

# **EVALUATING THE IMPACT OF MARKETING, ORGANISATIONAL AND PROCESS INNOVATION ON INNOVATION OUTPUT OF INFORMATION TECHNOLOGY FIRMS: CZECH REPUBLIC AND ESTONIA**

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## **Abstract**

**Purpose:** As technological innovation has enabled Information technology (IT) to seamlessly merge into daily routines playing an irreplaceable role in innovation generation and dissemination the research aims to assess the impact of marketing, organisational and process innovation on innovation in Czech Republic and Estonia.

**Design/methodology/approach:** Data from Community Innovation Survey (2012-2014) was used whilst multiple regression analysis. 395 firms were selected for both Czech Republic and Estonia. These member states were selected due to their dwindling performance on the innovation scale relative to EU in 2010; IT and information service firms was also chosen as the unit of analysis.

**Findings:** Public funding at the National and European Union level was only significant to innovation output in Estonia whilst organisational innovation was insignificant in both countries. Process innovation was significant to innovation output although with different direction of significance between both countries whilst marketing innovation variables were also fully significant in Czech Republic but partly significant in Estonia.

**Research/practical implications:** The study provides insights into innovation behaviour of the Czech and Estonian companies.

**Originality/value:** Furthering the innovation report of European Union and selectively focusing on the key innovation variables, the paper adds to the literature by detailing the response of the innovation output of Czech Republic and Estonia to marketing, organisational and process innovation of IT and information service firms.

**Keywords:** Marketing Innovation, Organisational Innovation, Process Innovation, Czech Republic, Estonia

**JEL codes:** O31, O32

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## Introduction

In an era of knowledge-based economies and spatially organized structures as vital prerequisites for innovation, actors of regions are supposed to be poised and proactively innovate to move in line with the rapidly changing environmental conditions. In an economy where, competitive advantages are sharpened by other regional players related to firms (Cooke, 2001), it is expedient to ensure the proper handling of inputs for innovation assigned to regional and organisational leaders to ensure improved effectiveness and efficiency. Odei and Stejskal (2018) found collaboration as an innovation driver in increasing competitiveness of firms and regions. Other inputs, however, have been lauded as the determinants of the regional innovation output ranging from human capital and financial investment (Franco and De Oliveira, 2017) and research expenditures paired with Gross Domestic products.

Owing to the evidence of innovation on firm growth, national and supranational entities actively engage in financial support schemes for private and public entities to create and/or utilize regional infrastructures for regional competitiveness; However, socio-economic factors peculiar to regions actively assist in transforming not just financial inputs but also human capital inputs into outputs for the regions (Cooke, 2001). Czech Republic and Estonia lie very close on the European Innovation Scoreboard, with Czech Republic possessing an average ranking of 84.4 and Estonia 79.8 as of 2017 whilst recording declining innovation performance relative to EU in 2010 (European Innovation Scoreboard, 2018).

On the evidence of the significance of innovation inputs to output of innovation and on the back of the differences in socio-economic conditions of region, and the evidence of Information technology as a driver of growth in the European Union, the research sought to identify the impacts of marketing, organization and process innovation on the innovation output of Information technology and information service firms measured with sales of new or significantly developed product (Cassiman and Veugelers, 2006) in both Czech Republic and Estonia. . Based on EU report in 2009 on diffusion of innovation which admonished focus on in-firm culture and structures for innovation, we hypothesise that “*organisational innovation has a significant impact on sales of newly produced goods of firms*”- H1 and *market innovation also has a significant impact in sales of newly produced goods*- H2. Based on Lundvall (2017) reverence of process innovation as a relevant input for innovation creation and diffusion by the European Commission, it is finally hypothesised that *process innovation is also a significant factor affecting sales of newly produced goods of firms*- H3.

The paper is organised as follows: this current section is the introduction, the next section, Section 2, discusses the theoretical review, the section 3, data and methodology, Section 4 expresses the results and the analysis of the results of the research. The final part, section 5, concludes information of the research findings and the resolutions of the research and its recommendations.

