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Assessing the impact of innovation strategies and R&D costs on the performance of IT companies

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Abstract

Innovative activity of companies differs due to their sphere. This paper will focus on companies operating in the IT (Information Technology) sphere, whose business success depends on innovations more than the success of companies in any other sector. Innovations for manufacturing hi-tech products, for example, computer equipment, demand more intense (narrower) focus on product innovations owing to the fact that the basis of viability and financial well-being of hi-tech companies is demand for their products. Therefore, innovations in such companies are mostly directed at creation of new products or modernization of the already existing ones. As a consequence, in order to define the activity of IT companies more precisely we should use specific classification of innovation strategies. The innovative behavior of IT-companies is one of the main sources of competitiveness, business survival and economic growth. It is therefore important to identify and understand the factors that determine innovation behavior among IT enterprises. Innovation behavior depends on innovation capacity and is realized in a particular innovation strategy. This paper attempts to show the mechanism of choosing the most appropriate innovation strategy and the most accurate project estimation. Using the data collected on IT companies, the correlation between innovation strategies and company's performance was found.

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Keywords: IT company, Innovation Strategy, R&D, Need Seekers, Market Readers, Technology Drivers.

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1. Introduction

In the new global economy, innovations play a significant role in the development of new technologies, providing sustainable competitive advantages, and thereby, in the growth and efficiency of the economic system. Innovation fuels organizational growth, drives future success, serves as the engine that allows businesses to sustain their viability in a global economy (Gaynor, 2002). For companies pursuing excellence in this era of hyper competition, restructuring, lowering costs, and enhancing product or service quality are no longer sufficient. Many researches agreed that companies must be able to create and commercialize a stream of new products and processes that extend the technology frontier, while at the same time keeping a step ahead of their competitors. Consequently, every company needs this basic core – innovation – to apply more productive manufacturing processes, perform better in the market, seek positive reputation in customers' perception and, as a result, gain sustainable competitive advantage.

Commonly used classification of innovation companies' strategies include: "make", "buy" and a combination of both – "make-buy" strategies (Bayona-Sáez & García-Marco, 2010; Gunday, Ulusov, Kilic, Alpkan, 2011). However, this classification does not take account of the features of the IT sector, nor does it examine direction towards the product development. That is why we are going to use the most relevant classification. According to the Booz&Co's publications, companies can be categorized as Need Seekers, Market Readers and Technology Drivers, which differ in the ways of creating and launching new products. Following a particular strategy is determined by specific features of the particular product and defined market and has an influence on the company's financial results.

2. Literature Review And Hypotheses

2.1 Innovative activity of companies

Innovation evaluation has become a significant and critical concern for both practitioners and researchers, as well as for public authorities. Literature attests to propositions for measuring the innovation management of companies and identifying the conditions of a successful innovation process (Guan et al., 2006; Wang et al., 2008; Tseng et al., 2009).

Input evaluation

The R&D intensity is often used as an evaluation criterion for innovation process input. These R&D efforts represent not only the company's current input, but provide information about strategic activities that are a complete part of the innovation capabilities of a company. Evaluation of R&D costs allows objective measuring of the direct effect on innovation output, avoiding subjective perspectives. There is a large volume of published studies supporting the positive relationship between RDSs and a company's innovative performance. Cameron (2000) observed a positive impact of R&D on total factor productivity growth, but the effects varied significantly across industries. Kafouros (2005) also found positive and direct effects of R&D on the productivity growth though the effect was higher for large companies than for small companies. Although there is common agreement as to the positive effects of R&D activities on company innovativeness, the question of whether different RDSs have the same impact on company innovative performance awaits a conclusive answer. Also, R&D efforts remain difficult to correlate with R&D and innovative activity results.

However, all applied models are difficult to use because preconditions are necessary before application (accounting algorithms among others) and because of the influence of qualitative variables such as the organization mode.

Output evaluation

Literature attests of research in the field of innovation performance. Performance is associated with the nature description and the assessment of the outcomes of the innovation process. Patents are intermediary results of the new product development process and are consequently indicative of the invention's activity and research efforts. However, this innovation criterion gives a reduced evaluation of innovation because only the technological results are patented. Researchers, particularly in the economic field, are increasingly using patent citations as an indicator of the inventive performance of companies and also journal-based innovation counts (Jensen and Webster, 2004).

Some financial indicators are also developed, including the total percentage of sale volume represented by new products.

