Importance of Technological Capabilities for Achievement Competitive Advantage of Croatian Export Firms

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Abstract

The paper explores the interrelationship of technological capabilities and firm performance of Croatian export firms. The primary aim of the study is to provide answer to research question: Are the most successful export firms in the Republic of Croatia prosperous due to the possession of technological capabilities? Firms with high level of technological capabilities enter the foreign markets more easily and more successfully and increase the share and dispersion of their international sales faster in comparison to their competitors. Proposition regarding relationships between technological capabilities and the firm's performance has been examined by multiple regression analysis, with the following variables: investment in technology, investment in research and development, the frequency of introducing new products and technological solutions, and return of sales and increase of total revenue. The results of research have shown that technological capabilities have a positive impact on the return of sales and an increase of total income in Croatian export firms.

Keywords: competitive advantage, export, firm performance, technological capabilities

1. Introduction

Technological capabilities are considered to be the dominant determinants of the level of the internationalization (Spender, 2006); they are the basis for creating a competitive position of the firm on the international market (Knight and Cavusgil, 2004; Oviatt and McDougall, 2004; Buckley and Hashai, 2014). Specific technological capabilities of the firm are the basis for privileged access to markets and the means by which profit is generated (Lin *et al*., 2013). Technological capabilities are mutually reinforcing opportunities that enable the recruitment and development of different technologies as such technology development, product development, manufacturing process and technological prediction (Zang and Li, 2017). In addition, the firm operating on international markets has a relative advantage in the domestic market in terms of its opportunities for developing and improving technological capabilities (Doz *et al*., 2001). Firms with developed technological capabilities have significant market expansion potential and relatively quickly expand their activities outside the domestic market (Caves, 2007). The firms that adapt their technologies have the capability for understanding and adopting knowledge on the development of new technologies (technology-based) and the intent and the capability to respond to new technologies (reaction to new technology).

Such firms regularly seek information on the development of new technologies that are sources of potential growth; they react proactively to radical technologies and are capable to reshape business strategies to take advantage of the opportunity or to diminish the danger that new technologies bring (Srinivasan *et al*., 2002). This understanding and reaction are strategies that allow firms to incorporate new technological advancements into their new products and be ahead of the competition (pre-emptive advantage), which leads to sustainable advantage and consequently to better business results (Olavarrieta and Friedman, 2008). Moreover, technology-based firms operate in technology-based industry and are different from other firms because of strong R&D, creation of new knowledge and

high employment rate of scientific and technical staff (Camisón-Haba, Clemente-Almendros and Gonzalez-Cruz, 2019).

Ehie and Olibe (2010) have supported the thesis of positive correlation between the investment in technology and the indicators of business success in the firms in China and America. There is no doubt that technological knowledge has to be used on the market with the aim of creating long-term profit (Teece, 2009), which is also the basis of the proposed hypothesis. In the existing researches, technological capabilities have been measured through (Tsai, 2004; Coombs, Bierly, 2006; Ariffin and Figueiredo, 2004; Ho, Fang and Lin, 2011): the frequency of introduction of new products, the number of the registered patents annually, investment in research and development and the number of projects carried out by the R&D department at an annual level. On the other hand, business success has been examined through: profit or loss in relation to return on sales (ROS), sales growth and total revenues (Hall and Bagchi-Sen, 2002; Coombs and Bierly, 2006; Guan *et al*., 2006, Artz *et al*., 2010).

Regarding the chosen focus of the research, special attention is given to technological capabilities of firms and their relations to business success.

The number of authors that investigate the connection between technological capabilities and business successfulness is not small (for example: Garcia-Muina and Navas-Lopez, 2007; Jin and Von Zedtwitz, 2008; Ariffin and Figueiredo, 2004; Calantone, Cavusgil and Zhao, 2002). The above-mentioned authors give support to the hypothesis that investment in technology, and in other resources, influences their business successfulness. Within the framework of this paper, business successfulness is measured with the following indicators: profitability – profit (or loss) in relation to return on sales (ROS) and growth (decline) of the total revenue and return on sales in relation to the former business period. The paper suggests that there is a connection between the level of technological capabilities and business success and it is examined with the multiple regression analysis and Pearson correlation coefficient where the dependant variable – business success is expressed with different indicators (profitability – profit (or loss) in relation to return on sales and the increase (reduction) of the total revenues and return on sales in relation to the former period. The independent variable, i.e., technological capabilities, is observed through investment in technology, investment in research and development at an annual level and the frequency of introduction of new products and technological solutions.