## **1 Theoretical review**

Innovation has long been understood as a fundamental factor in economic growth of regions. Various authors from diverse studying backgrounds, ranging from economics, geography and social sciences have examined the effects of innovation on economic growth, the factors associated with the production of innovations, and the even geographic distribution of innovations and knowledge spillovers (Tavassoli and Carbonara, 2014). These studies revealed a positive influence of entrepreneurial and industrial activities on innovation, consequently, growth of regions. Innovation has been represented in many forms such as product and process innovation and with these varied forms come different measuring methods such as with patent counts, innovative sales or research and development intensity (Buesa, Hejis and Baumert, 2010). To determine the real driver of innovation, some researchers classified knowledge created and diffused as an output of innovation whilst also referring to institutions, infrastructures, human capital and research, business sophistication, and market specialization as inputs of innovation (Franco and Oliveira, 2017). Human capital of organizations as well as intramural expenditure on research and development was also recognized as relevant inputs (Lundvall, 2017) of regional innovation.

As part of regional efforts to develop, such inputs of innovation are granted to innovation-oriented firms and are, expectedly, relied on to provide significant results owing to the growing and currently overwhelming abundance of evidence on the positive relationship of innovation drivers on sales of innovative products (Cassiman and Veugelers, 2006). Non-material inputs such as interaction, learning, knowledge transfer and proximity have also been raised important requirements for facilitating innovation. Research on proximity of regions have also affirmed the need for cluster creation and the reliance on proximity for information transmission and knowledge diffusion in a spatial context, on the contrary, there may also be reservations about creating too much geographical proximity among such firms as they could result in lock in learning and innovation processes and inadvertently render all investment efforts to cluster such firms non-productive. On the use of material inputs such as expenditures

and personnel, firm management of these investments was deemed a sensitive factor for appropriating outputs from such inputs (Prokop, Stejskal and Kuvikova, 2017) whilst organisational culture was also realized to affect the density of connections among related and interacting firms with the purpose of innovation which, in sum, has the potential to affect the learning orientation and innovative productivity of firms to develop their competitive advantage and new products in regions.

Avalanche of researches on inputs and outputs of innovation have shown enormous evidence of the validity of inputs on the outputs of innovation used, whether on knowledge created or diffused (Franco and De Oliveira, 2017) or the amount of sales of innovative products (Cassiman and Veugelers, 2006) or patents submitted to the EPO office (Buesa et al., 2010). Science and technology investment was found relevant total sales of innovative activities by Lundvall (2017) and has been widely recognized as relevant input within European Union's Horizon 2020s initiative. Europe, however, has long indulged in financial policies oriented at accelerating investments with the linear objective of creating and facilitating a stronger innovation sphere within the Union to stimulate employment, income and growth. Recent policies such as the Horizon 2020 and the European Union strategy 2020 that advocates regions to set aside 3% of their Gross Domestic Product (GDP) are obvious cases in point. Such public policies may be strategically aimed at accelerating innovation and subsequently regional productivity growth in all regions but strongly hinges on firms innovatively excelling to boost regional output. Although the presence of investment does not adequately guarantee a transformation to growth as there are institutional factors, externally influential and intrinsic regional factors that may impede the transformation (Prokop et al., 2017). As the growth of Czech Republic and Estonia have been strongly boosted by information assimilation and growth of information technology in the past years as reported by the European Commission, the objective of the research is to identify the impact of marketing, organisational and process innovation on output of innovation.

## **2 Data and Methodology**

Since our study is focused on analysing the impact of selected innovation inputs on innovation output of the Czech Republic and Estonia, for data, we resorted to the retrieval and the usage of binary data of Community Innovation Survey (2012-2014) conducted by the European Commission. The variables focused on were expenditure of Information technology and information service firms on innovation, organisational innovation, product innovation and

market innovation and sales of new or significantly improved products as a measure of innovation output. As applied by Cassiman and Veugelers (2006) and Rickne (2001), sales of new or significantly improved products were used as a measure of innovation output and dissemination although it has its downsides (Buesa et al., 2010).

The research used combination of inputs and output variables namely: TURNMAR- percentage of turnover in new or improved products introduced during 2012-2014 that were new to the market; INPSPD- Introduction onto the market a new or significantly improved method of production; INPSLG- Introduction onto the market a new or significantly improved logistic, delivery or distribution system; ROEK- Engagement in acquisition of external knowledge; RRDEX- Engagement in extramural research and development; RTR- Engagement in training for innovative activities; RMAR- Engagement in market introduction of innovation; FUNGMT- Public funding from central government; FUNEU- Public funding from the EU; MKTDGP- Significant changes to the aesthetic design or packaging; MKTPDL- New methods for product placement or sales channels; ORGBUP- New business practices for organising procedures.