Activity evaluation

Innovation capacity

A review of the literature reveals many suggestions for measuring the Innovation Capacity (IC) of companies. IC can be defined as the continuous improvement of the overall capabilities and resources that the company possesses for exploring and exploiting opportunities to develop new products to meet market needs. The IC of a company is based on a complex capacity hierarchy, and thus a simple conventional single performance criterion is insufficient to determine the level of an enterprise (Guan et al., 2006). According to Wang et al. (2008), measuring ICs requires simultaneous consideration of multiple quantitative and qualitative criteria. Authors adopt many statements before evaluation, particularly the number of ICs: three innovation capabilities (Kocand Ceylan, 2007), four innovation capabilities (Adler and Shenbar, 1990), five innovation capabilities (Lu et al., 2007; Wang et al., 2008), six innovation capabilities (Jonker at al., 2006), or seven innovation capabilities (Guan et al., 2006). The following sums up the related capabilities: resource allocation capability, capability to identify competitors' strategy and satisfy market requirements by developing new products, to foresee technological changes and manufacture new products using appropriate technological processes, to effectively respond to unanticipated technological activities created by competitors and unforeseen market forces, and to organize the internal training process. Literature review on the innovation capacity metrics shows that most of the proposed approaches are based on the evaluation of multiple factors. These factors are identified as leverage to manage innovation processes. A number of these factors being in common, the main difference resides in the aggregation technique used. MCDA (Multi-criteria Decision Aid) techniques have been widely applied to do these analyses, i.e. ELECTRA, Weighted Averages, and AHP (Analytic Hierarchical Process), fuzzy integrals, parametric identification, or Data Envelopment Analysis (DEA).However, these evaluation methods are not generic and therefore neither practitioners nor researchers have a real reference framework. Furthermore, these data collection methods are causing a problem because information is generally based on opinions expressed during interviews. Consequently, contributions are still possible through approaches based on in-situ observations within companies.

Dynamic capabilities

This part concerns the evaluation of innovation processes. A process may be considered as a sequence of tasks that are coherent in regard to the final artifact. Here the finality stands for a new product, a new service or a new technology. Thus, IC may refer to dynamic capabilities. Dynamic capabilities appear as routinized activities directed towards the development and adaptation of operating routines. More precisely, it emphasizes two aspects. First, it refers to the shifting character of the environment; second, it emphasizes the key role of strategic management in appropriately adapting, integrating and re-configuring internal and external organizational skills, resources, and functional competences toward the changing environment. Innovative enterprises try to remain competitive on highly evolving markets or to revolutionize offers on more conservative markets. Innovation is based on newness and, as a consequence, innovation management may be considered as a dynamic capability. Eisenhardt and Martin (2000) state that best practices definition is an adapted way to describe dynamic capabilities. Consequently, best practices observed in innovation companies have been selected as referential for the proposed model. Moreover, drawing on the literature on dynamic capabilities, Bender and Laestasius (2005) introduce the concept of innovation-enabling capabilities. This is composed of two dimensions, transformative and configurational capabilities. Transformative capabilities focus on the enduring ability of an organization to transform globally available general knowledge into locally specific knowledge and competence, the latter on the enduring ability to synthesize novelty by creating new configurations of knowledge, artifacts and actors. Note that these authors use ability and capability as synonyms. Literature attests no generic approach to evaluate dynamic capabilities, and, as the environment is changing and innovation practices are improving, there is no evolutive evaluation system of these capabilities. Even routines to innovate are changing; consequently, an adaptive approach of IC evaluation is still required.

Absorptive capacity

Absorptive capacity has been defined as a company's ability to recognize the value of new information, assimilate it and apply it to commercial ends. It is a set of organizational routines and processes by which companies

acquire, assimilate, transform and exploit knowledge to produce a dynamic organizational capability. Many studies address the enrichment of the concept, but the fundamental argument remains the same: by investing in certain (research or other capability-building) activities, companies can improve their ability to identify, value, assimilate and apply (or exploit) knowledge that is developed outside of the company. As a consequence, absorptive capacity gives priority, first, to the study of activities (capability-building), and second, to knowledge as a resource.

2.2 Innovation Strategies of IT companies

Innovation strategy selection is an increasingly important problem especially for young and innovative companies. Decisions regarding how the company will access technology are crucial since they affect its future performance and also determine business success.

