



# A Multi-Faceted Literature Review of Challenges in Iran's Knowledge-Based ICT Firms

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## Abstract

This review paper examines the multifaceted growth challenges faced by Knowledge-Based Firms (KBFs) operating in Information and Communication Technology (ICT) firms in Iran. Through a comprehensive analysis, the study identifies critical barriers across several domains, including financial constraints, market development limitations, political, regulatory, and legal complexities, business model intricacies, and knowledge-based law enforcement issues. Unlike previous studies that typically focus on isolated factors, this research offers a holistic view of the obstacles impeding the growth of ICT firms within the specific context of Iran and its regulatory environment. Key findings reveal that financial challenges are compounded by limited access to high-quality equipment and skilled personnel, while market development is hindered by both domestic and international barriers. Regulatory and legal hurdles, including inadequate intellectual property protections and cumbersome administrative processes, further exacerbate these issues. The study also highlights the need for strategic reforms in policy frameworks, enhanced coordination among governmental bodies, and targeted support mechanisms to address the evolving needs of these enterprises. Based on the analysis, the paper proposes several policy recommendations aimed at fostering an environment conducive to the sustainable growth and innovation of Iran's ICT sector. These include optimizing tax policies, facilitating international market entry, revising regulatory frameworks, and improving support for knowledge-based law enforcement. The findings highlight the importance of a nuanced and adaptive approach to policy-making to ensure the competitiveness and resilience of ICT companies in Iran's dynamic economic landscape.

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**Keywords:** *ICT Sector; Growth Challenges; Knowledge-Based Firms (KBFs); Iranian Market; Regulatory Barriers*

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## Introduction

In an era marked by unprecedented globalization and interconnected economies, the internationalization of firms stands as a pivotal driver for economic growth and cross-cultural collaboration. Knowledge-Based Firms (KBFs) are typically small, entrepreneurial firms that commercialize new technologies and knowledge (Curado & Bontis, 2006). They may act as knowledge creators, developing new technologies, or knowledge customizers, adapting global knowledge to local contexts (Woodward et al., 2011). KBFs are pivotal in driving sustainable development through the innovative application of technology, high-level knowledge production, research, and development. These firms leverage the expertise of scientists, technical professionals, and skilled staff to catalyze transformation and economic growth (Camisón-Haba et al., 2019). Characterized by their innovative ideas and expertise, KBFs play a crucial role in navigating the complexities of the global business environment.

KBFs, as new technology-based businesses, are recognized for their high level of knowledge production, research and development, employment of scientists and technical and professional staff,

and their role as the main source of transformation and innovation driving economic growth and sustainable development (Camisión-Haba et al., 2019). These companies foster entrepreneurship and wealth creation at the national level and, by commercializing scientific and technological achievements, play a key role in the economy (Jensen & Clausen, 2017; Kashani et al., 2014). In Iran, the country's strategic documents, including the policies outlined in Article 44 of the Constitution, the 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> development plans, and the twenty-year vision document, emphasize the significance of knowledge-based sectors for economic development (Askari, 2019).

One of the axes of economic development in countries is Information and Communication Technology (ICT), which significantly impacts economic performance (Davari & Farkhmanesh, 2016). This sector encompasses a wide range of industrial services, including information systems, computer science, e-commerce, and engineering, as well as soft and hard skills in programming and systems development, coupled with interpersonal communication skills (Odubiyi et al., 2019). ICT's share in the national GDP of Iran has increased from 2.6% in 2012 to 6.6% in 2022. Although the growth rate in this sector surpasses that of other sectors in Iran's economy, it still lags behind the average value across the national economy (IRNA, 2020).

Despite this growth, ICT companies in Iran face numerous risks and challenges that impede their development and sustainable growth (Naghizade & Namdarian, 2019). Theoretical evidence highlights the significant uncertainty and risk associated with the success and stability of these companies (Naghizadeh, 2021). Previous research has addressed various challenges affecting the growth of these firms, including financial constraints (Ghazinoori et al., 2017), limitations in starting, developing, or maintaining commercial operations in foreign and domestic markets (Zarei & Marjovi, 2018), issues related to government laws and regulations, and business problems, particularly concerning the provision of necessary equipment (Falahdoost, 2020; Inyang & Okonkwo, 2021; Fartash et al., 2021).

The acquisition of new technologies and capabilities is crucial for supporting product development and market entry for small and medium-sized enterprises (SMEs) venturing into foreign markets (Knight, 2001). Additionally, intermediaries such as local distributors and foreign designers play a critical role in bridging cultural divides and facilitating knowledge transfer (Sasaki et al., 2020). However, previous research has often been limited in scope, focusing on specific factors rather than a comprehensive analysis of growth challenges. This article seeks to address this gap by providing a holistic examination of the growth challenges faced by ICT KBFs in Iran (Fartash et al., 2022).

