International Journal for Quality Research 20(1) 303–320
ISSN 1800-6450

Ernest Vlačić[1]

Article info:
Received 10.04.2025.
Accepted 23.09.2025.

DOI – 10.24874/IJQR20.01-20

ABSORPTIVE CAPACITY AS A CATALYST FOR INNOVATION AND BUSINESS PERFORMANCE: EMPIRICAL EVIDENCE FROM CATCHING-UP ECONOMIES

Abstract: *This study aims to address the existing research gap by empirically examining the operationalization and impact of absorptive capacity within the Republic of Croatia, a catching-up economy. The primary objective is to investigate how absorptive capacity stimulates innovation activities and assess its influence on both firms' innovation performance outputs and overall business performance. To achieve this, the relationship between absorptive capacity, financial results, commercial success, and innovation frequency was systematically analyzed. The results of a statistical analysis conducted on data gathered from a survey of technology-driven firms reveal a strong positive correlation between higher levels of absorptive capacity and increased innovation activity, which in turn positively influences business performance metrics. These empirical insights contribute to the theoretical development of absorptive capacity literature while offering practical implications for improving firms' internal innovation management processes, particularly within the context of catching-up economies.*

Keywords: *absorptive capacity, innovation performance, technology driven firms, catching-up countries, new product and services*

1. Introduction

This study explores the concept of absorptive capacity (ACAP) with a particular emphasis on its operationalization within firms and its influence on innovation performance. Innovation, widely regarded as a critical driver of sustainable competitive advantage, plays a central role in firms' long-term success and market positioning (Weidner, Som & Horvat, 2023; Teece, Pisano & Shuen, 1997; Spender, 1996; Bayraktar et al., 2017). Within the innovation literature, absorptive capacity is frequently conceptualized as a latent variable that serves as a precursor to innovative behavior, emphasizing the firm's ability to identify, assimilate, and apply external knowledge for competitive advantage.

The theoretical foundations of the absorptive capacity concept can be traced back to the mid-20th century, particularly in the works of Millikan & Rostow (1957) and Rostow (1956, 1963), who examined the role of knowledge in economic development. However, its contemporary

[1] Corresponding author: Ernest Vlacic,
Email: evlacic@fefa.edu.rs

conceptualization, particularly concerning the utilization of external knowledge to support organizational research and development (R&D) and innovation processes, was formally introduced by Cohen and Levinthal (1989; 1990). Their seminal work defined ACAP as the firm's capacity to recognize valuable external knowledge, assimilate it, and apply it effectively to achieve innovation-driven performance enhancements.

The principal research questions guiding this study and defining its core objectives are: To what extent does absorptive capacity (ACAP) serve as a catalyst for firms' innovation activity, and how significantly is its influence reflected in both innovation outcomes and broader business performance metrics? These inquiries will be investigated through an empirical analysis of technology-oriented firms in a small open catching-up economy where the operationalization of ACAP has been insufficiently examined.

The study specifically aims to assess the overall absorptive capacity within firms by systematically evaluating its four core dimensions: knowledge acquisition, assimilation, transformation, and exploitation. This multidimensional measurement will be examined in relation to firms' innovation outputs, such as the frequency and diversity of newly introduced products and services, as well as key business performance indicators including financial growth, market expansion, and competitive positioning. The objective is to determine whether a statistically significant relationship exists between elevated levels of absorptive capacity and enhanced innovation activity, which subsequently influences business success.

By exploring these relationships, the paper seeks to contribute both theoretically and practically to the absorptive capacity literature, emphasizing its importance in driving innovation within catching-up economies. Additionally, the findings aim to provide practical insights for managers and policymakers, guiding the development of strategies to strengthen firms' internal capabilities for more effective innovation management.

The research construct of this paper is based on a quantitative methodology approach by using descriptive statistics which examine a population of technology innovating firms. In the scope and definition of the sample, this research is primarily focused on the population of manufacturing firms in the Republic of Croatia as small and open catching-up economy, which The data collection process involved a sample of over 500 firms, mostly SMEs, resulting in a final dataset of 108 valid responses. The gathered data were subjected to statistical analysis and hypothesis testing, which confirmed a positive correlation between higher levels of absorptive capacity (ACAP) and increased innovation activity, subsequently leading to improved business performance. The empirical findings derived from this research contribute both theoretically and practically, offering valuable insights for catching-up economies aiming to strengthen their innovation ecosystems and improve firm-level competitiveness.

By providing empirical evidence from a catching-up economy, this research contributes to the broader absorptive capacity literature while offering practical implications for managers and policymakers aiming to enhance firms' internal processes and innovation management capabilities. The study reinforces the critical role of absorptive capacity as a strategic driver for sustained competitive advantage, particularly in dynamic market environments.

The subsequent section introduces the theoretical framework that underpins the research question proposed in this study. The theoretical overview concludes with the formulation of research hypotheses, followed by a detailed presentation of the applied methodology, encompassing the definition of the sample and research scope, along with the inclusion of a correlation matrix for the descriptive statistics.

In the third section, the formulated hypotheses are tested, and the results are systematically analyzed and discussed. The findings indicate a positive correlation between absorptive capacity (ACAP) and firms' innovation outputs and performance, providing empirical support for the theoretical assumptions. The paper concludes by addressing the limitations encountered during the research process, offering practical recommendations for the application of the generated insights, and suggesting directions for future research to further explore the influence of ACAP on firm-level innovation and performance in catching-up economies.

2. Theoretical background and hypothesis formulation

In their study of absorptive capacity, Cohen and Levinthal primarily focus on the investment in the research and development (R&D) segment and do not discuss the company itself. Their work has been acknowledged and expanded upon by others (van den Bosch, van Wijk, & Volberda, 2003; Lane, Koka, & Pathak, 2006; Lichtenthaler & Lichtenthaler, 2009), recognizing the opportunity to research ACAP in a broader context beyond direct R&D investment. This realization has prompted a number of scholars to focus their research on ACAP's function within various types of organizations, particularly firms.