There is a large volume of published studies describing “make” and “buy” strategies and their influence on company’s innovative performance (Fey & Birkinshaw, 2005; Schmiedeberg, 2008; Rodionov, Rudskaia, Kushneva, 2014). Since 2000, more than 10 different studies ascertain the effect of make, buy and a combination of both (make-buy) strategies on company innovative performance. In order to determine RDSs effect on product and process innovations in these papers, quantitative analyses were carried out using a number of estimates and econometrics methods.

Based on the open innovation and absorptive capacity theoretical approaches, as well as on empirical evidence, many researchers revealed that all these strategies have a positive effect on the company's innovative performance, but the make-buy strategy has the greatest effect, whereas the lowest impact was shown by the buy strategy.

However, make, buy and make-buy strategies are quite general, so, on the one hand, they are rather universal and these strategies can be applied to various companies; on the other hand, they do not take into account teh features of the IT sector. That is why more a relevant classification is required to describe the features of IT companies, whose innovations are directed first of all towards product development.

The only appropriate classification provided by Booz&Co is quite modern and reflects the features of the IT sector. It identifies three categories: Need Seekers, Market Readers and Technology Drivers, which differ in the ways of creating and launching new products.

From the studies of Booz&Co it can be claimed that:

- Need Seekers actively and directly engage current and potential customers to shape new products and services based on superior end-user understanding, and strive to be the first to market with those new offerings.
- Market Readers watch their customers and competitors carefully, focusing largely on creating value through incremental change and by capitalizing on proven market trends.
- Technology Drivers follow the direction suggested by their technological capabilities, leveraging their investment in research and development to drive both breakthrough innovation and incremental change, often seeking to solve the unarticulated needs of their customers via new technology.

2.3 Development of Hypotheses

Following a particular strategy is determined by specific features of the particular product and defined market and has an influence on the company’s financial results. According to the strategies description, it can be presumed that usage of the Need Seekers strategy leads to an increase in profits, whereas the Technology Drivers strategy demands greater expenses, thereby usage of this strategy does not contribute to higher profits in the short run.

However, there have been no studies which carry out an empirical research, concompanying these hypotheses. So far, this paper will examine the empirical estimation of these innovative technologies' influence.

3. Methodology

3.1 Research Goal

In this survey, we aim to identify the main innovation drivers and the impact of innovation strategies on the company’s performance.

3.2 Sample and Data Collection

As a source of statistical information for the study, primary sources were used - annual and quarterly reports of companies in the IT sector (since the selected companies are public, their statements are published and are publicly available). In addition to that, websites of some news agencies, such as Bloomberg BusinessWeek and CNN Money, were used. Statistics were based on the basic performance indicators of the 100 largest companies in the industry, such as company revenue and profit, equity, number of employees, R&D costs (as of 2013).

The table of statistics also features innovation strategies used by companies (Need Seekers, Market Readers and Technology Drivers) as well as the information on the diversification of company activity and the life cycle of the company's average product. The companies' assignment to one of the strategies was done analytically based on the information on company activity, products and competitors and current trends in the field.

Companies whose innovation policy involves mainly studying and understanding customers and their demands were reckoned among the ones using the Need Seekers strategy. The knowledge of customer demands doesn't always come from the customers themselves. Such companies often just guess that a new product is going to create demand and be popular in time, even if it isn't that obvious at the time. A vivid example was Apple launching iPhone and iPad, which founded the modern smartphone and tablet market accordingly.

The innovation strategy of the companies sticking to the Market Readers strategic model comes down to immediate reaction to the new products of the main competitors. This doesn't mean that they don't analyze the demands of their potential customers. They just mainly follow the same path as their main competitors.

Technology Drivers are companies that keep a relative distance from competitors and potential customers, trying to solve the problems of their customers, both existing and future, by improving technologies and creating new ones, which often results in innovational breakthroughs. Such problems of future customers are often vague and can not be clearly conceived.

Let us take a closer look at some companies from the list. Apple clearly exhibits the Need Seekers strategy. It also monitors new products of their competitors and tries to keep up, which is characteristic of the Market Readers strategy. Apple is also no stranger to the Technology Drivers strategy, as the company patents a lot of new technologies and has R&D establishments. For example, a department of the Artificial Intelligence Center was taken over to create Siri.

Microprocessor manufacturers can also be assigned to the Need Seekers strategy for such innovative products that meet market demands as x64 (multi-core) processors introduced by AMD or Intel low-power processors that inspired computer manufacturers to create ultrabooks, which became a brand new device among portable computers.