2. Methodology

The research was conducted on the population of Croatian export firms. The sample was firms with an export share of more than 50% of total revenue (there are less than 500 such firms in Croatia).

A highly structured questionnaire was used as a research instrument and 113 fulfilled questionnaires were collected as study input. Business success is measured through two dependant variables: profit (loss) in relation to return on sales and the application of total revenue in relation to last year. The first variable which represents successfulness (profit/loss) in relation to return on sales is derived as the result of the arithmetic mean of five different questions measured with a Likert scale (1. Average investments in facilities and equipment of our firm in the last five years are significantly higher than that of our local competitors, 2. Our firm uses advanced technology for developing new products, 3. Our products are technologically competitive in relation to our regional competition, 4. Our products are competitive in terms of price in relation to our regional competition, 5. We are among first to introduce new technology on the market).

Profit (loss) in relation to return on sales has the highest level of statistically relevant correlation with the variables that measure primacy in the introduction of new technology onto the market (.334: .000), while the lowest level of correlation was established for the use of advanced technologies for the development of new products (.256: .007). Average investments in facilities and equipment in the last five years in relation to the competition is not statistically correlated with the ratio of business result and revenue (.086: .370). The change in total revenue in relation to the former business year

significantly correlates only with technological competitiveness of the products in relation to regional competition (.216: .022) (see Table 1.).

		1	2	3	4	5	6	7	8
Average investments in facilities and equipment of our firm in the last five years are significantly higher than that of our local competitors.	P								
	S								
	N								
Our firm uses advanced technology for developing new products.	P	.539**							
	S	.000							
	N	113							
Our products are technologically competitive in relation to our regional competition.	P	.368**	.743**						
	S	.000	.000						
	N	112	112						
Our products are competitive in terms of price in relation to our regional competition.	P	.089	.420**	.631**					
	S	.349	.000	.000					
	N	113	113	112					
We are among first to introduce new technology on the market.	P	.405**	.468**	.634**	.448**				
	S	.000	.000	.000	.000				
	N	113	113	112	113				
INVESTMENT IN TECHNOLOGY	P	.650**	.826**	.876**	.638**	.790**			
	S	.000	.000	.000	.000	.000			
	N	113	113	112	113	113			
PROFIT (LOSS) IN RELATION TO RETURN ON SALES	P	.086	.256**	.275**	.297**	.334**	.333**		
	S	.370	.007	.004	.002	.000	.000		
	N	111	111	110	111	111	111		
GROWTH (DECLINE) OF THE TTOAL REVENUE IN RELATION TO FORMER BUSINESS YEAR	P	-.008	.100	.216*	.109	.110	.145	.108	
	S	.936	.292	.022	.248	.246	.126	.261	
	N	113	113	112	113	113	113	111	
**significance of correlation p<0.01 *significance of correlation p<0.005									

Table 1. Investments in technology and business success correlation matrix
(Source: authors' calculation)

3. Results and Discussion

In order to test the hypothesis, two supporting regression models have been defined. In the initial regression model (Table 2), the dependant variable is profit (loss) in relation to return on sales, while the independent variables are the four measures of technological capabilities: investment in technology, research and development, frequency of introducing new products and technological solutions. Prior to coefficient evaluation, the HAC correction was conducted. The VIF (Variance Inflation Factors) test has confirmed that there exists no problem of multi-collinearity of the dependant variables.

(Explanation of the symbols from the tables – **IT** – investment in technology, **IRD** – investment in research and development, **NP** – frequency of introducing new products, **TS** – technological solutions)

Observe that the variable frequency of introducing new products and technological solutions is not a statistically significant, estimate is the modified model. The coefficients of variable investment in technology and R&D are statistically significant and are $\beta1=0.78$ and $\beta2=0.24$, while the model coefficient of determination is $R2=0.17$ (Table 3).

