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# The Impact of Innovation Capital on Raising the Competitiveness of Enterprises:

## "A Study of Selected Electronic Industry Companies in Algeria"

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### **Abstract:**

The study indicates a substantial effect on sustainable competitive advantage, with the model explaining 74 percent of its variance. Moreover, all three dimensions of innovation capital product innovation, service innovation, and innovation ability, were found to support competitive advantage.

The study recommended introducing improvements and modifications to products in accordance with environmental changes and consumer preferences. It also highlighted the need to encourage innovation by protecting intellectual property rights and providing incentives and special support for outstanding individuals. In the field of services, the study advised adopting new marketing strategies, such as targeting international exhibitions and using the Internet, among other methods.

**Keywords:** intellectual capital, innovation capital, sustainable competitive advantage, electronic industry, innovation ability.

**Jel Classification Codes:** O34, O3, O33.

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## 1. Introduction

In the past, intellectual capital was viewed merely as intangible assets. However, with the emergence of the information age, where information became a primary source for creating added value, researchers' attention to intellectual capital increased, recognizing it as a significant variable explaining the growing difference between companies' book and market values.

With increasing globalization and rapid technological change, innovation capital emerges as a cornerstone for sustainable competitive advantage and value creation in companies. Researchers emphasize the need for firms to leverage their intangible assets and competencies in innovative ways to face competition and achieve profitability .

A company's innovation capability is key to achieving growth and outperforming competitors, while low innovation capital increases risks and threatens market leadership.

Accordingly, this study aims to investigate the impact of innovative capital on enhancing the competitiveness of electronic industry institutions in Algeria to achieve a sustainable competitive advantage.

### 1.1 Problematic study

Amid the growth of global markets and increasing competition, electronics companies must leverage intellectual assets to ensure survival and expand their market share. Therefore, innovation capital is a key factor in achieving profitability and enhancing long-term performance, raising the central question: Does innovation influence the attainment of competitive advantage of electronic industry institutions in Algeria?

### 1.2 Secondary Questions

Under this main question, a set of sub-questions is posed as follows:

- ✓ What is the level of interest of Condor and ENIM, Algerian electronics industry companies, in innovation capital?
- ✓ To what extent are the dimensions of innovation capital present within Condor and ENIEM institutions?
- ✓ Does innovation capital have an impact on achieving a sustainable competitive advantage in Condor and ENIEM companies?

### 1.3 Study Hypothesis

Addressing the research questions, a set of hypotheses is proposed as follows:

- ❖ **The Main Hypothesis:** Innovation capital has an impact on achieving sustainable competitive advantage for the electronic industry institutions under study. This hypothesis is subdivided into three sub-hypotheses as follows:
  - ✓ **Secondary Hypothesis 1:** Innovation ability has an impact on achieving the sustainable competitive advantage of the electronic industry institutions under study.
  - ✓ **Secondary Hypothesis 2:** Product innovation influences the attainment of sustainable competitive advantage for electronic industry enterprises.
  - ✓ **Secondary Hypothesis 3:** Service innovation affects the achievement of sustainable competitive advantage for electronic industry enterprises.

#### **1.4 Significance of the Study**

This study highlights the importance of innovation capital in strengthening the sustainable competitive advantage of electronics companies in Algeria, emphasizing the need for firms to leverage their intellectual and innovative resources to survive and excel, while providing theoretical and practical contributions to support innovation and enhance market leadership.

#### **1.5 The Study Objective**

This study aimed to explore the nature of the relationship and impact between innovation capital and competitive advantage in electronic industry institutions in Algeria, through several sub-goals, including:

- ✓ Determining the extent to which these institutions are committed to innovation capital by evaluating their capacity to support innovation, as well their dedication to introducing or developing new products, as well as innovating services aligned with the desires and needs of customers.
- ✓ Assessing the level of competitive advantage held by the organization and comparing it with that of its competitors within the same industry.

#### **1.6 Previous Studies**

Arya Aji Aditya and Andi Rahmat Kaswaar (2022) conducted a study to investigate two relationships: between innovation capital and company value, and the relationship between innovation capital and company risk. The population for this study comprised all companies listed on the Indonesia Stock Exchange from 2016 to 2020. The required research sample was selected using a purposive sampling technique, and data were analyzed using multiple linear regression.

The results showed that innovative capital has a positive and statistically significant impact on a company's value, while its relationship with risk is

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negative and insignificant. Its effect on value is realized only when companies gain a competitive advantage by disclosing research and development costs and investments in their financial statements, whereas its impact on risk varies depending on the uniqueness of each company. (Aditya & Kaswar , 2022, pp. 74-86).