Samsung constantly monitors the activity of their main competitors in the market. Unique products are rarely introduced. The most innovative products often come after the launch of a rival product. The best example is the mobile devices market (smartphones and tablets), Samsung lost several patent disputes to Apple inc. Hence, Samsung adheres to the Market Readers strategy. The same category includes other mobile market giants, such as HTC, RIM, Motorola and Nokia. On the other hand, Samsung has other activities such as the development and production of components for a variety of other companies in the sector. Emphasis on technology development assigns the company to Technology Drivers as well. It should also be noted that Samsung has recently been the first to introduce such products as Smart TVs and Galaxy S Note smartphone-tablet. These products meet user demands (such as the demand for a larger screen on smartphones), which means that Samsung uses all three strategies.

Hewlett Packard, Dell, Toshiba, Asus, Lenovo, Sony produce laptops and other computers as their main activity. These products don't stand out and, being assembled of components produced by other companies, make it difficult to follow customer demands, since in any case, anything new will be developed by other companies. These companies have other products apart from computers, but they are no more different from their competitors.

Further segmentation of the 50 selected companies according to various innovative strategies was done similarly to the analytical process described above. Companies that are technological leaders in their markets and launch new products were assigned to Need Seekers. Companies whose products are similar to those of their competitors without the advantage of being the first on the market were assigned to Market Readers. Companies whose innovation policy comes down to the development of technologies for both product and production were assigned to Technology Drivers (for example, Foxconn, which manufactures devices under the brand name of other companies

from the list). Microprocessor and component manufacturers (Intel, AMD, Broadcomm, NVidia, Qualcomm, etc.) were also assigned to this category.

It should be noted that the analysis of company products and their assignment to a certain strategy were done based on the data for the past 5-7 years, which is why Motorola - the founder of the mobile communication technology - was not assigned to Need Seekers and Technology Drivers, since the technology was introduced a long time ago. It should also be noted that the data was collected in 2010-2012, and the indicators of some companies have changed since then. Moreover, some companies, Motorola for example, currently do not exist.

Such factors as "Diversification" and "Life Cycle" were also acquired analytically. If a company has its share in various markets (for example, Samsung is the manufacturer of computers, mobile devices, components, TVs, home appliances and even cars), then the production of this company is obviously diversified. The "life cycle" of a product was measured by the analysis of the company's average product presence in the market until it is replaced by the next-generation product or withdrawn from the market. All these indicators are subjective, but the method of acquisition corresponds to the definition of the strategies and indicators.

For the descriptive statistics of the statistical data see Table 1.

Table 1. Descriptive statistics of variables.

		Mean	Median	Std. Deviation	Min	Max
		Mean	Median	Std. Deviation	Min	Max
Total Revenues ($b)	Total Revenues ($bb)	25.6969	10.2	36.35904	.258	223.2
Profits ($mm)	Profits ($mm)	1994.72	431	6096.881	-12650	41733
Total Stockholders' Equity ($mm)	Total Stockholders' Equity ($mm)	13925.19	5245.5	23851.67	-5639.2	146415.6
Assets ($mm)	Assets ($mm)	34857.6	14092.5	50668.24	342.8	272315
R&D Costs ($mm)	Total Stockholders' Equity ($mm)	1843.91	917.5	2589.104	0	13975.7
Employees	Employees	81987.3	27925	145394.3	1060	1230000
Product lifecycle	Product Life Cycle (years)	2.47	2	.9369519	1	5

As can be seen in the histogram above, the distribution of revenue (the variable) is inhomogenuous. The maximum value is $2,861,446, while the minimum value is $2 550; the span is very significant. The average value of revenue is $497 049.7, and the standard deviation is $433 945.6. From these values, a variation coefficient can be calculated, which equals 0.87, i.e. the average spread is 87% of the mean value, which indicates a very high volatility in revenue. The kurtosis is positive, so the distribution peak is sharp. 50% of the cases lie between 253 816 and 561 254 and 1% higher than 2 458 975. It is suggested that the latter companies are the most successful.