According to Zahra and George (2002), absorptive capacity is recognized as a dynamic capability that can significantly affect the nature and sustainability of competitive advantage. In recent years, researchers have employed the concept of ACAP in studies examining various organizational phenomena (Zahra & George, 2002), including strategic management (Nahapiet & Ghoshal, 1998), technology-related management (Gerdoçi et al, 2023; Schilling, 1998; Rodriguez, Wise, & Martinez, 2013; Rush, Bessant, & Hobday, 2007), corporate entrepreneurship (García-Sánchez, García-Morales, & Martín-Rojas, 2017), and regional growth (Fan et al, 2023; Fritsch & Kublina, 2017).

According to the widely acknowledged model by Zahra and George (2002), the absorptive capacity of a company consists of four fundamental complementary components: acquisition, assimilation, transformation, and exploitation. In terms of the effects produced within the firm, the first two components, acquisition and assimilation, belong to the category of potential absorptive capacity (PACAP), while the latter two, transformation and exploitation, fall under the category of realized absorptive capacity (RACAP).

ACAP is often explored in the context of innovation, particularly among firms focused on technological development. Initial research models of ACAP were frequently challenged, resulting in the emergence and evolution of new models. These emerging models were developed for various reasons, but two are particularly crucial. The first addresses the need to operationalize ACAP in alignment with researchers' paradigms, while the second reflects an evolution in the understanding of ACAP's scientific foundation and the necessity to upgrade or modify previous models in light of new knowledge.

For the purpose of this paper, an extended model adapted from van den Bosch, Volberda & De Boer (1999), Lane, Koka & Pathak (2006), and Lichtenthaler & Lichtenthaler (2009), as presented in De Araújo (2010), was selected and is illustrated in Figure 1. Among other models, this proposed one is particularly relevant to the focus of this paper because it examines innovation and firm performance as outputs, two components central to our research.

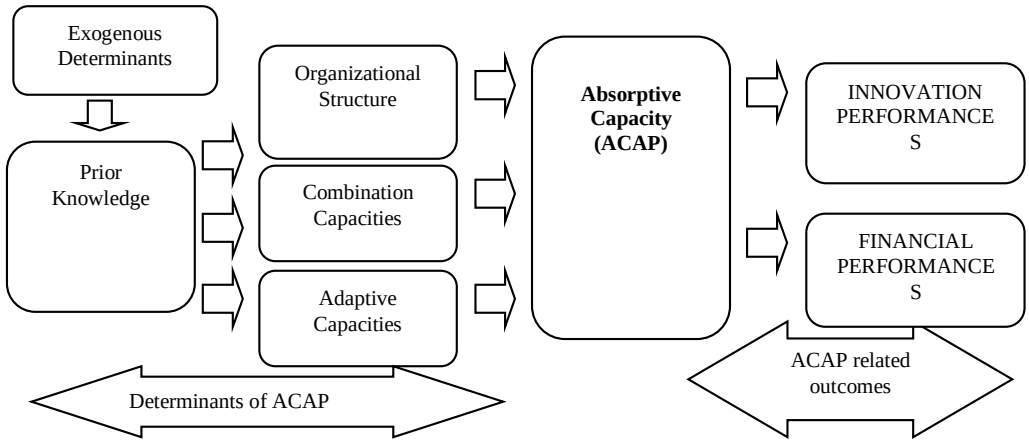

Figure 1. ACAP model adjusted and expanded from van Den Bosch, Volberda & De Boer (1999), Lane, Koka & Pathak (2006) and Lichtenthaler & Lichtenthaler (2009) and presented in De Araújo (2010).

2.1 Hypothesis formulation

Theoretical frameworks posit that a developed absorptive capacity (ACAP) and a firm's ability to innovate are critical determinants of competitive advantage (Cohen & Levinthal, 1990; Zahra & George, 2002). Over the years, significant empirical research has been conducted to explore the interactions and relationships between ACAP levels, organizational innovation, and performance outcomes. For example, Lin, Su & Higgins (2016) investigates the relationship between ACAP and the initiation intensity of innovation processes, with a specific focus on the accessibility of external knowledge as a facilitating factor. Similarly, Liao et al. (2009) examines the linkages between ACAP and firms' innovation capacities, further demonstrating the role of ACAP in driving organizational innovation (Duan et al, 2021), including the green innovation and sustainable development (Fan et al, 2023; Lazarević, Pitić, & Vlačić, 2024).

In their study, Forés & Camisón (2016) analyze the impact of ACAP on the effectiveness of innovation processes by differentiating between radical and incremental innovations. Drawing on the resource-based view (RBV) theory, their research evaluates how ACAP-related functions influence organizational performance, with return on assets (ROA) employed as a key performance indicator to assess these effects.

Complementing this perspective, Bahli (2012) and Bahli et al. (2013) provide additional insights into the relationship between ACAP and the generation of innovative outputs. Bahli (2012) specifically examines the nature of innovations—whether incremental or radical—and underscores the dependence of these outcomes on the maturity of ACAP's four dimensions: acquisition, assimilation, transformation, and exploitation. In his later work, Bahli et al. (2013) focus on the inherent specificity and uncertainty associated with initiating innovative processes, emphasizing the critical role ACAP plays in navigating these complexities and fostering innovation.

Rakthin (2013) conducts a study exploring the relationship between firm performance and the two fundamental components of absorptive capacity: potential absorptive capacity (PACAP) and realized absorptive capacity (RACAP). The research employs an extended set of performance indicators, including market orientation, price and product differentiation, sales growth, and customer loyalty, to provide a comprehensive evaluation of how these dimensions of ACAP influence organizational outcomes.

Thus, based on a review of the key literature on absorptive capacity and its influence on a firm's innovation processes, a primary hypothesis (H1) and two related auxiliary hypotheses (H1.1 and H1.2) are formulated:

H1.: Higher levels of absorptive capacity positively influence the triggering of innovation processes

In testing this hypothesis, we started from the assumption that firms with a higher level of absorptive capacity would perform better at initiating innovation processes, as they are better able to recognize innovation potential and subsequently embed it in their activities.

H1.1.: Higher levels of absorptive capacity positively influence new products/services for market launches

To test this hypothesis, we assessed the correlation between the existing level of absorptive capacity and the success of a firm's new services/products for market launches. In establishing this hypothesis, no consideration was given to whether the developed product or service is eventually commercialized. This is due to the high uncertainty associated with the commercialization of innovative products.

H1.2.: Higher levels of absorptive capacity positively influence successful commercialisation of launched products/services

Similar to H1.1, but in the testing of this hypothesis innovative products/services were considered as already successfully commercialized.