The study by Nurul Nadia Abd Aziza and Sarminah Samad (2016) found that innovation strongly enhances the competitive advantage of Malaysian small and medium-sized food companies, accounting for 73.5% of its variation, highlighting the need for these companies to invest in innovation to maintain a competitive edge. (Abd Aziz & Samad, 2016, pp. 256-266)

his study stands out from previous ones by using specialized indicators from experts like Edvinsson and Bontis to measure innovation capital directly and examining its direct impact on competitive advantage, rather than linking it to performance or value creation. Its uniqueness also lies in its focus on Algeria's electronics industry, where innovation and R&D are central, enhancing the study's validity and reliability.

## 1.7 Study Model

The study model illustrates the relationships between innovation capital and competitive advantage as follows :

Fig N° 1: study model



Source : Prepared by researchers

## 2. Introduction to Innovative Capital

Intellectual capital (IC) is commonly defined as the sum of economically valuable intangible resources that enhance wealth creation and support organizational excellence. Its importance has been widely discussed. Handy (1989) argued that intellectual assets are three to four times a firm's tangible book value. Van Burren (1999) reported that intangible assets account for more than two-thirds of a company's value, while Osborne (1998) estimated that 80 percent of firm value is non-tangible. Consequently, evaluating IC is vital for companies seeking to estimate their value more accurately. (Theriou, Maditinos, & Šević, 2009, p. 2), Researchers differ in identifying the components of intellectual capital (IC) and in the models used to measure it. This divergence reflects the proliferation of intellectual traditions addressing the concept, its inherent complexity, and the multiple definitions found in the specialist

literature. Innovation capital is often highlighted as a prominent component of IC. Its importance has been acknowledged across several frameworks for example, by ASTD and in the work of Chen et al. (2004), Malone (1997), Edvinsson, and Brooking (1996), where it is frequently associated with intellectual property related assets, and by Roos et al. (1997), who refer to related elements as renewal and development capital.

### **2.1 The Concept of Innovative Capital**

In 1997, Edvinsson and Malone used the term innovation capital to describe a firm's capacity to create and commercialize products and services by leveraging intellectual property and other intangible assets. This framing shows how innovation can add value in multiple ways, including both process and product innovation (Aditya & Kaswar , 2022, p. 75).

According to Tseng and Goo (2005), innovation capital encompasses a company's ability to develop new offerings and generate novel ideas that sustain competitive advantage. It includes the introduction of new technological products or services, new processes, and significant technological improvements. (Theriou, Maditinos, & Šević, 2009, pp. 5-6). For some researchers, innovation capital refers to a firm's capacity to produce new knowledge and to develop creative products and ideas (Yahya, Arshad, Kamaluddin, & Abdul Rahman, 2019, p. 465). Others define it as an intangible form of capital that equips individuals with resources to commercialize new ideas and serves as a critical driver of commercial success. It is also described as a combination of human and social capital ( Audretsch & Link, 2018, p. 1761)n another view, it is the total stock of organizational innovation covering new product development, patents, trademarks, and copyrights ( Chen, 2008, p. 274).

Some scholars position innovation capital within the broader dimensions of intellectual capital, arguing that it arises from the combined effects of human and structural capital. In this view, innovation is achieved by integrating high-caliber employees, effective rules and processes, organizational culture, and technology; moreover, innovation capital can stimulate the growth of relational capital (Chen, Zhu, & Xie, 2004, p. 202). Other authors describe innovation capital as unfolding in two stages: first, decisions and activities related to research and development (R&D) and the marketing of an invention; second, the creation of a new product or significant improvements to products, services, and other organizational processes (Hassan, Kamaluddin, Saad, & Samad, 2021, p. 87).

Accordingly, innovation capital encompasses an organization's capacity to conduct research and development and register patents in order to deliver new

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products and services or implement improvements and modifications that align with customer needs and preferences. Many scholars view innovation capital as the most important component of intellectual capital, and its significance in modern economies can be summarized as follows:

\_The magnitude of innovation capital can indicate the quality of a company's investment projects and, by extension, its ability to generate future cash flows (Chin, Lee, Kleinman, & Chen, 2006, p. 88).

\_Through technological innovation, a company can reduce production costs and, at the same time, increase revenue by offering diversified, innovative products (Chen, Zhu, & Xie, 2004, p. 208).

\_Innovation capital enables an organization to withstand fierce competition by continually developing new products to meet customer demand, especially as product life cycles grow ever shorter (Chen, Zhu, & Xie, 2004, p. 202).

\_The importance of innovation capital lies in creating added value, securing competitive advantage, strengthening market position, and shaping demand (Aditya & Kaswar, 2022, p. 74).

