

# Businesses: The Association Between Their Export Performance and Information and Communication Technology Adoption

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## Introduction

Businesses, the wheel of economic sustainability and a very important variable of a firm's profitability are characterized by their ability to export, the export activity (Daryanto et al. 2012). Through the years, mankind used technology, constantly seeking new ways to survive leading to the creation of the very base of every day's lives, social and economic interactions, information and communication, a linkage to the heart of economy, businesses (Bronner and de Hoog 2013). Greek economy has been a pole of study in the scientific world as it shows different variations in times of crisis and economic unsustainability (Vlamis 2014).

Simulations are used in information and communication technology with great success to simulate a real procedure with no fear of loss. Anylogic 7.2 University is a well-known tool used for this purpose (Dimitrios et al. 2013). Regression analysis is used in specific sample spectrums to identify the importance of specific variable assessments and to clarify importance (Frowd et al. 2015).

There have been 57 previous studies as regarding information and communication technology adoption of businesses and simulation modeling but no other study has been conducted so far that shows the association between businesses' export performance and information and communication technology adoption for a rare sample of 3500 Greek business firms using simulation modeling combined

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with regression analysis with the Anylogic 7.2 University and E-Views 8 tools and that is what makes this paper unique (Deepdyve 2016). Thorough research through the paper showed that information and communication technology adoption from Greek businesses lead to exponential export performance and activity.

## **Related Literature Review and Variable Assessment**

This paper is based on an answered questionnaire of Greek businesses. Exports Intensity, Employee Internet usage, E-Procurement, ICT Production Integration, E-Sales, Human Capital ICT Expert Knowledge, Absorptive Capacity R&D, Technology Monitoring are the variables used representing each yes or no questionnaire answer.

### ***Exports Intensity***

Garrido et al. (2008), modeled how firm export performance is led by its competencies and showed that production, marketing and sale ones and informational competencies, lead to strategic competitiveness that gives financial and strategic performance.

### ***Employee Internet Usage***

Mathews et al. (2015) proved that Internet marketing capabilities can lead to information availability and international strategic orientation, international network and to international strategic orientation and international capabilities.

### ***E-Procurement***

Garrido et al. (2008), also believed that internet tools like size, functional areas, hierarchical level and participation, lead to efficiency and efficacy and categorized them in Intranet, Extranet, Web pages, E-mail, Videoconference and Discussion groups.

### ***ICT Production Integration***

Jung et al. (2013) collected annual statistics in ICT capital and labor productivity, during 1994–2007 searching the contribution of ICT capital in labor productivity.

ICT usage, ICT production and Non ICT capital production were the variables used. Eventually, they indicated the ICT capital been lost as regarding the labor productivity.

### ***E-Sales/E-Commerce***

Internet marketing capabilities give export information and business network relationships. Online advertising, online sales, online after sale service, market research and purchasing/procurement are part of internet marketing capabilities factors (Bianchi and Mathews 2016).

### ***Human Capital ICT Expert Knowledge***

Stucki (2016), braked the Founders' human capital term in general and specific and continued in education and experience and specific in field-specific with division in business and technical and export-specific with division in education and experience. The export-specific part is breaking in the start-up experience, industry experience, large firm experience and international experience.

### ***Absorptive Capacity R&D***

Kaynak and Kuan (1993), linked the strategy factors, export activity and firm's economic performance with others that lead to both export intensity and firm's economic performance. Exponential company growth and market value lead to innovation strategy and innovation and eventually to an exponential export activity and performance.

### ***Technology Monitoring***

Kaynak and Kuan (1993) also introduced a high–low performer model, with characteristics as export-related R&D expenditure divided in the percentage of export sales from patented products and the export sales from new products. New knowledge from R%D, give export-related R&D expenditure, then export sales from patented products export sales from new products, thus giving export intensity.