Patel & Fiet (2008) investigate the relationship between firms' ability to innovate and their capacity to replicate innovation processes based on prior experiences. This capability is closely linked to potential absorptive capacity (PACAP), a subcomponent of absorptive capacity (ACAP). Their study examines whether firms with higher levels of PACAP are able to mitigate the effects of path dependence on performance. The findings indicate that for frequent innovators, a well-developed PACAP has a greater positive impact on innovation success compared to realized absorptive capacity (RACAP). Conversely, firms with lower innovation frequency benefit more significantly from a stronger RACAP.

Leal-Rodríguez et al. (2014a) further explore the role of PACAP in successfully initiating innovation processes within firms. In a related study, Leal-Rodríguez et al. (2014b) investigate the mediating role of RACAP within a relational learning context and assess its corresponding influence on innovation outcomes. Additionally, Tang & Murphy (2012) examine whether previously acquired knowledge, as an element of PACAP, positively impacts the development and launch of new products or services.

Leal-Rodríguez et al. (2014b) operationalize ACAP through PACAP by correlating it with specific innovation outputs, including the technology readiness level (TRL) of innovations, the dynamics of innovation processes, and the number of new products introduced to the market. Similarly, Kostopoulos et al. (2011) study the mediating role of ACAP in linking external knowledge inflows with innovation performance, providing additional insights into how absorptive capacity facilitates innovation.

Building on this understanding of PACAP's role in a firm's innovation processes and its influence on mitigating path dependence, the second auxiliary hypothesis is formulated:

H1.3.: Firms with higher levels of potential absorptive capacity are more successful at repeating the innovation processes (prior investments in innovating as path dependence).

To test this hypothesis, we evaluated the influence of prior investments and pre-existing knowledge as path-dependent components of absorptive capacity (ACAP) in facilitating the initiation of new innovation processes. Specifically, the analysis seeks to determine whether firms with a more advanced understanding of market trends exhibit greater success in implementing

innovation processes.

The formulation of the previous hypothesis considered the relationship between the level of ACAP and a firm's performance. Various studies (Forés & Camisón, 2016; Rakthin, 2013) have emphasized that this relationship is particularly significant for achieving sustainable competitive advantage (SCA). Among the authors who examine the positive relationship between ACAP and firm performance through the operationalization of ACAP, Chauvet & Guiot (2003) concludes that a developed ACAP, bounded by the firm's knowledge transfer capabilities, is essential for attaining and sustaining SCA.

Recent research by Tzokas et al. (2015) also operationalizes ACAP and confirms a positive correlation between ACAP and firm performance. This relationship is examined from the perspective of technological capabilities and customer loyalty, highlighting the dual role of ACAP in driving innovation processes and fostering systematic knowledge management. Consequently, it is evident that ACAP is closely and inextricably linked to the achievement of sustainable competitive advantage (SCA) in firms.

Furthermore, Gerdoçi et al (2023) argue that advances in the understanding of co-evolutionary theory position absorptive capacity for external knowledge as a critical factor in achieving global and sustainable competitive advantage. Building on the literature review of ACAP's contribution to firm performance and its relevance to the objectives of this study, we propose the second major hypothesis of this paper:

H2. Higher levels of absorptive capacity positively influence firm performances.

This hypothesis seeks to examine whether absorptive capacity (ACAP) is positively associated with a firm's performance. Specifically, it investigates whether firms with higher levels of ACAP achieve superior business outcomes. A preliminary review of the theoretical framework suggests that frequent and intense innovation activities within a firm increase the likelihood of its success. Supporting this, Kalay & Lynn (2015) demonstrate that innovation strategy, organizational structure, and innovation culture significantly enhance firm innovation performance.

The measurement of successful innovation typically incorporates a variety of performance indicators across multiple categories. The first category often involves innovation-related productivity (, which is frequently analyzed using econometric models such as the Crépon, Duguet, and Mairesse (CDM) framework (Crépon, Duguet & Mairesse, 1998). A second category focuses on employment metrics, as explored by Lachenmaier & Rottmann (2011) and Harrison et al. (2008), while a third category includes financial performance indicators, as discussed by Kemp et al. (2003) and Artz et al. (2010). Furthermore, Chatterjee, Chaudhuri & Vrontis (2022) highlight that innovation, as a direct outcome of knowledge creation or its combination, is a fundamental component of entrepreneurship and a critical driver of business success. Based on the review of the innovation processes linkage and firms' performance, we state our next hypothesis:

H3. A higher frequency of initiated innovation processes positively influences firm performance.

To test this hypothesis, we posit that the suspension or interruption of innovation processes significantly reduces the likelihood of success in the commercialization of innovative products. This assumption underscores the critical importance of maintaining continuity in innovation activities to achieve desirable market outcomes.

In line with the formulation of this hypothesis and based on the selected absorptive capacity (ACAP) model illustrated in Figure 1, a tailored empirical model has been developed to guide the analysis. This model is presented in Figure 2 and reflects the specific dimensions and interactions relevant to the hypothesis under investigation.