With regards to the sample, Czech Republic and Estonia of Eastern Europe, for comparison purposes, Information technology and other information service firms were chosen as the unit of analysis. Three hundred and fourteen firms (314) from all regions in the Czech Republic and eighty one (81) from Estonia were used. This large difference is comprehensible owing to wide population differences of both countries as Czech Republic recorded a population of 10.1 million inhabitants and 1.3 million inhabitants in Estonia as of 2017 as recorded by European Union. Firms chosen had their headquarters in the country of operation or in another European Union, in an European Free Trade Association candidate country or located in the rest of the world. Employment of the last calendar year was used as the indicator of the size of the enterprises. For the purpose of this research, we didn't differentiate according to sizes. We used all firms that employed between ten (10) to five hundred (500) employees. Owing to the degree to which Information technology has permeated and seamlessly formed an irreplaceable foundation of the Estonian economy and their quite close EU innovation rankings and contrasting innovation strengths, results of both firms could be useful for each other for benchmarking and modelling purposes. Multiple regression analysis was used as the tool of analysis due to the intent of assessment of impact of a set of independent variables on a dependent variable, as used by (Cassiman and Veugelers, 2006; Buesa et al., 2010).

### 3 Results and Analysis

Initially, a conjoined analysis was conducted and results of the data signifies the varying and although synergetic impact the different variables of innovation has on the entire measure of firm's innovation using sales of innovative product . Below is a descriptive statistics of the analysis for both the Czech Republic and Estonia.

**Tab. 1: Descriptive statistics of the innovation variables for the Czech Republic**

	Sales	Production methods	Logistics	External Research & development	External Knowledge	Training	National funding	EU funding	Organisation of procedures	Product design	Sales channels
Valid	314	314	314	314	314	314	314	314	314	314	314
Missing	0	0	0	0	0	0	0	0	0	0	0
Mean	0.089	0.280	0.057	0.175	0.127	0.366	0.127	0.159	0.226	0.166	0.134
Std. Deviation	0.212	0.450	0.233	0.381	0.334	0.483	0.334	0.366	0.419	0.372	0.341
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
No. of observations	314										

Source: Author's calculation

**Tab. 2: Descriptive statistics of the innovation variables for the Estonia**

	Sales	Production methods	Logistics	External Research & development	External Knowledge	Training	National funding	EU funding	Organisation of procedures	Product design	Sales channels
Valid	81	81	81	81	81	81	81	81	81	81	81
Missing	0	0	0	0	0	0	0	0	0	0	0
Mean	0.087	0.185	0.049	0.247	0.333	0.333	0.123	0.086	0.210	0.160	0.185
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Std. Deviation	0.211	0.391	0.218	0.434	0.474	0.474	0.331	0.283	0.410	0.369	0.391
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
No. of observations	81										

Source: Author's calculation

From Table 3 below, it could be observed that organisational innovation was found to be insignificant for both countries. This contrasted with the findings of Koren and Palčič (2015) who found high usages of technical and organisational concepts have a positive impact on the

product characteristics and their market performance. His findings showed that companies obtained more internal information about new products via sales departments whilst the customers were still the important external source of innovation. These findings effectively rejected H1 for both countries contrary to EU's findings of impact of innovation culture on output of innovation in 2009. Introduction of a new or improved method of production and a new or improved delivery system for Czech Republic showed a strong and positive impact on sales growth of new products. In Estonia, introduction of a new or improved method of production was moderately positively significant to sales of new or developed products; However, introduction of a new or improved delivery system showed a moderately significant but negative impact on sales of new or developed products. This supports the findings Masso and Vauhter (2007) who revealed that whilst larger firms were more oriented to innovation as innovation is largely determined by size; innovation of processes had a positive effect on company's performance in terms of productivity, but innovations of products did not seem to have that effect.