\_Sougiannis (1994) reported that a \$1 increase in R&D expenditure is associated with a \$2 increase in profits and a \$5 increase in market value over the subsequent seven years. Likewise, Lev and Sougiannis (1996) found that increasing R&D spending by \$1 is associated with future operating income of US \$2,328 (Wang & Chang, 2005, p. 224).

### **2.2 Measurement of Innovative Capital**

Interest in evaluating innovation capital has intensified over the past decade as managers have recognized that, in turbulent economic environments, the sheer volume of resources available to an organization is not the decisive driver of results. There is an urgent need to assess innovation capital for internal decision-making and to communicate with external stakeholders who seek forward-looking information about organizational performance. Consequently, identifying and reporting innovation capital will be a key differentiator in competitive performance.

According to Kijek (2012), a three-stage procedure can be used to determine the value of innovation capital. First, estimate overall intellectual capital, with particular emphasis on the value added created by the company. Second, isolate the value of innovation capital within total intellectual capital. Third, evaluate the efficiency of innovation capital. The resulting efficiency coefficient indicates how effectively the organization uses its existing innovation capital and can serve as a proxy for the quality of innovation-capital assets. From the perspective of Ehie and Olibe (2010) and Kim et al. (2018),

innovation capital in the second stage is often operationalized as expenditure scaled by total assets ( Aditya & Kaswar, 2022, p. 75).

To facilitate measurement, many researchers divide innovation capital into three components (Chen, Zhu, & Xie, 2004, pp. 205-206):

**Innovation achievements:** These are Outputs such as new products and services, as evidenced by patents and technologies generated through technological innovation. Indicative metrics include the average number of patents per employee, the number of new technologies developed in the past three years, and the number of services introduced over the past three years.

**Innovation mechanisms:** To innovate effectively, an organization needs a robust innovation system that encompasses investment, operations, collaboration, and incentives. Effective innovation typically requires adequate investment in human and material resources, clear, firm-level strategic policies, close cooperation between R&D, marketing, and manufacturing, appropriate R&D spending relative to sales, sufficient quantity and quality of R&D personnel, and well-designed incentives that reward innovative employees.

**Innovation culture:** This is the foundation of a sound innovation system. Organizations renowned for innovation, such as 3M and Intel, exhibit strong innovation cultures. Such a culture enables the company to adjust its strategy, structure, and workforce in response to challenges that arise during the innovation process, helping it maintain a leading position in innovation management. Indicative metrics include cultural support for innovation, encouragement of employee creativity, and strong managerial backing for innovation. In measuring innovation capital, this study used a questionnaire with 16 items, organized into three dimensions following the American Society for Training and Development (ASTD): innovation achievements (covering product and service innovation), innovation mechanisms, and innovation culture.

### **3. Competitive Advantage**

Although strategic management research has identified many sources of competitive advantage, there is no single, unified definition. Scholars differ on what constitutes competitive advantage, though several formulations are widely accepted.

In 1985, Porter popularized the term “competitive advantage,” defining it as the strategic edge a firm holds over rivals within its industry. Others describe it as a capability derived from distinctive attributes and resources that enables a firm to outperform peers in the same industry or market (Braslina, Viksne, Cumakovs, & Batraga, 2014, p. 35). In the same vein, Wickramasinghe and Alawattage discuss a firm’s ability to outperform competitors and thereby secure

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a strategic position, which can result from applying strategic cost management techniques ( Adigbole, Abogun, Adegbola, & all, 2022, p. 143). Another view narrows the concept to what makes an entity's goods or services superior to other options available to customers (Setyaningrum & Uii, 2022, p. 3). A further perspective frames competitive advantage as a form of organizational efficiency that differentiates the firm by delivering new value to customers in ways that rivals do not, thereby achieving market superiority (mogbolu, 2022, p. 67), In practice, a firm is considered to have a competitive advantage when it can deliver comparable benefits at lower cost (cost advantage) or provide higher perceived value through superior products and services (differentiation advantage); in the latter case, differentiation is something customers value more than a low price.

From this body of research, two broad perspectives on competitive advantage emerge. One treats competitive advantage as superior business performance; the other anchors it in firm-specific resources and capabilities.

The first widely recognized perspective is the resource-based view of the firm (RBV), which holds that companies are fundamentally unique and that their distinctive bundles of resources enable increasing profitability over time. In this view, competitive advantage stems from firm-specific resources rather than industry structure or product-market characteristics. When a company possesses resources that are more unique or scarce than those of rivals, it gains an advantage. Such resources can include human resources, information, tangible and intangible assets, brands, and more. Their distinctiveness raises barriers to imitation, making it difficult for competitors to replicate the firm's superior resources.