Dependent Variable: ROS
Method: Least Squares
Sample: 1 113
Included observations: 109
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.038838	10.26605	-0.880459	0.3806
IT	0.625196	0.342285	1.826534	0.0706
IRD	0.238070	0.112681	2.112776	0.0370
NP	0.519332	0.446217	1.163856	0.2471
TS	0.174804	0.582184	0.300255	0.7646
R-squared	0.185401	Mean dependent var		19.92855
Adjusted R-squared	0.154070	S.D. dependent var		14.38861
S.E. of regression	13.23385	Akaike info criterion		8.048219
Sum squared resid	18214.02	Schwarz criterion		8.171675
Log likelihood	-433.6279	Hannan-Quinn criter.		8.098285
F-statistic	5.917534	Durbin-Watson stat		1.513934
Prob(F-statistic)	0.000249	Wald F-statistic		3.342581
Prob(Wald F-statistic)	0.012854			

Table 2. Initial regression model of technological capabilities and profit (loss) in relation to return on sales
(Source: authors' calculation)

Dependent Variable: ROS
Method: Least Squares
Sample: 1 113
Included observations: 109
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.197857	8.580367	-0.489240	0.6257
IT	0.780022	0.328295	2.375978	0.0193
IRD	0.243943	0.109671	2.224326	0.0282
R-squared	0.172894	Mean dependent var		19.92855
Adjusted R-squared	0.157288	S.D. dependent var		14.38861
S.E. of regression	13.20865	Akaike info criterion		8.026758
Sum squared resid	18493.66	Schwarz criterion		8.100832
Log likelihood	-434.4583	Hannan-Quinn criter.		8.056798
F-statistic	11.07886	Durbin-Watson stat		1.502646
Prob(F-statistic)	0.000043	Wald F-statistic		5.525159
Prob(Wald F-statistic)	0.005218			

Table 3. Final regression model of model of technological capabilities and profit (loss) in relation to return on sales matrix
(Source: authors' calculation)

The second regression model tests the influence of technological capabilities (investment in research and development, the frequency of introducing new products and technological solutions) on the change in revenues in the current business year in relation to the former year (Table 4). The HAC correction has been conducted and the VIF test shows that there exists no problem of multi-collinearity of the independent variables, while the residuals do not have normal distribution. None of the technological capabilities have shown to be statistically significant and therefore the influence of the above-mentioned variables that represent technological capabilities on the change in the profit cannot be confirmed.

Dependent Variable: PP (change in total revenue in compared to the previous year)
Method: Least Squares
Sample: 1 113
Included observations: 111
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.941942	3.198949	0.294454	0.7690
IT	0.102854	0.135795	0.757421	0.4505
IRD	0.077075	0.062328	1.236598	0.2190
NP	0.109428	0.171107	0.639528	0.5239
TS	0.211140	0.341183	0.618848	0.5373
R-squared	0.061833	Mean dependent var		7.759792
Adjusted R-squared	0.026431	S.D. dependent var		6.205356
S.E. of regression	6.122801	Akaike info criterion		6.505915
Sum squared resid	3973.801	Schwarz criterion		6.627966
Log likelihood	-356.0783	Hannan-Quinn criter.		6.555428
F-statistic	1.746582	Durbin-Watson stat		1.880839
Prob(F-statistic)	0.145209	Wald F-statistic		2.241776
Prob(Wald F-statistic)	0.069383			

Table 4. Regression model of technological capabilities and growth (decline) of total revenue in relation to former period
(Source: authors' calculation)

Based on the set regression models, it can be concluded that technological capabilities influence business successfulness measured through profit (loss) in relation to return on sales.

4. Literature

Technological capabilities of modern firms are an important strategic resource that enables them to accomplish competitive advantage within their industry (Hagedoorn and Duysters, 2002), and it also entails long-term success in the competition in different business fields. As information technology develops and markets are becoming global, firms are searching for a way to be competitive through technological and organizational innovations. Firms are no longer focused on the results inside the organization, but are rather paying attention to the market and the needs arising there. Technological know-how is not a quality in itself; it has to have a potential of being marketed and be in the function of reaching above-average results (Camison and Villar-Lopez, 2014). In the paper, the influence of technological capabilities on business successfulness has been tested. It has been measured with return on sales and change in revenue in relation to former business year.

Introduction of new products and technological solutions do not have significant influence on business success, while investments in technology ($\beta1=0.78$) and investments in research and development ($\beta2=0.24$) could jointly account for 17% of the variance. On the other hand, it has been confirmed that the measures of technological capabilities are not connected with the change in revenue. Finally, the return on sales variable has proven that there is a connection between the level of technological capabilities and business successfulness.

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