## **Conceptual Framework**

Summarizing the literature, the conceptual framework of this research identifies five main categories of challenges:

1. Financial challenges
2. Domestic and export market development challenges
3. Political, regulatory, and legal challenges
4. Business model challenges
5. Challenges related to the implementation of knowledge-based law

This framework will serve as the basis for the analysis presented in this study. The purpose of this study is to critically analyze existing literature, develop a theoretical framework, and provide policy and strategy recommendations to address the growth challenges faced by knowledge-based ICT firms in Iran.

## **Objectives**

To achieve this purpose, this study addresses the following objectives:

- To Critically Analyze Existing Literature: Conduct a comprehensive review of the existing literature on the growth challenges of knowledge-based ICT firms in Iran, synthesizing the findings to identify key themes, gaps, and inconsistencies.
- To Provide Policy and Strategy Recommendations: Develop actionable recommendations for policymakers, industry leaders, and other stakeholders based on the findings from the literature review, focusing on strategies that can mitigate the identified challenges and promote the growth of knowledge-based ICT firms in Iran.

### **1.3. Significance**

Given the importance of this topic and the identified research gaps, this study specifically investigates the financial and regulatory challenges encountered by knowledge-based ICT firms in Iran. This paper presents a framework to analyze these challenges, offering insights and strategies for overcoming them. The findings aim to inform policymakers and managers, facilitating sustainable growth and development within Iran's ICT sector.

### **Definition and Role of KBFs in Iran**

According to Article 1 of the Law on the Protection of KBFs and Institutions and the Commercialization of Innovations and Inventions, a KBF or institution in Iran is defined as a private or cooperative entity aimed at synergizing science and wealth, developing a knowledge-based economy, and achieving scientific and economic goals. This encompasses the expansion and application of invention and innovation, as well as the commercialization of research and development results, including the design and production of goods and services in high-value technologies (Valibeigi et al., 2020). These organizations are typically private enterprises founded and managed by specialists in science and technology or entrepreneurs. They are primarily engaged in the innovation and commercialization of technological achievements, with a strong emphasis on research and development. The competitive advantage of these firms lies in their technical knowledge and technological capability, which are critical for fostering indigenous knowledge and innovation across various domains (Fartash et al., 2022). For the purpose of this study, KBFs are those recognized and certified for protection under the aforementioned law, often possessing inherent technological capabilities in high-tech fields.

As Iran transitions from a state-run economy to one driven by private enterprises, knowledge-based ICT (Information and Communications Technology) companies encounter distinctive challenges in achieving sustainable growth (Farnoodi et al., 2020). These firms operate within a complex ecosystem shaped by national policies, industry dynamics, and firm-level strategies. To thrive in this environment, they must navigate financial constraints, regulatory challenges, and technological disruptions effectively.

### **Challenges Faced by Knowledge-Based ICT Firms in Iran**

#### **Financial Challenges**

The ICT industry in Iran has been undergoing a significant transformation, with the emergence of KBFs playing a crucial role in driving innovation and economic growth (Saleem et al., 2016). However, these firms face a myriad of challenges, particularly in the financial domain, which can hinder their ability to thrive and compete effectively.

Accessing financing stands as a primary hurdle for Iranian ICT startups, largely due to economic sanctions and the country's heavy reliance on oil revenues. One of the primary factors contributing to the financial challenges faced by knowledge-based ICT firms in Iran is the country's transitional

economy (HamidiMotlagh et al., 2020). Iran's heavy reliance on oil revenues has created a unique set of circumstances that differ from the growth factors observed in more developed economies. As such, these firms must navigate a complex landscape marked by issues such as oil price fluctuations, economic sanctions, and a limited access to international financial markets (Rehman et al., 2021).

Traditional funding sources like bank loans and venture capital are severely limited (Farnoodi et al., 2020). While politically connected firms may have some advantages in securing financing, the broader business environment remains challenging (Ghasseminejad & Jahan-Parvar, 2021). Moreover, SMEs in Iran often lack the resources and capabilities required to develop innovative technologies or adapt existing ones (Yadollahi Farsi & Toghraee, 2014).

Financial restrictions pose significant obstacles to the growth and development of KBFs. These firms typically necessitate substantial investment, and uncertainties surrounding returns on such investments exacerbate the challenge (Ghazinoori et al., 2017). The financing process is particularly problematic for ICT firms, which contend with high implementation costs (Fartash et al., 2021). Furthermore, issues related to the credit allocation system, high interest rates, taxes, duties, and excessive costs complicate the financial landscape (Inyang & Okonkwo, 2021). Support programs, government loans, venture capital, investment funds, foreign investment, and government assets could play pivotal roles in alleviating these financial challenges (Shukaili et al., 2018).

Additionally, the lack of adequate knowledge and understanding among Iranian consumers regarding e-banking services has also posed a significant obstacle for the growth of knowledge-based ICT firms (Salehi & Alipour, 2010). This lack of digital financial literacy can limit the adoption of innovative financial technologies, thereby hindering the firms' ability to capitalize on the potential of these technologies.