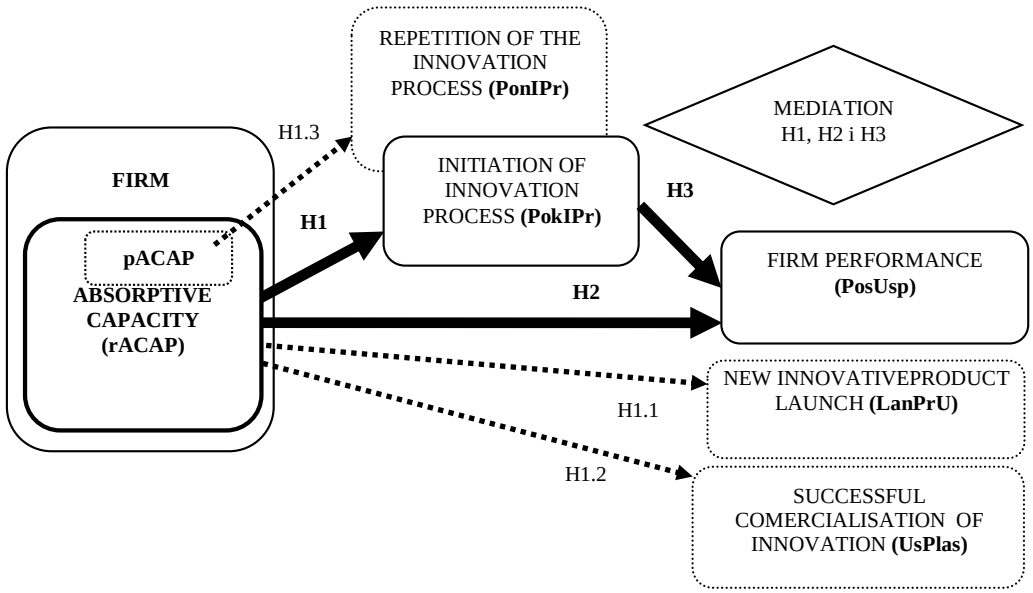

Figure 2. Research model with allocated hypotheses

3. Methodology

Despite the theoretical significance and widespread global application of the ACAP construct, research on its practical implementation and effects in catching-up economies remains limited. This gap is particularly evident in Central and Eastern European countries, where empirical evidence on how absorptive capacity influences firm-level innovation outcomes is scarce. The present study seeks to address this research void through an empirical investigation conducted in Croatia, a representative of catching-up emerging economy undergoing structural shifts towards innovation-driven growth.

A questionnaire utilizing a Likert scale ranging from 1 to 8 was employed for all questions related to absorptive capacity (ACAP). Financial performance data were represented by an arithmetic mean composite value, which aggregates firms' profitability and revenues over a five-year period. The sample consisted of firms classified according to the National Classification Code (NKD 2007), which aligns with the NACE classification. The sample included 500 firms selected for the distribution of the questionnaire from a database maintained by the national Chamber of Economy (CCE). The population sample comprised firms from the manufacturing sector, as well as the engineering and ICT (Information and Communication Technology) sectors, without specific consideration of the country of ownership or ownership typologies. Within this population, two primary strata were identified: a larger group consisting of medium-sized and small enterprises, and a significantly smaller group comprising large enterprises.

To determine a firm's eligibility for inclusion in the study, it was crucial to establish whether the firm had participated in or intended to engage in the innovation process. It was assumed that the selected firms had already undertaken innovation activities or invested in research and development, thereby facilitating the initiation of further innovation processes.

A total of 127 firms successfully completed their questionnaires. Following a thorough filtration and verification process, 108 responses were considered complete and usable, reflecting a return rate of 20.8%.

Analyzing the distribution of returned responses by company size, it is evident that large companies (those with over 250 employees) recorded the highest relative response rate at 30%. In contrast, small companies achieved a response rate of 24.1%, placing them in second position by a narrow margin. Medium-sized companies, on the other hand, exhibited a relatively low return rate, with only 73 responses collected out of a potential 302.

First, to investigate the interdependence and integration among a selected number of relevant control and independent variables, as well as to provide a comprehensive overview of the interactions measured between absorptive capacity (ACAP) and other firm-related variables, a correlation matrix analysis was employed.

Then, the proposed hypotheses were tested through a combination of descriptive statistics, including regression and mediation analyses. Specifically, all hypotheses were examined using simple linear regression, while mediation analysis was utilized to evaluate the influences of the variables involved. In this research, consistent with standard practices in mediation analyses, three variables were included in the testing. The number of active innovation processes within the enterprise (PokIPr) served as the mediator variable for assessing the correlation between the level of ACAP (rACAP) and the business performance of the enterprise (PosUsp). This mediation analysis model is illustrated in Figure 3.

To validate the credibility and extent of mediation, the Sobel test was conducted. This test was chosen over Baron and Kenny's method due to the relatively large sample size (>100) used in this study, providing a more robust analysis of mediation effects.

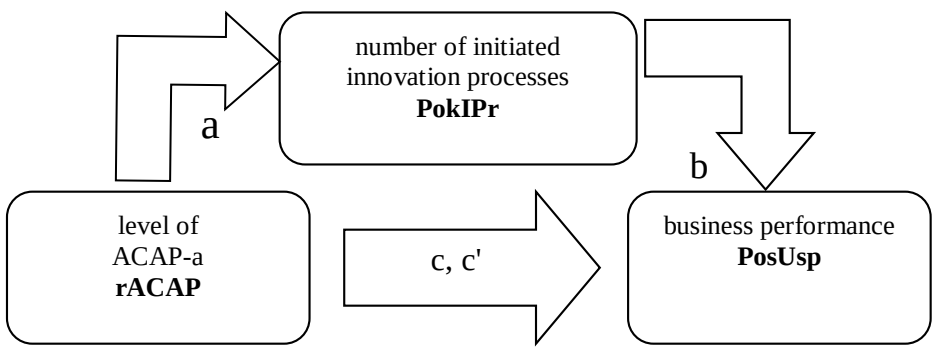

Figure 3. Mediation analysis model

4. Research results

4.1 Correlation matrix analysis

As the initial step in conducting the correlation matrix analysis, it was crucial to identify five control variables and five operational (working) variables. Unlike the descriptive statistics analysis, which required fully completed questionnaires, a larger set of 108 responses met the criteria for operationalization in the correlation matrix analysis. The selected control variables included total revenues over the past five years, profits from the last five years, the percentage of exported products and services, the number of patents filed, and firm size. Concurrently, five operational variables were identified: the measured level of absorptive capacity (rACAP), the measured level of potential absorptive capacity (pACAP), the measured level of realized absorptive capacity (reACAP), the number of initiated innovation processes (PokIPr), and the firm's business performance (PosUsp). All variables are summarized in Table 1.

Table 1. Correlation matrix analysis variables

Control variables	Revenues in the last 5 year	Profit in the last 5 year	% of export	Number of patents	Firm's size
Operative – working variables	rACAP	pACAP	reACAP	PokIPr	PosUsp

The first step in conducting the correlation matrix analysis involves a descriptive statistical analysis of the identified five control variables and five operational (working) variables. Table 2. presents the basic statistics for all 108 responses, indicating that there are no significant anomalies or limitations within the results. Consequently, the selected variables are deemed relevant and suitable for interpretation.