The second research direction focuses on the company's capabilities, often referred to as the capability- or competence-based view (CBV). Within this stream, the concept of core competencies is central. Core competencies are typically identified on the basis of three criteria: they enable participation in multiple markets; they make a significant contribution to customers' perceptions of product benefits; and they are difficult for competitors to imitate. A firm's ability to integrate, build, and reconfigure internal and external capabilities to address rapidly changing environments is referred to as dynamic capabilities. Dynamic capabilities are a source of competitive advantage, emphasizing two aspects: the changing nature of the environment and the critical role of strategic management in adapting, integrating, and reconfiguring organizational skills, resources, and capabilities in response to that change (tuan, trang, & quan, 2022, pp. 49-50).

Competitive advantage enables a firm to deliver products and services that meet customer needs and preferences. This is reflected in financial performance through increased market share and higher annual sales, and it supports the stability and sustainability of operations over a defined period, some sources specify up to five years. In this study, CA is operationalized along four dimensions: cost reduction, delivery speed, flexibility to adapt to environmental changes, and quality. This approach aligns with several prior studies that use these factors to assess competitive advantage.

#### **4. The Relationship of Innovation Capital to Competitive Advantage**

Innovation capital is one of the primary drivers of organizational excellence. It opens multiple pathways to competitive advantage, such as price advantages (cost efficiency), higher quality, and rapid customer responsiveness, and it enables firms to create new market opportunities by developing new goods and services. When effectively implemented, innovation capital helps the firm reach its goals and sustain a distinctive position in the competitive arena. To maintain a competitive advantage, theoretical and empirical work shows that technology plays a pivotal role in generating new products and processes, reshaping the rules of competition by altering the foundations of industry structure through research and development. Firms that craft innovation-focused strategies can increase market share, leading to organizational excellence (Dereli, 2015, p. 1369). Product innovation is a key means of meeting market demand and can serve as a source of competitive advantage; by enhancing value, innovative products strengthen a company's competitiveness (Kuncoro & Suriani, 2022, p. 187). Other authors argue that by pursuing well-targeted innovations, firms can create products that improve business performance and reinforce their advantage relative to competitors (Farida & Setiawan, 2022, p. 5).

### **5. Research Methodology**

#### **5.1 Research Design**

To achieve the objectives of the study, a descriptive-analytical research approach was adopted, which allows for a precise scientific description of the phenomenon under investigation and the analysis of the variables and their relationships, contributing to the assessment and interpretation of the impact of innovation capital on enhancing competitive capability at the level of the institutions under study.

#### **5.2 Population and Sample of Study**

The study population consisted of managerial staff (cadres) at the Algerian electronics companies ENIEM and CONDOR both active in the electronics

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industry in Algeria. These two institutions were selected based on scientific and precise methodological criteria that align with the objectives of the research, for the following reasons:

**\_Sectoral Representation:** Both belong to a sector characterized by a high level of competitiveness and reliance on technological and knowledge-based innovation as a primary source of competitive advantage, making it an ideal environment to study innovation capital.

**\_Data Accessibility:** The two institutions were chosen due to the availability of access to their managerial staff and the possibility of obtaining accurate and reliable data.

**\_Analytical Value:** Combining the two institutions contributes to enhancing the validity and broader applicability of the results, and allows for a deeper analysis of the mechanisms for utilizing innovation capital to improve the competitive capability of the electronics industry sector in Algeria.

The sample consisted of managerial staff (cadres) at the Algerian electronics companies ENIEM and CONDOR; as they are the main actors in formulating and implementing innovation and competitiveness strategies, in addition to their ability to understand the nature of the study and to provide more accurate and credible responses. The total number of managerial staff (cadres) was 115 at Condor and 60 at ENIEM. A random sample was drawn from the managerial staff of both companies, resulting in 52 participants from Condor and 48 participants from ENIEM.

## 5.3 Research Instrument

A questionnaire was used as the primary tool for data collection, due to its suitability for measuring managerial attitudes and perceptions toward the dimensions of innovation capital and indicators of competitive capability. The questionnaire is structured into two main axes, The first axis was the independent variable, innovation capital, across its three dimensions and comprised 16 items. The second axis was the dependent variable, sustainable competitive advantage, and comprised 12 items rated on a five-point Likert scale as follows:

**Table N°1: Likert Scale Rating System**

Agreement Level	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Score	5	4	3	2	1

**Source:** Hussain Alkharusi(2022), A descriptive Analysis and Interpretation of Data from Likert Scales in Educational and Psychological Research, Indian Journal of Psychology and Education, July, 2022, Vol. 12, No.2, p 13.

