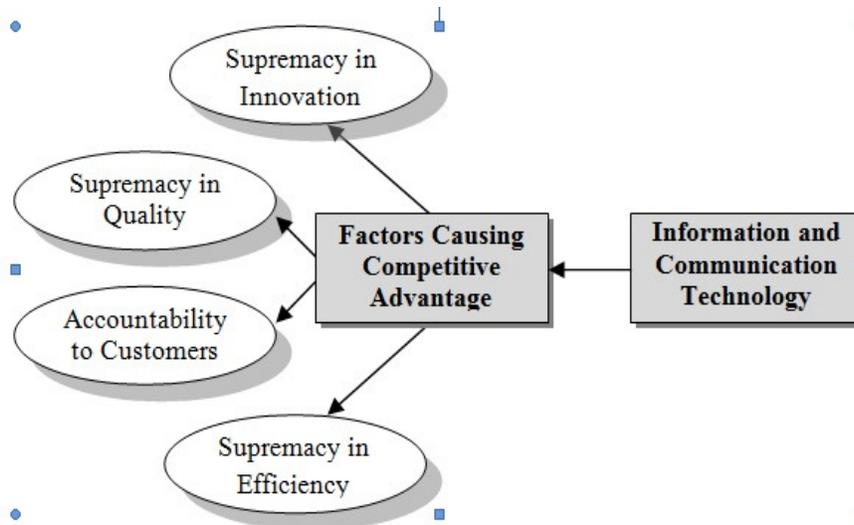
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Figure-3
The theoretical framework of research

What they have been designed to, iii. Supremacy in accountability to customers: to respond the customers, the organization should exactly offer what they are looking for, and iv. Supremacy in efficiency: supremacy in converting inputs such as labor force, capital, management, technology, etc., to outputs including the offered services[2].

Research hypotheses: The research hypotheses include: Information and communication technology affects factors causing competitive advantage in small industries of East Azerbaijan Province. Information and communication technology affects supremacy in innovation in small industries of East Azerbaijan Province. Information and communication technology affects supremacy in quality in small industries of East Azerbaijan Province. Information and communication technology affects supremacy in Accountability to Customers in small industries of East Azerbaijan Province. Information and communication technology affects supremacy in Efficiency in small industries of East Azerbaijan Province.

Methodology

The present research is a survey and applied one considering method and objectives, respectively. Statistical population of the research was consisted of senior managers of industrial units of small industries of East Azerbaijan Province (n=2713). According to Cochran formula, statistical sample size was estimated 337 persons. Stratified randomized sampling method was used to select statistical sample from the statistical population. For this purpose, the statistical population was initially classified into 35 classes considering number of industrial towns. Following calculation of share of each class in statistical sample size using simple randomized sampling method, specified number was selected from every class. Researcher-made 32-item questionnaire with 5-point Likert

scale was used to collect data. The questionnaire is of content and face validity. To estimate reliability of the questionnaire, Cronbach's Alpha was obtained as 0.822 and 0.747 for questions about using information and communication technology and factors causing competitive advantage. The questionnaire is of appropriate reliability.

Analytical method of statistical data: Descriptive and inferential statistical methods were used to analyze the collected data. To statistically describe the provided answers, tables of frequency distribution and percentage of responses related to demographic questions and the research variables were initially presented. At inferential level, regression test was used to test the hypotheses.

Results and Discussion

Statistical description of demographic questions: are demonstrated in tables-1 and 2.

Statistical description of the research variables: are demonstrated in table-3.

Inferential analysis of statistical data: Regression test was used to determine correlation between information and communication technology and factors causing competitive advantage and its aspects in small industries, according to table-4.

Table-1
Frequency distribution and percentage of responses of statistical sample to questions about gender

Gender	Male		Female		Total	
	F	%	F	%	F	%
Response quantity	337	100	0	0	337	100

Table-2
Frequency distribution and percentage of responses of statistical sample to questions about type of employment, educational level, and work records

Age	Below 25 years		25-35 years		36-45 years		46-55 years		Total	
	F	%	F	%	F	%	F	%	F	%
Response Quantity	4	1.2	271	80.4	53	15.7	9	2.7	337	100
Educational level	Diploma		Associate		Bachelor		Master and Ph.D.		Total	
	F	%	F	%	F	%	F	%	F	%
Response Quantity	0	0	104	30.9	198	58.8	35	10.4	337	100
Management experience	Less than 5years		5-10 years		11-15 years		16-20 and More years		Total	
	F	%	F	%	F	%	F	%	F	%
Response Quantity	49	14.5	233	69.1	42	12.5	13	21	337	100

Table-3
Descriptive statics of the research variables

	Factors Causing Competitive Advantage				Competitive Advantage	Information and Communication Technology
	Supremacy in Innovation	Supremacy in Quality	Accountability to Customers	Supremacy in Efficiency		
Number	337	337	337	337	337	337
Missing	0	0	0	0	0	0
Mean	21.6320	38.6706	22.4184	13.1662	95.8872	20.4510
Mode	22	39	23	14	97	22
Std. Deviation	25.00	41.00	25.00	14.00	94.00	23.00
Variance	2.77659	3.85621	2.41153	1.54984	8.87675	5.28234
Range	7.709	14.870	5.815	2.401	78.797	27.903
Minimum	14.00	18.00	11.00	6.00	48.00	25.00
Maximum	11.00	27.00	14.00	9.00	62.00	0.000
Number	25.00	45.00	25.00	15.00	110.25	25.00