Table 2. Correlation matrix descriptive statistic analysis

	Revenues in last 5 years	*Profit in last 5 years*	*% share of exports*	*Nr. of patents, owned or in procedure*	*Firm' size*	*rACAP*	*pACAP*	*reACAP*	*PokIPr*	*PosUsp*
Mean	4,824	4,380	2,806	1,222	2,000	6,113	6,143	5,742	2,370	4,676
Standard Error	0,145	0,147	0,151	0,053	0,083	0,105	0,111	0,169	0,119	0,130
Median	5	5	2,5	1	2	6,241	6,133	6,208	2	5
Mode	5	5	1	1	2	5,704	5,933	0	2	5
Standard Deviation	1,509	1,527	1,573	0,553	0,865	1,091	1,154	1,755	1,235	1,351
Sample Variance	2,277	2,331	2,476	0,305	0,748	1,191	1,332	3,081	1,525	1,824
Kurtosis	1,589	0,137	-1,364	2,620	-0,398	1,760	1,558	4,246	-0,451	0,458
Skewness	-1,108	-0,650	0,211	1,413	0,353	-0,993	-0,895	-2,005	-0,500	-0,640
Range	7	7	5	3	4	6	6,4	8	4	6
Minimum	0	0	0	0	0	1,889	1,6	0	0	1
Maximum	7	7	5	3	4	7,889	8	8	4	7
Sum	521	473	303	132	216	660,24	663,45	620,19	256	505
Count	108	108	108	108	108	108	108	108	108	108

The correlation matrix method was applied to each of the ten selected variables, encompassing both control and operational (working) variables. The data presented in Table 3. indicate predominantly positive correlations among the selected variables, with varying degrees of strength. The only exception to this trend is the correlation between realized absorptive capacity (reACAP) and firm size, which is slightly negative.

As anticipated, the strongest correlations were found between the composite variable representing firms' business performance (PosUsp) and its individual performance indicators, such as revenues and profitability, with correlation coefficients of 0.855 and 0.856, respectively. This reinforces the validity of the PosUsp quantification widely utilized in regression analyses. Notably, a particularly strong correlation was observed between the overall level of absorptive capacity (rACAP) and the level of potential absorptive capacity (pACAP), with an impressive correlation value of 0.968.

Table 3. Correlation matrix results

	Revenues in last 5 years	*Profit in last 5 years*	*% share of exports*	*Nr. of patents, owned or in procedure*	*Firm' size*	*rACAP*	*pACAP*	*reACAP*	*PokIPr*	*PosUsp*
Revenues in last 5 years	1									
Profit in last 5 years	0,6377	1								
% share of exports	0,2452	0,315	1							
Nr. of patents, owned or in procedure	0,193	0,2979	0,2867	1						
Firm' size	0,0788	0,0425	0,1236	0,313	1					
rACAP	0,0924	0,0534	0,1747	0,2749	0,0678	1				
pACAP	0,0737	0,0319	0,1669	0,2459	0,094	0,9676	1			
reACAP	0,0074	0,0032	0,2055	0,2548	-0,034	0,5495	0,4884	1		
PokIPr	0,0654	0,1626	0,2154	0,3439	0,105	0,2938	0,2929	0,5417	1	
PosUsp	0,8545	0,8557	0,2713	0,2101	0,1	0,1227	0,1123	0,0296	0,1371	1

4.2 Descriptive Statistics

A combination of statistical methods was employed for the purpose of hypothesis testing. Table 4. presents an integrated methodological approach, detailing the regression analyses applied and defining the relevant variables.

Table 4. Applied methodology and variables description

Hip.	Description	Method	Indep. variable	Dependent variable
H1	Higher level of absorptive capacity positively influences triggering of innovation processes	Simple linear regression Mediation analysis	level of ACAP-a ***rACAP***	Number of processes initiated **PokIPr**
H1.1	Higher level of absorptive capacity positively influences new product/services market launch	Simple linear regression	level of ACAP-a ***rACAP***	Number of launched products/services independent of commercialisation success **LanPrU**
H1.2	Higher level of absorptive capacity positively influences successful commercialisation of launched product/services	Simple linear regression	level of ACAP-a ***rACAP***	Successfully commercialised product/service **UsPlas**
H1.3	Firms with higher level of potential absorptive capacity are more successful in repeating innovation processes *(prior investments in innovating as path dependence*).	Simple linear regression	level of PACAP-a, ***pPACAP***	Frequency of innovation processes repetition **PonIPr**
H2	Higher level of absorptive capacity positively influences firm performances.	Simple linear regression Mediation analysis	level of ACAP-a, rACAP	Firm's performances PosUsp
H3	Higher frequency of initiated innovation processes positively influences firm performances.	Simple linear regression Mediation analysis	Number of processes triggered/initiated PokIPr	Firm's performances PosUsp

A summary of the regression analyses test results is presented in Table 5, where besides the regression formula, the ρ, r2 and p values are presented for each applied regression. A hypothesis testing result is given as well.

Table 5. Regression analyses test results

Hip.	Regression formula	ρ	r^2	p	test result
H1	PokIPr = 0,3624 rACAP + 0,3105	0,341	0,116	0,000	confirmed
H1.1	LanPrU = 0,5054 rACAP + 0,2811	0,270	0,073	0,006	confirmed
H1.2	UsPlas = 0,2635 rACAP + 0,2616	0,238	0,056	0,014	confirmed
H1.3	PonInP = 0,7279 pACAP + 1,4177	0,503	0,253	0,000	confirmed
H2	PosUsp = 0,2002 rACAP + 3,6429	0,201	0,040	0,053	partially confirmed
H3	PosUsp = 0,4114 PokrIPr + 3,3811	0,308	0,095	0,001	confirmed

As illustrated in Table 5, all tested hypotheses yielded positive outcomes and were confirmed. However, certain cases merit further discussion. For example, according to the Chaddock scale (Chaddock, 1925), none of the regression analyses produced a strong or very strong Pearson correlation coefficient. Rather, the coefficients were categorized as moderately strong or weak, yet they remained statistically relevant and suitable for the objectives of this study. Furthermore, in the evaluation of hypothesis H2, a borderline p-value of 0.053 was noted. Although this value is close to the threshold of 0.05, it is considered acceptable and sufficiently significant for inclusion in the analysis.