## Empirical Strategy

The Dependent variable is Exports Intensity in binary numbers. The variables presented in the theory are the independent ones. Binary Probit method is used for binary numbers analysis. C(1), C(2), C(3), C(4), C(5), C(6), C(7), C(8), will be estimated with C(1) being the constant variable.

$$\begin{aligned} \text{EXPORTS\_BINARY} = & \text{C(1)} + \text{C(2)} * \text{D10\_ABSORPTIVE\_CAPACITY\_R\_AND\_D} \\ & + \text{C(3)} * \text{ICT\_PRODUCTION\_INTEGRATION} \\ & + \text{C(4)} * \text{TECHNOLOGY\_MONITORING} \\ & + \text{C(5)} * \text{EMPLOYEE\_INTERNET\_USAGE} \\ & + \text{C(6)} * \text{ESALES} + \text{C(7)} * \text{E\_PROCUREMENT} \\ & + \text{C(8)} * \text{HUMAN\_CAPITAL\_ICT\_EXPERT\_KNOWLEDGE} \end{aligned}$$

In Table 1, we indicate the regression results of the model analysis using Binary Probit method. Positive C(7) and E-Procurement has probability lesser than the other variables. This variable affects Exports\_Binary the most, whereas C(4) and Technology\_Monitoring has the second biggest positive impact in Exports\_Binary variable.

**Table 1** Regression results

	Coefficient	Std.Error	z-Statistic	Prob.
C(1)	-0.221635	0.114477	-1.936064	0.0529
C(2)	0.013084	0.017624	0.742375	0.4579
C(3)	0.027275	0.024466	1.114802	0.2649
C(4)	0.045525	0.023537	1.934217	0.0531
C(5)	-0.044563	0.020267	-2.198744	0.0279
C(6)	-0.011018	0.026871	-0.410024	0.6818
C(7)	0.046304	0.024477	1.891761	0.0585
C(8)	-0.024875	0.023046	-1.079354	0.2804
Mean dependent var		0.492716		
S.E. of regression		0.497795	<b>S.D. dependent var</b>	0.500161
Sum squared resid		287.2003	<b>Akaike info criterion</b>	1.384317
Log likelihood		-799.749	<b>Schwarz criterion</b>	1.419019
Deviance		1599.498	<b>Hannan-Quinn crit.</b>	1.397407
Avg.log likelihood		-0.685303	<b>Restr.deviance</b>	1617.558
Obs with Dep = 0		592	<b>Total obs</b>	1167
Obs with Dep = 1		575		

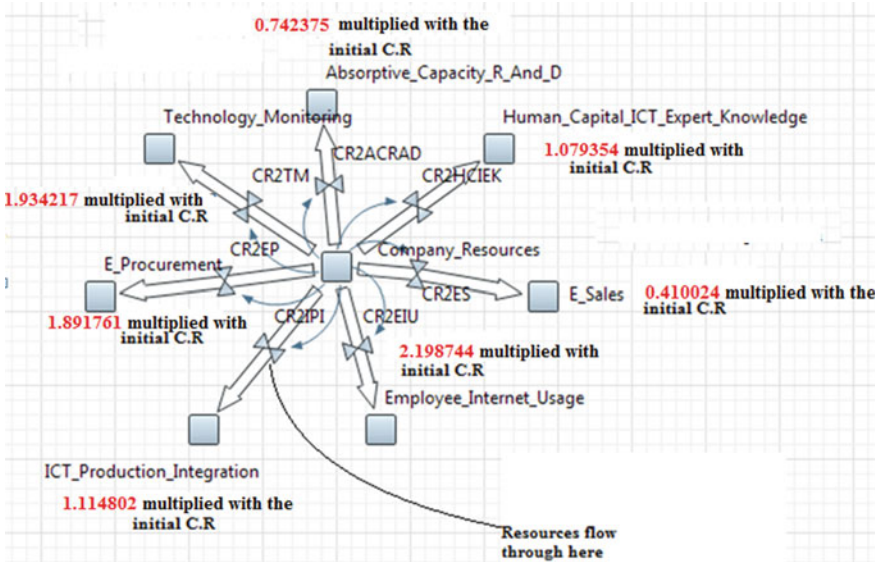


Fig. 1 Exact numbers of resource percentage given from the firm for each variable implication

## Implementation of the Dynamic Simulation Model and the Importance of z-Statistic

Anyclogic 7.2.0 University is used to modelize our simulation dynamically with empirical analysis and simulation modeling. All previous research connects to this paper, closing the gap with the z-statistic. It measures the null hypothesis of a given sample data. Z is stored as a percentage and is multiplied by the initial resources given to each variable.

Stocks, flows, converters and connectors consist of the model. A stock shows the concentration of a quantity. A flow fills or depletes a stock. The arrow points the direction of a flow in a stock. Connectors are action links or dashed wires, information links. A converter converts inflows into outflows through user-defined algebraic or graphical functions (Dimitrios et al. 2013) (Fig. 1).