Table 2. Description of variables

Variable	Description
Dependent variable	
Log(TR/Emp)	logarithm of the total revenue per employee, $mm
Explanatory variables (regressors)	
TR	Total Revenue ($ bb)
Profit	Profit ($ mm)
Equity	Total Stockholders' Equity ($ mm)
Assets	Assets ($ mm)
R&D	R&D Costs ($ mm)
Employees	Employees
Need Seekers	dummy variable; whether the company adheres to the Need Seekers strategy (1), (otherwise - 0)
Market Readers	dummy variable; whether the company adheres to the Market Readers strategy (1), (otherwise - 0)
Technology Drivers	dummy variable; whether the company adheres to the Technology Drivers strategy (1), (otherwise - 0)
Diversity	dummy variable; whether company products are diversified (1) or not (0)
Product Life Cycle	company's average product life cycle (years)
TR/Emp	total revenue per employee, $ mm
Equity/Emp	
R&D/Emp	R&D costs per employee, $ mm
Log(R&D/Emp)	logarithm of R&D costs per employee, $ mm
Log(Equity/Emp)	logarithm of equity per employee, $ mm
Log(Employees)	logarithm of the number of employees

3.3 Analyses and Results

In order to assess the impact of such indicators as R&D costs and types of innovative strategies on corporate earnings, a number of econometric models was built. The analysis was performed using the STATA statistical package. Immediately prior to the modeling, the following assumptions were made:

1) High R&D costs lead to a greater revenue as a lot of new products are introduced on schedule as well as due to increased production capacity, new technologies, etc.

Hypothesis: Raising R&D costs increases company revenue.

2) The use of the Need Seekers strategy leads to a greater revenue as the strategy is based on identifying customer preferences and providing them with the newest products and, therefore, suggests a strong demand for products.

Hypothesis: The Need Seekers strategy increases company revenue.

3) The use of the Technology Drivers strategy doesn't lead to a greater revenue in the short term as this strategy involves fundamental innovations that are costly in terms of both time and money.

Hypothesis: The Technology Drivers strategy neither increases nor decreases company revenue.

Let us compare the two models containing the transformed (logarithmic) variables. Model (1) is a regression of the total revenue per employee logarithm on characteristics, model (2) includes the R&D costs per employee logarithm.

As can be seen in the table, the variable reflecting R&D costs became a value variable in the second model as opposed to the first one, thus improving the accuracy of the model. The coefficients of the variables also changed, but their values remained the same. Therefore, the hypothesis about the relevance of both models is not rejected. Model (2) better explains the dispersion of price R2=75% vs. 69%. Based on the information criteria, the second model also proves to be better (it has lower AIC and BIC, the lower these are the better), F-statistics is higher. However, regression analysis showed that the diversification of production has little impact on revenue, i.e. company success is not determined by its presence in multiple markets, and sometimes focus on one market will yield greater results. In addition, the coefficient of the Product Lifecycle variable not only changed its value, but also became positive. This variable is not significant, so we excluded it. As can be seen in the table below, the R2 of the model did not change significantly because of this, and information criteria even improved.

Table 3. Liner regression models 1 and 2

	(1) ltremp Coef.	Std. err.	p	(2) ltremp Coef.	Std. err.	p
Equity/Emp	0.21**	(0.06)	0.001	0.20***	(0.05)	0.000
R&D/Emp	2.48	(1.29)	0.059			
Employees	-0.00***	(0.00)	0.000	-0.00***	(0.00)	0.000
Need Seekers	0.60***	(0.15)	0.000	0.45***	(0.12)	0.000
Market Readers	0.15	(0.11)	0.175	0.14	(0.10)	0.160
Technology Drivers	-0.33**	(0.12)	0.007	-0.29**	(0.11)	0.008
Diversity	0.11	(0.11)	0.299	0.11	(0.10)	0.258
Product Life Cycle	-0.01	(0.06)	0.886	0.03	(0.06)	0.585
Log(R&D/Emp)				0.20**	(0.06)	0.001
_cons	-1.12***	(0.22)	0.000	-0.34	(0.26)	0.196
N. of cases	100.00			97.00		
Adj R-squared	0.66			0.73		
F	27.08			39.62		
vce	robust			robust		

Table 4. Regression Models 2 and 3.