4.3 Mediation analysis

The conducted mediation analysis involved three interacting variables, with the number of ongoing innovation processes in the enterprise (PokIPr) tested as the mediator variable. Its mediation effect was examined to assess its influence on the correlation between the level of absorptive capacity (rACAP) and the business performance of the enterprise (PosUsp). The summarized results of the mediation analysis, which integrated a simple linear regression (testing relationships a, b, and c as depicted in Figure 3) along with a multiple linear regression of PosUsp against both rACAP and PokIPr, are presented in Table 6.

Table 6. Mediation analysis results

step	non-standardised regression coefficient – β	standard deviation - σ	statistical significance - p
c	0,230	0,117	0,053
a	0,362	0,099	0,000
b	0,412	0,126	0,001
c'	0,034	0,143	0,814

Looking at the values of the non-standardised regression coefficient of the relationship c/c' in Table 6 one can notice its significant reduction from $\beta c = 0.230$ to $\beta c=0.034$. By using a mediation rule where partial mediation occurs when the condition $0<c'<c$ is satisfied, we can interpret our results as by stating that there exists a significant partial mediation of the mediator PokIPr in the correlation between rACAP and PosUsp. To confirm the determined significant partial mediation statistically, a Sobel test was performed where Sobel's calculation value of p(2)=0.103 confirms the established role of PokIPr as a mediating variable.

5. Analyses, discussion and impact

5.1 Correlation Matrix Analysis Results

The analysis reveals a relatively strong correlation between realized absorptive

capacity (reACAP) and the number of initiated innovation processes, with a coefficient of 0.542. This finding indicates that firms are effectively able to activate innovative ideas leveraging their own capacities. Furthermore, the number of initiated innovation processes exhibits a moderately strong correlation with both overall ACAP and potential absorptive capacity (PACAP) levels. In relation to our research objectives, this analysis indicates that the level of ACAP within firms has a relatively weak correlation with their financial performance, as represented by the PosUsp variable, yielding a coefficient of 0.123.

5.2 Regression Analysis

In the regression analysis conducted to test hypotheses H1, H1.1, and H1.2, the correlation between the dependent and independent variables revealed somewhat weaker but positive relationships. The testing of H1 indicated that a higher level of absorptive capacity (ACAP) positively impacts the number of initiated innovation processes within firms. Similarly, the results from testing H1.1 demonstrated that a greater level of ACAP positively influences the number of launched products and services, irrespective of their commercialization status. In testing H1.2, a slightly lower positive correlation between realized absorptive capacity (rACAP) and the variable for successfully launched products and services (UsPlas) was identified; however, this correlation coefficient remained statistically significant. Consequently, we established that a higher level of ACAP positively affects the number of successfully launched products and services. Furthermore, in testing H1.3, we found that a higher level of potential absorptive capacity (PACAP) positively influences the number of repeated innovation processes, indicating that a developed PACAP fosters the successful recurrence of the innovation process.

In testing H2, a relatively weak positive correlation between the independent variables (rACAP) and the dependent variable (PosUsp) was observed, with a marginally significant correlation coefficient. This suggests that while a higher level of ACAP does positively influence firm performance, the effect is currently minimal. For these firms, this indicates that possessing greater levels of ACAP is important; however, its impact on business success remains low at this time. Nevertheless, it is anticipated that the innovative capacities of enterprises may become more developed in the near future, leading to increased financial benefits.

Finally, testing H3 revealed that a higher number of innovation processes positively affects firm performance. Given the weak correlation established, this suggests that while the implementation of innovative processes is important, it does not significantly impact business success at present.

5.3 Mediation Analysis

Through the mediation analysis, a notably significant mediating role of the variable PokIPr was identified in the relationship between realized absorptive capacity (rACAP) and business performance (PosUsp). This finding indicates that initiated innovation processes serve as a crucial mediating variable, exerting a significant positive impact on the relationship between ACAP and business performance within firms.

5.4 Contribution and implementation for practitioners

The attractiveness, applicability, and significance of the proposed topic have been validated by both the firms involved and their national institutional framework, including organizations, associations, and other stakeholders in the innovation ecosystem. The examination of innovation capacities, particularly through the lens of absorptive

capacity (ACAP), reveals substantial opportunities for practical implementation.

This potential is evident in the prospect of improving the current situation for both firms and their institutional environments. From an academic standpoint, there is a significant opportunity for focused research on ACAP, whether through extensions of existing studies or new evaluations of enhanced and newly developed business innovation models. The findings of this study are pertinent for a broader audience and can contribute valuable insights to existing national innovation strategies and smart specialization frameworks (MINGO, 2014; MINGO, 2016). Thus, these results could be instrumental in guiding future updates to action plans aimed at practical and structural improvements that would enhance the innovative performance of firms in Croatia.

This approach necessitates the active involvement of stakeholder organizations and relevant experts, as well as participation from the firms themselves. In response to inquiries about enhancing ACAP through the acquisition of external knowledge, nearly two dozen respondents expressed a strong interest in immediately obtaining information to upgrade their technological innovations and initiate new innovation processes.

Furthermore, several representatives from the institutional framework indicated a desire for researchers to present their study results at upcoming events aimed at both small and medium-sized enterprises (SMEs) and larger companies. There was also additional interest from institutional representatives to disseminate the findings to a selected group of firms, focusing on clusters and other professional organizations. This points to a notable demand for collaboration and knowledge exchange as essential drivers of innovation in the region.

5.5 Limitations and future research

As an increasing number of researchers turn to survey questionnaires as an assessment tool, potential respondents have shown reluctance to participate, often finding these inquiries burdensome. The data collection process for this study proved to be operationally complex, particularly in achieving the desired sampling figures. Ultimately, a total of 108 fully completed questionnaires were returned, which can be regarded as a satisfactory outcome, albeit one that required three rounds of persuasion from representatives of the firms.

Moreover, despite our efforts to construct questions that are accessible to a broad audience, it is important to acknowledge that respondents possess diverse skills, hierarchical positions, and varying cognitive profiles. Consequently, we recognize that different cohorts of respondents may have interpreted several questions in distinct ways. Nevertheless, all responses were treated and evaluated with equal consideration.