## Identification and Explanation of the Dynamic Simulation Model

Theoretical research is applied, by using the Dynamic Simulation Model (Dimitrios et al. 2013). Resources are supplied from the basic counterpart “Company\_Resources” stock subsection to “E\_Sales” stock, “Human\_Capital\_ICT\_Expert\_Knowledge” stock, “ICT\_Production\_Integration” “E\_Procurement”,

“Technology\_Monitoring”, “Absorptive\_Capacity\_R\_And\_D”, “Employee\_Internet\_Usage” Subsections. “Exports\_Intensity” combines the satisfaction levels of the other independent variable factors and in the same time counteracts the initial resources lost. Figure 2 presents this combination.

Figure 3 shows that the satisfaction percentage as regarding all seven leading factors is raising significantly during the first months and then they gain stability. Exports Intensity eventually stabilizes too and gives very satisfied results. Pie chart shows that the amount of Exports gained back, is approximately four times higher than the initial Company Resources lost.

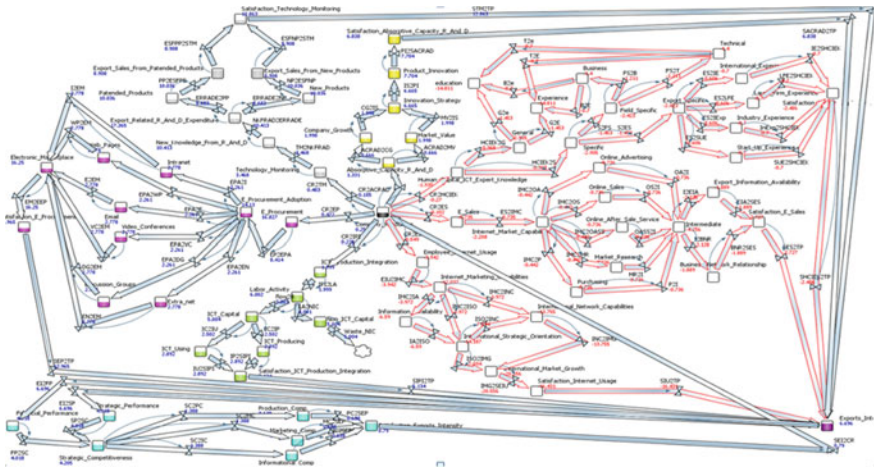


Fig. 2 Implication of the simulation model using Anylogic 7.2 University

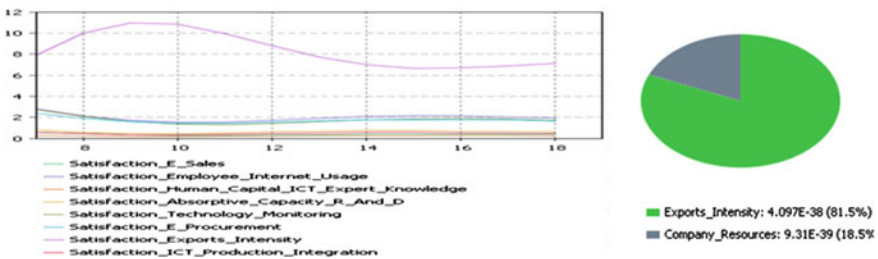


Fig. 3 Time Chart and Pie Chart: Satisfaction E\_Sales, in conjunction with Satisfaction\_Internet\_Usage, Satisfaction\_Human\_Capital\_ICT\_Expert\_Knowledge, Satisfaction\_Absorptive\_Capacity\_R\_And\_D, Satisfaction\_Technology\_Monitoring, Satisfaction\_E\_Procurement, Exports\_Intensity and Satisfaction\_ICT\_Production\_Integration. Pie Chart: Company Resources in conjunction with Exports\_Intensity

## Conclusions

In this research was made an attempt to simulate the association between their businesses' export performance and information and communication technology adoption for a sample of 3500 Greek business firms by modeling a regression analysis using Anylogic 7.2 University and E-Views 8. The nature of the variables examined is dynamic. Regression analysis and is used to calculate the statistical importance and depict it in dynamic modeling. This article attempts to steer the reader in the right direction about the influence of the export intensity factor in Greek businesses by measuring the appropriate satisfaction levels. Thorough research, statistical analysis and simulation modeling through this paper revealed that E-Procurement has the biggest positive impact in export performance and intensity of the Greek firms. Further research could be conducted on a given IT product or service, the company's objectives, its size and limitations of the firm.

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