**Tab. 3: Results of regression analysis for the Czech Republic and Estonia**

	EU Member States	Czech Republic			Estonia		
Classification	Variables	TURNMAR			TURNMAR		
		Coefficients	p value	Standard error	Coefficients	p value	Standard error
	Intercept	0.101	0.011	0.040	0.018	0.826	0.079
Public funding	EU funding	-0.019	0.719	0.051	-0.438	0.009***	0.132
	National funding	-0.011	0.841	0.056	-0.608	0.004***	0.155
Process innovation	Logistics	0.241	0.001***	0.075	-0.232	0.068*	0.112
	New method of Production	0.147	0.001***	0.043	0.318	0.010**	0.099
Marketing Innovation	Product design	0.098	0.055*	0.051	0.176	0.117	0.102
	New sales channels	-0.164	0.005***	0.057	-0.334	0.010**	0.103
Organisational Innovation	Organising procedures	0.030	0.526	0.047	0.126	0.149	0.080
Innovation activity and Expenditure	External Knowledge	0.063	0.224	0.052	-0.482	0.001***	0.102
	External Research and development	-0.001	0.983	0.048	0.397	0.002***	0.088
	Training for innovation	-0.043	0.366	0.047	0.580	0.000***	0.102
	Model Statistics	<b>P value &lt; 0.001</b> <b>R<sup>2</sup>= 0.17</b> Adjusted R <sup>2</sup> = 0.11 Number of observations = 395			<b>P value &lt; 0.00682</b> <b>R<sup>2</sup>= 0.87</b> Adjusted R <sup>2</sup> = 0.72 Number of observations = 395		

Source: Author's own; Legend: \* significant at  $P < 0.10$ ; \*\* significant at  $P < 0.05$ ; \*\*\* significant at  $P < 0.01$

It could be alluded a difficulty in initial product acceptance by new customers, competition difficulties or created by present firms in a supposedly dense market. This accepts H3 for both Czech Republic and Estonia.

Changes to aesthetic design and packaging had a weak but positive impact on sales of new products among Information Technology and information service firms in Czech Republic as it obviously appeals more to consumers. This finding is in line with the work of Seifert and Chattaraman (2017) who found that apparel designs with high-novelty will result in more positive aesthetic response than apparel designs with low-novelty. On the contrary, it wasn't significant in Estonia; however, new methods of product placement or sales channels were of strong significance to sales of new or developed product for both countries. This also supports the work of Verhoff, Kannan and Inman (2015) who, aside affirming the positive impact of multi sales channels on sales performance, revealed a gradual shift of multi channelling to omni channelling in recent times. These findings accept H2 for Czech Republic but not entirely for Estonia. Firms could be frustrated by the competitive strength of other firms in those channels, selling at wrong locations, inability to assimilate and efficiently use modern technologies and failure to reach their desired target market. Poor firm reputation, short ended preparations and unpopular distributors selected may also affect the publicity and ultimately the sales output of the firm.

## **Conclusion**

The objective of the research was to assess the impact of selected innovation variables on innovation output of Information technology and information service firms between Czech Republic and Estonia.

Via the analysis, it was revealed that public funding information technology firms is a significant contributor to the total innovation output in Czech Republic, however in Estonia it turned out to have a strong negative significance to innovation output. Introduction of a new or significantly improved method of production or a new or significantly improved logistic, delivery or distribution system did have a strong bearing on innovation output in Czech Republic. Significantly improved logistic, delivery or distribution system was found to moderately improve the innovation in Estonia, however, new methods of production had a weak and negative impact on innovation. Business processes were found to affect innovation output in both countries, expenditure of firms on external research and on training personnel for innovation also had a strong and direct effect on innovation in Estonia even as external

knowledge acquisition was found to have a strong negative impact on innovation in these IT and information service firms.

Based on these findings, we recommend that National and European institutions, with one eye on possibility of market failure of their investment, should be directed and more focused on the business needs that are tied directly to innovation output of the firm. Discipline in the financial market should also be tampered with acceptable standards of corporate governance to ensure more relevant connection to the focus and the innovation output of these firms. Higher importance should also be placed on marketing channels as poor and unpopular channels may results in wasted efforts of conveying products to consumers, hence credibility of websites resorted to for sales as well as the potential of reach of these channels used and the assurance of reaching to the purported target market should be highly considered as well. Marketing channels that has a high potential of increasing sales volume should be designed and the impact of intermediaries should be limited to ensure strong control whilst also striving for new market opportunities. Strong accountability sessions and interim control measures should be held to ensure adequate significance to targets set and, finally, expenditure expended on external knowledge appropriated should be connected a lot more with research on customer's behavioural swings and the product's position with customers as well.

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