Discussion: According to table-3, mean of independent variable of competitive advantage is 95.8872. Additionally, mean of factors causing competitive advantage, i.e. supremacy in innovation, quality, accountability to customers, and efficiency, is 21.6320, 38.6706, 22.4184, and 13.1662, respectively. According to table 4, meaningful level of regression test is 0.000 for all cases. It may be claimed that regression test is meaningful at confidential level of 95%. Therefore, H0 is rejected for all cases. Meanwhile, R2 discretionary coefficient-ratio of variations described by variable x to total variations- for effects of information and communication technology on factors affecting competitive advantage and its aspects in small industries is 0.101, 0.156, 0.076, 0.037, and 0.017, respectively. It can be stated that 10.1% of variations of factors causing competitive advantage in small industries are explained by variations in using information and communication technology. Also, 15.6%, 7.61%, 3.7%, and 1.7% of variations of supremacy in innovation, quality, accountability to customers, and efficiency are explained by variations in using information and communication technology. According to table 5 as well as mathematical relation between effects of information and communication technology on factors causing competitive advantage and its aspects in small industries, it is concluded that one unit increase in independent variable of information and communication technology results in 0.535 unit increase of factors causing competitive advantage in small industries. Also, one unit increase in independent variable of information and communication technology respectively results in 0.208, 0.201, 0.088, 0.038 unit increase of supremacy in innovation, quality, accountability to customers, and efficiency in small industries.

The research literature also indicates to effectiveness of "information and communication technology" variable on "factors causing competitive advantage". In other words, information and communication technology affects development and strength of competitive advantage and its aspects (supremacy in innovation, quality, accountability to customers) in small industries of East Azerbaijan Province. Information technology reduces quest costs such that customers may obtain much information about their required services or products through internet search within some minutes and choose the best option. It leads to competitive advantage for the company. Additionally, Dastranj[30] suggests that information technology positively affect organizational structure as well as concentration on strategic decision-making.

Conclusion

The research conducted by Shoaei[11] indicates to effect of information and communication technology on factors causing competitive advantage. Using modern information and

communication technologies, small industries will realize that their mental and occupational growth as well as wining the industrial competition requires use of modern information and communication technologies. The much the involving of personnel of small industries in modern information and communication technologies and the much the trainings required on using these technologies, the higher the creativity

and innovation of personnel in lieu of whole of the company. In turn, it will result in competitive advantage for small industries. Therefore, the more the positive modifications in small industries considering use of information and communication technology, the more strong the factors causing competitive advantage.

Table-4
Variance analysis of hypotheses related to regression model of variable of effects of information and communication technology on factors causing competitive advantage and its aspects in small industries

	R		**R^2**	**Adjusted R^2**		**Std. Estimate**	
	.318		.101	.099		8.42719	
ITC on factors causing competitive advantage	Model	df	Sum of Squares	Mean Square	F	Confidence Level	Sig
	Regression	1	2684.853	2684.853		.95	0.000
	Residual	335	23790.862	71.017	37.806	Test Result:	
	Total	336	26475.715	------		Rejection of H_0	
	R		R^2	Adjusted R^2		Std. Estimate	
	.395		.156	.154		2.55404	
ITC on Supremacy in Innovation	Model	df	Sum of Squares	Mean Square	F	Confidence Level	Sig
	Regression	1	405.135	405.135		.95	0.000
	Residual	335	2185.238	6.523	62.108	Test Result:	
	Total	336	2590.374	------		Rejection of H_0	
	R		R^2	Adjusted R^2		Std. Estimate	
	.276		.076	.073		3.71195	
ITC on Supremacy in Quality	Model	df	Sum of Squares	Mean Square	F	Confidence Level	Sig
	Regression	1	380.629	380.629		.95	0.000
	Residual	335	4615.810	13.779	27.625	Test Result:	
	Total	336	4996.439	------		Rejection of H_0	
	R		R^2	Adjusted R^2		Std. Estimate	
	.193		.037	.034		2.36991	
ITC on Supremacy in Accountability to Customers	Model	df	Sum of Squares	Mean Square	F	Confidence Level	Sig
	Regression	1	72.492	72.492		.95	0.000
	Residual	335	1881.514	5.616	12.907	Test Result:	
	Total	336	1954.006	------		Rejection of H_0	
	R		R^2	Adjusted R^2		Std. Estimate	
	.129		.017	.014		1.53882	
ITC on Supremacy in Efficiency	Model	df	Sum of Squares	Mean Square	F	Confidence Level	Sig
	Regression	1	13.422	13.422		.95	0.000
	Residual	335	793.272	2.368	5.668	Test Result:	
	Total	336	806.694	------		Rejection of H_0	

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Table-5
Coefficient of parameters of effects of information and communication technology on factors causing competitive advantage and its aspects in small industries

	Variable	β	t	Sig	Result	Formula
ITC on factors causing competitive advantage	Constant	84.943	46.211	0.000	Reject of H_0	$Y=84.934+.535X_1$
	ICT	.535	6.149	0.000	Reject of H_0	
ITC on Supremacy in Innovation	Constant	17.381	31.199	0.000	Reject of H_0	$Y=17.381+.208X_1$
	ICT	.208	7.881	0.000	Reject of H_0	
ITC on Supremacy in Quality	Constant	34.550	42.672	0.000	Reject of H_0	$Y=34.550+.201X_1$
	ICT	.201	5.256	0.000	Reject of H_0	
ITC on Supremacy Accountability to Customers	Constant	20.620	39.889	0.000	Reject of H_0	$Y=20.620+.088X_1$
	ICT	.088	3.539	0.000	Reject of H_0	
ITC on Supremacy in Efficiency	Constant	12.392	36.920	0.000	Reject of H_0	$Y=12.392+.038X_1$
	ICT	.038	2.381	0.000	Reject of H_0	

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