5.6 Future research

As previously noted, this study marks the inaugural operationalization of absorptive capacity (ACAP) through a scientific, empirical investigation involving national firms. This foundational work opens avenues for future cross-national research, particularly in neighboring countries such as Slovenia, Serbia, and Macedonia, as well as among both EU and non-EU nations. It is advisable to extend this research to encompass additional disciplines through an interdisciplinary approach, incorporating fields such as strategy, human resource management, knowledge management, and project management. Such an expansion would enrich the understanding of ACAP and its applicability across various contexts.

Further research through modified sample. To facilitate either broader or more narrowly focused research on absorptive capacity (ACAP), it is essential to appropriately modify the survey sample. For instance, the population samples could be selected from a diverse range of industries or specifically

from those sectors that are more inclined towards innovation. This approach would enhance the validity of the findings and ensure a comprehensive understanding of ACAP across different contexts.

Trans-regional and transnational comparative studies. Future research endeavors could be directed towards a comparative analysis of transnational and trans-regional dimensions of innovation. This focus would facilitate a deeper understanding of the drivers that underperforming nations, such as Croatia, must leverage to enhance their innovation capabilities (Lyu et al., 2022). Furthermore, it is imperative to investigate the role of research and development (R&D) centers and the linkages between universities and businesses in the process of building and strengthening absorptive capacity. Such investigations are essential for developing effective strategies to foster innovation and improve performance in these contexts.

6. Conclusions

The findings of this research demonstrate that the results obtained from testing the hypotheses fell largely within anticipated boundaries, although some unexpected outcomes emerged. To ensure the relevance and significance of firm selection, this study meticulously identified and examined firms with a proven capacity for innovation.

The research revealed that firms in the national ecosystem face numerous challenges in executing their innovation processes. A particularly significant issue is their limited ability to identify new knowledge that could catalyze the activation of these processes. This shortcoming may be attributed to the social and cultural dynamics present in the national business environment. Through hypothesis testing, this study confirmed the existence of relationships between absorptive capacity (ACAP) and various innovation-related processes within the firms, although these connections exhibited varying levels of correlation and significance.

Notably, a positive correlation was established between the identified level of ACAP and the business performance outputs of the observed firms. While this relationship was relatively weak, it was nonetheless present. The business performance outputs considered included the number of commercial launches of innovative products, overall financial performance, and the number of initiated innovation processes.

From these results, it can be concluded that ACAP is more strongly correlated with innovation performance in firms than with general business performance or financial results. The study found that a higher level of ACAP, across all its components, positively influences both the initiation of innovation processes and the number of successful market launches of innovative products and services.

In summary, empirical evidence supports a robust and enduring connection between ACAP and the implementation of innovation processes. This relationship arises from the fact that all components of ACAP are typically engaged during the implementation phase, serving as essential tools for achieving innovation objectives. Thus, nurturing and enhancing absorptive capacity in firms is crucial for fostering innovation and improving overall performance in the dynamic landscape of business.

References

Artz, K. W., Norman, P. M., Hatfield, D. E., & Cardinal, L. B. (2010). A longitudinal study of the impact of R&D, patents, and product innovation on firm performance. *Journal of Product Innovation Management, 27*(5), 725-740.

Bahli, B. (2012, January). Enabling innovation in information technology outsourcing: An empirical study. In ACIS 2012: Location, location, location: *Proceedings of the 23rd Australasian Conference on Information Systems 2012* (pp. 1-8). ACIS.

Bahli, B., Wettenberg, C., Borgman, H. P., & Heier, H. (2013, January). The role of absorptive capacity in information technology outsourcing and innovation performance: a moderated mediation analysis. *In System Sciences (HICSS), 2013 46th Hawaii International Conference* on (pp. 4635-4644). IEEE.

Bayraktar, C. A., Hancerliogullari, G., Cetinguc, B., & Calisir, F. (2017). Competitive strategies, innovation, and firm performance: an empirical study in a developing economy environment. *Technology Analysis & Strategic Management*, *29*(1), 38-52.

Chaddock, R. E. (1925). Principles and methods of statistics. *Houghton Mifflin Company*.

Chatterjee, S., Chaudhuri, R., & Vrontis, D. (2022). Knowledge sharing in international markets for product and process innovation: moderating role of firm's absorptive capacity. *International Marketing Review*, *39*(3), 706-733.

Chauvet, V., & Guiot-BP, C. (2003). Absorptive capacity and knowledge transfer Propensity: towards the obtaining of a competitive advantage. *IAE Aix-en-Provence, Clos Guiot-BP*, *33*, 13540.

Cohen, W. M., & Levinthal, D. A. (1989). Innovation and learning: the two faces of R & D. *The economic journal*, *99*(397), 569-596.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 128-152.

Crépon, B., Duguet, E., & Mairessec, J. (1998). Research, Innovation and Productivi [Ty: An Econometric Analysis at the Firm Level. *Economics of Innovation and new Technology*, *7*(2), 115-158.

De Araújo, A.L.L. (2010). *Looking within and searching beyond: Towards a dynamic model of absorptive capacity*, DRUID-DIME Winter Conference, January 21–23, Aalborg.

Duan, Y., Huang, L., Luo, X., Cheng, T. C. E., & Liu, H. (2021). The moderating effect of absorptive capacity on the technology search and innovation quality relationship in high-tech manufacturing firms. *Journal of Engineering and Technology Management*, *62*, 101656.

Fan, Q., Abbas, J., Zhong, Y., Pawar, P. S., Adam, N. A., & Alarif, G. B. (2023). Role of organizational and environmental factors in firm green innovation and sustainable development: Moderating role of knowledge absorptive capacity. *Journal of Cleaner Production*, *411*, 137262.

Fritsch, M., & Kublina, S. (2017). Related variety, unrelated variety and regional growth: the role of absorptive capacity and entrepreneurship. Regional Studies, 1-12. https://doi.org/10.1080/00343404.2017.1388914

Forés, B., & Camisón, C. (2016). Does incremental and radical innovation performance depend on different types of knowledge accumulation capabilities and organizational size?. *Journal of Business Research, 69*(2), 831-848.

García-Sánchez, E., García-Morales, V. J., & Martín-Rojas, R. (2017). Analysis of the influence of the environment, stakeholder integration capability, absorptive capacity, and technological skills on organizational performance through corporate entrepreneurship. *International Entrepreneurship and Management Journal*, 1-33.