After collecting data from the operational frameworks of the two companies under study, the researchers used SPSS version 23 and SmartPLS 4 to process the data and analyze the results.

#### 5.4 Statistical Analysis Methods

The SPSS and SMART PLS software programs were employed to process the data, analyze the results, and conduct statistical tests to examine the main hypothesis and its sub-hypotheses. The arithmetic mean and standard deviation were calculated to determine the general tendency of respondents answers regarding the study variables. Furthermore, the convergent validity and discriminant validity were examined to verify the accuracy and reliability of the research model. The cross-loadings test was applied to assess the extent to which each indicator belongs to its corresponding dimension compared to other dimensions. The Fornell-Larcker criterion was also employed to ensure that no overlap occurred among the study variables. Finally, the structural model was evaluated using the coefficient of determination ( $R^2$ ) to measure the model's explanatory power.

#### 6. Analysis of The repones of The Study Sample

Following data entry and processing in SPSS, the means and standard deviations for the study variables were computed as follows:

**Table N°2: The answers of the study sample about the variable of innovation capital**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Arithmetic Mean	Standard Deviation	Agreement Level
1	2	13	13	59	13	3.68	0.93	High
2	2	13	18	51	16	3.66	0.96	High
3	1	14	15	52	18	3.72	0.95	High
4	3	10	16	52	19	3.74	0.98	High
5	2	15	17	49	17	3.64	1.0	High
6	3	12	18	53	14	3.63	0.97	High
7	2	13	15	56	14	3.67	0.94	High
<b>Innovation Capability</b>						3.67	0.88	High
8	2	13	13	56	16	3.71	0.95	High

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9	0	11	15	54	20	3.83	0.87	High
10	0	11	13	58	18	3.83	0.85	High
11	0	11	14	55	20	3.84	0.87	High
12	0	10	15	57	18	3.8	0.84	High
New Products						3.77	0.82	Very High
13	0	9	17	64	10	3.75	0.75	High
14	0	9	21	51	19	3.80	0.85	High
15	1	9	16	59	15	3.78	0.84	High
16	2	7	19	61	11	3.72	0.82	High
New Services &						3.73	0.66	High
Innovation Capital						3.70	0.77	High

Source : Prepared by researchers based on SPSS output.

The table shows that most respondents report high agreement across all items related to innovation capability (mean = 3.67, SD = 0.88). This suggests that electronics industry organizations are making substantial efforts to support innovation and foster an innovation-oriented culture. Evidence of this includes deploying advanced tools and equipment in the production process; partnering with research and consulting centers while offering extensive scientific and training programs for high-performing employees; protecting intellectual property; and encouraging and supporting creative individuals in particular.

The study also records high agreement on the product innovation dimension (mean = 3.77, SD = 0.82). This reflects sustained efforts to improve and innovate products by redesigning them to align with modern technologies, introducing enhancements and modifications in line with customer aspirations and preferences, and launching new products at short intervals. Compared with other dimensions, organizations appear to place greater emphasis on this area.

Additionally, the table reveals strong agreement among respondents regarding service innovation, with a mean of 3.73 and a standard deviation of 0.77. This demonstrates that the studied electronics industry institutions place considerable emphasis on innovating their marketing and sales services to complement their products. They provide after-sales services, develop modern

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marketing and sales methods including e-marketing, and participate in international exhibitions to promote their products

**Table N°3: Study Sample Responses on Competitive Advantage Variable**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Arithmetic Mean	Standard Deviation	Agreement Level
1	0	12	14	55	19	3.81	0.88	High
2	0	10	13	56	21	3.88	0.85	High
3	1	11	14	51	23	3.84	0.93	High
4	0	16	18	48	18	3.68	0.95	High
5	0	8	18	55	19	3.85	0.82	High
6	0	6	14	62	18	3.92	0.74	High
7	0	8	15	56	21	3.90	0.82	High
8	0	6	12	63	19	3.95	0.74	High
9	0	8	13	66	13	3.84	0.74	High
10	0	6	16	62	16	3.88	0.74	High
11	0	12	20	49	19	3.75	0.90	High
12	0	9	20	56	15	3.77	0.81	High
<b>Sustainable Competitive Advantage</b>						<b>3.79</b>	<b>0.74</b>	<b>High</b>