	(2) ltremp Coef.	Std. err.	p	(3) ltremp Coef.	Std. err.	p
Equity/Emp	0.1962***	(0.05)	0.000	0.1943***	(0.05)	0.000
Log(R&D/Emp)	0.2007**	(0.06)	0.001	0.1976**	(0.06)	0.001
Employees	-2.28e-06***	(0.00)	0.000	-2.29e-06***	(0.00)	0.000
Need Seekers	0.4499***	(0.12)	0.000	0.4475***	(0.12)	0.000
Market Readers	0.1425	(0.10)	0.160	0.1462	(0.10)	0.147
Technology Drivers	-0.2922**	(0.11)	0.008	-0.2996**	(0.10)	0.005
Diversity	0.1132	(0.10)	0.258	0.1004	(0.10)	0.334
Product Life Cycle	0.0304	(0.06)	0.585			
_cons	-0.3428	(0.26)	0.196	-0.2717	(0.23)	0.245
N. of cases	97.0000			97.0000		
Adj R-squared	0.7276			0.7297		
F	39.6228			46.5864		
vce	robust			robust		

Regression analysis of the model 3 shows a 0.2 coefficient for the R&D costs logarithm. This means that increasing R&D costs by 1% will lead to a 0.759% increase in company revenue per emloyee. The 0.1943 coefficient of the Equity/Emp variable suggests that increasing company equity by $1m increases company revenue by (e0.1943-1)*100%=21.45%.

The model also shows that there is a positive correlation between company revenue per employee and the choice of the Need Seekers strategy. This proves the hypothesis that it is the companies that stick to the Need Seekers strategy that get the greatest revenue per employee. The use of the Need Seekers strategy increases revenue by approximately (e0.4475-1)*100%=56.44%.

On the contrary, a negative coefficient was identified before the Technology Drivers regressor. This is due to the fact that following this strategy involves the creation of advanced technology and, as a result, large financial investments and an increase in long-term R&D costs. Having spent a lot on R&D, the companies that use only this strategy are only going to get revenue in the long run, after some innovative technoloogies have been developed and implemented. That is why today the companies that stick to the Technology Drivers strategy are trying to use it along with another strategy in order to improve the understanding of advanced technologies and tendencies so as to be able to convert consumer needs into products and services.

Thus, the assumptions presented in the beginning of this section were concompanyed by econometric studies of three models. Increasing R&D costs does increase company revenue, so does the choice of the Need Seekers strategy, while the choice of the Technology Drivers strategy reduces company revenue.

Regression analysis

As can be seen in the Table 3.5, we only get three runouts for all three criteria. However, it necessary to check how much do the indicators of the model change after these runouts have been removed.

Table 5. Runout identification.

Criterion	Number of runouts
Studentized residuals	6
Cook's distance	4
DFITS	10
Three criteria	3

Runouts are few and non-critical as coefficient values didn't change much and kept their signs, so it is possible to keep the observation data. Such indicators as R-squared, AIC, BIC also improved. However, the F-Statistics value dropped (Table 6).

Table 6. Comparison of the regression model 3 (finite) and 4 (no runouts).

	(3) ltremp Coef.	Std. err.	p	(4) ltremp Coef.	Std. err.	p
Equity/Emp	0.1943***	(0.05)	0.000	0.1706***	(0.05)	0.001
Log(R&D/Emp)	0.1976**	(0.06)	0.001	0.2582***	(0.06)	0.000
Employees	-2.29e-06***	(0.00)	0.000	-2.02e-06***	(0.00)	0.000
Need Seekers	0.4475***	(0.12)	0.000	0.3817**	(0.12)	0.002
Market Readers	0.1462	(0.10)	0.147	0.1487	(0.10)	0.154
Technology Drivers	-0.2996**	(0.10)	0.005	-0.2715**	(0.10)	0.010
Diversity	0.1004	(0.10)	0.334	0.1262	(0.10)	0.214
_cons	-0.2717	(0.23)	0.245	-0.0739	(0.22)	0.736
N. of cases	97.0000			96.0000		
Adj R-squared	0.7297			0.7475		
F	46.5864			44.7558		
vce	robust			robust		

Runouts are few and non-critical as coefficient values didn't change much and kept their signs, so it is possible to keep the observation data. Such indicators as R-squared, AIC, BIC also improved. However, the F-Statistics value dropped.

4. Conclusion

Thus, according to the results of the conducted econometric analysis, we can say that the assumptions made in the beginning of the chapter were concompanyed by regression models. The finite model (Model 3) clearly demonstrates that increasing R&D costs leads to greater company revenue. The choice of the Need Seekers strategy also leads to revenue increase, while the choice of the Technology Drivers strategy leads to a reduction in revenue in the short term.

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