Gerdoçi, B., Busho, N., Lena, D., & Cucculelli, M. (2023). Disentangling the relationship between business model, absorptive capacity, differentiation strategy and performance. Evidence from a transition economy. *European Journal of Innovation Management, 26*(7), 385-414.

Harrison, R., Jaumandreu, J., Mairesse, J., & Peters, B. (2008). Does innovation stimulate employment? A firm-level analysis using comparable micro-data from four European countries (No. w14216). *National Bureau of Economic Research.*

Kalay, F., & Lynn, G. (2015). The Impact of Strategic Innovation Management Practices on Firm Innovation Performance. *Research Journal of Business and Management, 2*(3), 412-429.

Kemp, R.G., Folkeringa, M., De Jong, J.P. and Wubben, E.F., (2003). *Innovation and firm performance.* Zoetermeer, the Netherlands: EIM.

Kostopoulos, K., Papalexandris, A., Papachroni, M., & Ioannou, G. (2011). Absorptive capacity, innovation, and financial performance. *Journal of Business Research*, *64*(12), 1335-1343.

Lachenmaier, S., & Rottmann, H. (2011). Effects of innovation on employment: A dynamic panel analysis. *International Journal of Industrial Organization*, *29*(2), 210-220.

Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. *Academy of Management Review*, 31(4), 833-863.

Lazarević, J., Pitić, G., & Vlačić, E. (2024). From linear to circular: creating and delivering sustainable value. *Cyclic Economy Policies in Major Countries and the EU*, 1-20.

Leal-Rodríguez, A. L., Ariza-Montes, J. A., Roldán, J. L., & Leal-Millán, A. G. (2014a). Absorptive capacity, innovation and cultural barriers: A conditional mediation model. *Journal of Business Research*, *67*(5), 763-768.

Leal-Rodríguez, A. L., Roldán, J. L., Ariza-Montes, J. A., & Leal-Millán, A., (2014b). From potential absorptive capacity to innovation outcomes in project teams: The conditional mediating role of the realized absorptive capacity in a relational learning context. *International Journal of Project Management*, 32(6), pp.894-907.

Liao, S. H., Wu, C. C., Hu, D. C., & Tsuei, G. A. (2009). Knowledge acquisition, absorptive capacity, and innovation capability: an empirical study of Taiwan's knowledge-intensive industries. *Technology, 11*, 160-167.

Lichtenthaler, U., & Lichtenthaler, E. (2009). A capability-based framework for open innovation: Complementing absorptive capacity. *Journal of management studies*, *46*(8), 1315-1338.

Lin, H. F., Su, J. Q., & Higgins, A. (2016). How dynamic capabilities affect adoption of management innovations. *Journal of Business Research*, *69*(2), 862-876.

Lyu, C., Peng, C., Yang, H., Li, H., & Gu, X. (2022). Social capital and innovation performance of digital firms: Serial mediation effect of cross-border knowledge search and absorptive capacity. *Journal of Innovation & Knowledge*, *7*(2), 100187.

Millikan, M. F. & Rostow, W. W. (1957). A Proposal: Key to an Effective Foreign Policy, New York: Harper.

MINGO, Ministarstvo gospodarstva, podruzeništva i obrta (2014). Strategija Poticanja Inovacija Republike Hrvatske 2014. – 2020. *Narodne Novine Repubublike Hrvatske, 153*(74).

MINGO, Ministarstvo gospodarstva, podruzeništva i obrta (2016). Strategija pametne specijalizacije Republike Hrvatske za razdoblje 2016.-2020. *Narodne Novine Republike Hrvatske, 2*(2).

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of management review*, *23*(2), 242-266.

Patel, P. C., & Fiet, J. O. (2008). Un-Locking Path Dependence To Build On An Innovative Firm's Absorptive Capacity, *Frontiers of Entrepreneurship Research,28*(13). Retrieved from http://digitalknowledge.babson.edu/fer/vol28/iss13/2

Rakthin, S. (2013). *Contextual Differentiation of Absorptive Capacity: Empirical and Conceptual Development*. Michigan State University. Business Administration.

M. Rodriguez, C., A. Wise, J., & Ruy Martinez, C. (2013). Strategic capabilities in exporting: an examination of the performance of Mexican firms. *Management Decision*, *51*(8), 1643-1663.

Rostow, W. W. (1956). The take-off into self-sustained growth. *The Economic Journal*, *66*(261), 25-48.

Rostow, W. W. (1963). *The Economics of Take-Off Into Sustained Growth.* New York: St. Martin's Press.

Rush, H., Bessant, J., & Hobday, M. (2007). Assessing the technological capabilities of firms: developing a policy tool. *R&D Management*, *37*(3), 221-236.

Schilling, M. A. (1998). Technological lockout: An integrative model of the economic and strategic factors driving technology success and failure. *Academy of Management Review*, *23*(2), 267-284.

Spender, J. C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic management journal*, *17*(S2), 45-62.

Tang, J., & Murphy, P. J. (2012). Prior knowledge and new product and service introductions by entrepreneurial firms: The mediating role of technological innovation. *Journal of Small Business Management*, *50*(1), 41-62.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, *18*(7), 509-533.

Tzokas, N., Kim, Y. A., Akbar, H., & Al-Dajani, H. (2015). Absorptive capacity and performance: The role of customer relationship and technological capabilities in high-tech SMEs. *Industrial Marketing Management, 47*, 134-142.

Van Den Bosch, F. A., Van Wijk, R., & Volberda, H. W. (2003). Absorptive capacity: antecedents, models and outcomes. *ERIM Report Series Research in Management*, (ERS-2003-035-STR).

Van Den Bosch, F. A., Volberda, H. W., & De Boer, M. (1999). Coevolution of firm absorptive capacity and knowledge environment: Organizational forms and combinative capabilities. *Organization science, 10*(5), 551-568.

Weidner, N., Som, O., & Horvat, D. (2023). An integrated conceptual framework for analysing heterogeneous configurations of absorptive capacity in manufacturing firms with the DUI innovation mode. *Technovation, 121*, 102635.

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of management review*, *27*(2), 185-203.

Ernest Vlačić
FEFA Faculty, Metropolitan University Belgrade, Serbia
Faculty Of Economics And Business, University of Rijeka, Croatia
evlacic@fefa.edu.rs
ORCID 0000-0002-1459-8280