**Source :** Prepared by researchers based on SPSS output.

From the table, we note that the majority of the study sample agrees to a high degree on the paragraphs of sustainable competitive advantage, with an arithmetic average of 3.79, with a standard deviation of 0.74. This indicates that there is a great interest on the part of the electronic industry institutions to achieve sustainable competitive advantage through a set of procedures and policies, such as working to reduce their production and human costs and the costs of their inputs by taking advantage of economies of scale in the acquisition of their raw materials, and working to recycle the waste of production processes to cover part of their expenses as well, in addition to working to reduce the percentage of defects in the product. The use of less expensive marketing methods, as well as institutions to try to achieve high quality to ensure the sustainability of their competitive advantage and this through the adoption of advanced technologies in the production process and its timing through the allocation of teams to follow up its quality, as well as institutions take the quality of raw materials as a prerequisite in the selection of their suppliers, also among the measures and policies adopted by institutions to achieve a sustainable

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competitive advantage, we mention the work to provide products at the right time and place and in the required quantity and speed to gain customer loyalty and satisfaction, which is the main indicator in evaluating the performance of institutions and market shares, as well as the institution seeks to achieve High response to customer requirements and changing markets.

## 7. Ensure Internal Validity of The Model

This ensures both approximate and differential validity

### 7.1 Convergent Validity:

Convergent validity serves as a key criterion for assessing the correlations among indicators that measure the same construct, thereby evaluating the overall validity and reliability of the model. As shown in the table, the results include values for CA, composite reliability, and average variance extracted (AVE) for all variables.

**Table N°4: Convergent Validity Test Results**

constructs	Items	loading	AVR	CR	Cronbach's alpha
Product innovation	abi1	0.902	0.735	0.911	0.910
	abi2	0.901			
	abi3	0.923			
	abi4	0.871			
	abi5	0.879			
	abi6	0.899			
	abi7	0.903			
	comp1	0.762	0.597	0.940	0.938
	comp10	0.774			
	comp11	0.808			
	comp12	0.790			
	comp2	0.732			
	comp3	0.762			
	comp4	0.761			

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competitive advantage	comp5	0.807			
	comp6	0.721			
	comp7	0.823			
	comp8	0.733			
	comp9	0.790			
Innovation ability	ip1	0.868	0.804	0.961	0.959
	ip2	0.859			
	ip3	0.833			
	ip4	0.880			
	ip5	0.847			
Service innovation	is1	0.754	0.710	0.868	0.862
	is2	0.891			
	is3	0.904			

**Source :** Prepared by researchers based on Smart PLS4 output.

Cronbach's alpha and composite reliability (CR) are used to assess internal consistency reliability. Based on the table, we observe that the Cronbach's alpha coefficients exceed 0.70, which is generally considered statistically acceptable. We also report CR, which is often regarded as more precise than Cronbach's alpha because it explicitly accounts for measurement error; its values likewise exceed 0.70. Accordingly, the measurement indicators demonstrate acceptable internal consistency and reliability.

Convergent validity is assessed using average variance extracted (AVE). From the table, the AVE values for all study variables are above the 0.50 threshold. This provides evidence of convergent validity: the questionnaire items are consistent, and the measurement indicators capture the same underlying construct

## **7.2 Differential Validity:**

The second stage entails evaluating the measurement model before proceeding to the structural model. Establishing discriminant validity demonstrates that each construct is unique and captures phenomena not represented by other constructs in the model. To ensure discriminant validity, cross-loadings should first be examined. In practice, this verification is conducted using two tests.

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❖ **Cross Loadings:** This criterion aims to measure the extent to which the indicator belongs to its building compared to other buildings.

**Table N°5: Cross Loadings Standard Results**

	Product innovation	Service innovation	Innovation ability	competitive advantage
abi1	0.672	0.715	0.902	0.704
abi2	0.663	0.694	0.901	0.690
abi3	0.763	0.734	0.923	0.736
abi4	0.638	0.678	0.871	0.664
abi5	0.671	0.728	0.879	0.680
abi6	0.615	0.706	0.899	0.642
abi7	0.705	0.696	0.903	0.762
comp1	0.594	0.664	0.562	0.762
comp10	0.654	0.578	0.504	0.774
comp11	0.709	0.651	0.621	0.808
comp12	0.637	0.666	0.622	0.790
comp2	0.551	0.609	0.507	0.732
comp3	0.599	0.618	0.645	0.762
comp4	0.591	0.621	0.640	0.761
comp5	0.692	0.744	0.739	0.807

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comp6	0.623	0.631	0.592	0.721
comp7	0.558	0.663	0.632	0.823
comp8	0.546	0.478	0.506	0.733
comp9	0.635	0.571	0.608	0.790
ip1	0.868	0.734	0.639	0.637
ip2	0.859	0.631	0.642	0.664
ip3	0.833	0.640	0.587	0.672
ip4	0.880	0.703	0.637	0.727
ip5	0.847	0.784	0.726	0.722
is1	0.618	0.754	0.542	0.668
is2	0.724	0.891	0.749	0.716
is3	0.733	0.904	0.719	0.736
is4	0.668	0.812	0.638	0.611

**Source :** Prepared by researchers based on the outputs of the smart PLS program.

As shown in the table, each indicator loads most strongly on its intended latent variable, with higher values compared to its loadings on other variables. This pattern confirms that the indicators are distinct, with no substantial overlap across different constructs. Thus, according to this criterion, the measurement instrument partially achieves discriminant validity.

❖ **Fournell-L:** This criterion aims to verify the absence of interference that is, to confirm that the variables are distinct from one another. For the study instrument to demonstrate discriminant validity, each indicator should load as highly as possible on its intended latent variable relative to its loadings on the other variables.

**Table N°6: Fournell-L test results**

	Product innovation	Service innovation	Innovation ability	competitive advantage
Product innovation	0.858			
Service innovation	0.816	0.843		
Innovation ability	0.755	0.789	0.897	
competitive advantage	0.800	0.813	0.779	0.873

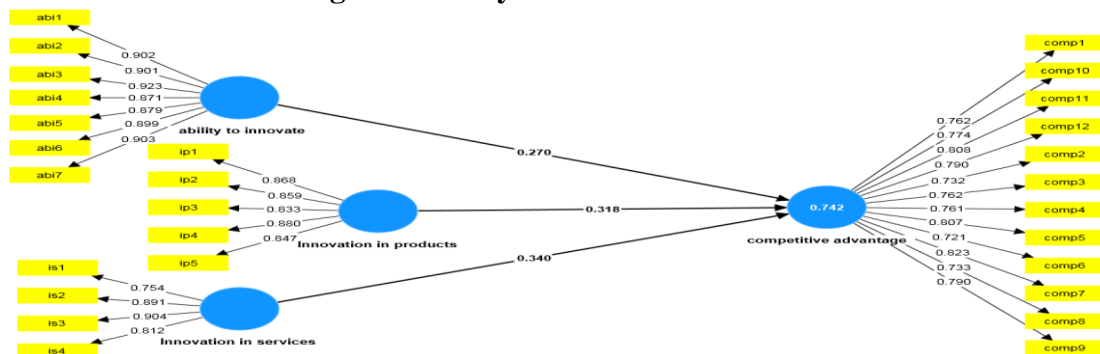
**Source :** Prepared by researchers based on the outputs of the smart PLS program.

As indicated in the table, each construct shows a stronger association with itself (diagonal entry) than with other constructs (off diagonal entries). most

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indicators of discriminant validity reach the accepted cutoffs and are statistically acceptable. In practical terms, each latent variable is represented more by its own indicators than by those of other variables, indicating distinct constructs with no substantive overlap. Given that both convergent validity and discriminant validity are satisfied, the measurement model can be considered sound. The figure below presents the final model after all criteria specified for the software and recommended by specialists were met.

**Fig N° 2: Study form after evaluation**



**Source:** Prepared by researchers based on the outputs of the smart PLS program.

## 7.3 Structural Model Evaluation

Once the measurement model standards have been confirmed, the second stage in PLS-SEM involves assessing the structural model results. In this study, the primary criteria for evaluating the structural model include the path coefficient estimates and the R<sup>2</sup> values. We will accordingly evaluate the structural model through a series of steps, outlined in the following sequence:

**Table N°7: Coefficient of determination R<sup>2</sup> in the study form**

R Square	R-square adjusted
0.742	0.734

**Source:** Prepared by researchers based on the outputs of the smart PLS program

A common criterion for evaluating the structural model is the coefficient of determination (R<sup>2</sup>). This coefficient reflects the proportion of variance in the dependent variable that is explained collectively by the independent variables. In this study, R<sup>2</sup> = 0.74, indicating that 74% of the variation in sustainable competitive advantage is explained by innovation capital (Innovation ability, product innovation, and service innovation). According to the Chin (1998) benchmarks, this represents high explanatory power: values above 0.67 are considered strong, values between 0.33 and 0.67 are moderate, and values around 0.19 are weak; values below 0.19 may be considered insufficient.

The significance of the path coefficients, showing the effects of the innovation capital dimensions on sustainable competitive advantage, is summarized in the following table:

**Table N°8: Significance of the study model path coefficients**

Relationship	Std.Beta	Std. Error	T valur		Decision
H1Innovation ability -> competitive advantage	0.270	0.043	2.022	0.043	Supported*
H2 Product innovation -> competitive advantage	0.318	0.002	3.106	0.002	Supported**
H3 Service innovation -> competitive advantage	0.340	0.004	2.897	0.004	Supported**

**Source:** : Prepared by researchers based smart PLS4 output

In PLS-SEM, you're basically checking how different stuff connects by looking at these things called path coefficients and their t-values. As shown in the table, all path coefficients in the structural model are statistically significant ( $p < 0.05$ ). These findings indicate that firms' innovation capability, product innovation, and service innovation each contribute to strengthening sustainable competitive advantage. Innovation ability has a statistically significant effect on sustainable competitive advantage ( $\beta = 0.27$ ). On a standardized scale, a one-unit rise in innovation capability corresponds to a 0.27-unit increase in competitive advantage. Therefore, we accept the first sub-hypothesis: "There is a statistically significant impact of innovation ability in supporting sustainable competitive advantage in electronics industry institutions in Algeria." Product innovation also has a statistically significant effect on sustainable competitive advantage ( $\beta = 0.31$ ). A one-unit increase in Product innovation is associated with a 0.31 increase in competitive advantage. Therefore, we accept the second sub-hypothesis: "There is a statistically significant effect of Product innovation on supporting sustainable competitive advantage in electronics industry institutions in Algeria." Service innovation shows a statistically significant effect and is the most influential of the three dimensions ( $\beta = 0.34$ ). A one-unit increase in service innovation is associated with a 0.34 increase in competitive advantage. Therefore, we accept the third sub-hypothesis: "There is a statistically significant effect of Service innovation on supporting sustainable competitive advantage in the electronics industry institutions under study in Algeria. "

## **8. Result and discussion**

The results of the statistical analysis of this study showed that innovative capital explains 74% of the changes in the level of competitive advantage, reflecting the strength and importance of this variable in enhancing the competitiveness of institutions. The results also indicated that the different dimensions of innovative capital contribute positively to achieving a competitive advantage, with the innovation dimension in services being the most influential

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among the rest. A one-unit increase in innovation in services enhances competitive advantage by 34%.

Regarding the hypotheses proposed within this study, the following can be concluded: the main hypothesis regarding the impact of innovative capital on achieving competitive advantage was confirmed, as the results showed a strong and direct relationship. The results supported all secondary hypotheses related to the dimensions of innovative capital (innovation ability, product innovation, and service innovation), with varying levels of impact. The most prominent of these was innovation in services.

Therefore, these results confirm that investing in innovative capital represents a vital strategic tool that enables electronics industry organizations to enhance their capabilities.

## 9. Conclusion

Innovation capital is kind of the secret sauce behind what makes a company tick these days. It's not just some fancy buzzword tucked away in an annual report; it's the backbone of that whole "intellectual capital" thing everyone's always talking about. Basically, it's what gets people actually thinking outside the box, you know? It pushes teams to roll out cool new products, sometimes just by tweaking the old stuff, sometimes by dropping something totally fresh. And it's not just about gadgets, either. We're talking new ways to sell, new spins on marketing, pretty much anything that helps a company keep up with the wild pace of tech and business shifts (especially in the electronics world, where things change faster than you can blink). Companies that invest in this sort of creativity end up saving on costs, too, whether it's making stuff cheaper or hustling smarter on the marketing side.

Plus, let's not forget: when you're cranking out better products and cooler services than the other guys, people notice. This process represents the development of a genuine and sustainable competitive advantage. Over time, such an advantage enables the organization to expand its market share, enhance its profitability, and achieve its overarching strategic objectives, provided that implementation is effective. Long story short? Ignore innovation capital, and you're basically handing your competitors the keys to the castle.

Through this study, several results were obtained:

\_Innovation capital has a significant effect on achieving competitive advantage in electronics industry institutions. As the independent variable, innovation capital accounted for 74 percent of the variation in competitive advantage.

\_The dimensions of innovation capital each have a positive impact on competitive advantage. Among these, the service innovation dimension is the most influential: a one unit increase in this dimension is associated with a 34 percent increase in competitive advantage.

\_Based on the findings, the study proposes a set of measures to address observed weaknesses and reinforce strengths associated with these variables in electronics industry institutions in Algeria including:

\_Strengthening institutional innovation ability by more actively encouraging creative individuals and allocating sufficient budgets to research and development, alongside the enactment of stringent intellectual property protection laws.

\_Continuing to introduce new products and refine existing ones in line with customers' aspirations and preferences, as an effective means to outperform competitors and keep pace with changes in the business environment.

\_Developing new services to reduce marketing and sales costs and to simplify product acquisition, thereby enhancing customer satisfaction and fostering.

## **10. Research Prospects**

This study opens several prospects for future research on innovation and competitive advantage, luding the following suggested topics:

- \_the role of intellectual capital in achieving sustainable development,
- \_the impact of green innovation on enhancing competitive performance,
- \_ , the role of green innovation in strengthening corporate social responsibility.

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