Furthermore, the integration of financial technology (FinTech) into the Islamic banking system in Iran has presented its own set of challenges. While the use of FinTech can offer numerous benefits, such as increased efficiency and compliance with Shariah principles, the absence of clear regulatory frameworks and standards has created uncertainty and risks (Haridan et al., 2020).

According to Fartash et al. (2022), the most valuable asset of knowledge-based ICT firms is their skilled human capital rather than fixed assets like land, buildings, and equipment. This presents a significant challenge when these firms seek banking facilities, as banks typically require substantial fixed assets as collateral. Many ICT KBFs, such as Digikala, heavily invest in human capital, thus lacking the fixed assets necessary to secure working capital and development project loans from banks. Standard banking requirements for collateral do not align with the intellectual property and intangible assets that predominantly constitute the value of these firms.

Another substantial financial challenge is the lack of a clear process and mechanism for accurate tax determination, coupled with stringent tax and insurance regulations. For instance, fintech companies often face taxes calculated on a capital basis. Due to the high volume of financial transactions, they handle, tax officers may avoid detailed calculations and impose taxes based on financial turnover, leading to excessively high tax liabilities.

Furthermore, knowledge-based ICT firms encounter difficulties with international currency transfers, such as the inability to pay for POS devices due to currency transfer issues, which hampers their international operations. The essential infrastructure equipment for these companies, such as servers, is often imported, and currency fluctuations further inflate costs, necessitating multiple expenses to procure necessary infrastructure. Despite these increased costs, the prices of their services and goods are often regulated, preventing proportional price increases. Consequently, these firms face significant liquidity challenges.

Background analysis of ICT companies reveals significant hurdles in accessing financial resources and securing adequate financing mechanisms. Among these challenges are insufficient investments and high interest rates (Fartash et al., 2021). Additionally, issues such as opaque insurance and tax regulations, frequent penalties, and high costs associated with implementing information technology further compound these financial constraints (Inyang & Okonkwo, 2021; Falahdoost, 2020).

Further examination of these challenges highlights common issues faced by these companies, including:

- Difficulty in obtaining bank loans
- Inaccurate tax assessments and stringent tax regulations
- Constraints on international currency transfers
- Liquidity challenges due to uncertainties in capital returns

Addressing these multifaceted financial challenges is crucial for fostering an environment conducive to the sustainable growth and development of ICT companies in Iran.

### **Domestic and Export Market Development Challenges**

ICT firms in Iran encounter numerous hurdles in both domestic and export markets, significantly impacting their growth prospects. These challenges include intense competition, inadequate competitive positioning in national and international markets, limited access to distribution channels, and difficulties in ensuring timely product or service delivery (Ibitoye, 2018; Mohan & Ali, 2019). Additionally, issues such as continuous industry evolution, inaccurate competitor behavior predictions, ineffective advertising strategies, lack of market research, and constrained distribution networks contribute to these challenges (Suwannaporn & Speece, 2010). Moreover, economic stagnation, domestic market complexities, economic conditions, and customs-related issues further impede market development efforts (Jalalpour et al., 2016).

According to Fartash et al. (2022), Iranian knowledge-based ICT firms face substantial hurdles in international interactions and exporting their products and services due to embargoes and restrictions. The lack of international communication infrastructure poses a significant barrier for these firms aiming to penetrate global markets. Despite potential cost advantages in labor and infrastructure, Iran's global limitations hinder its connectivity with key international industry players.

Economic diplomacy plays a pivotal role in market expansion and export activities for these firms. For instance, expanding the international market for fintech companies necessitates high-level political negotiations to facilitate global financial transactions. The absence of robust diplomatic efforts limits these firms' growth potential on the global stage. Moreover, many managers in large ICT firms lack expertise in international marketing, underscoring the need for targeted training and development initiatives to enhance their export capabilities.

Domestically, there is a critical need to broaden the market for ICT products and services. Numerous traditional sectors in Iran still require technological modernization through information technology solutions. Therefore, while pursuing international market opportunities, it is equally imperative for ICT firms to foster their domestic market presence to achieve balanced growth.

Another specific challenge pertains to Iranian computer game companies, which face reluctance from major international distributors to invest in and collaborate with them. This reluctance significantly limits the international reach and marketability of Iranian-developed games. Furthermore, certain segments of the domestic ICT market, such as computer games, are experiencing saturation, intensifying competition among local firms and emphasizing the necessity for both domestic and international market expansion efforts.

A comprehensive examination reveals several critical challenges obstructing the market development and export endeavors of Iranian ICT companies. These include fierce competition both domestically and internationally, compounded by inadequate distribution channels and delays in product or service rollout (Mohan & Ali, 2019). Moreover, these companies grapple with challenges like insufficient market research, technical and commercial risks, and limited capacity to compete effectively in national markets, which significantly hinder their entry and expansion into foreign markets (Ibitoye, 2018).

Additional complexities highlighted in the background analysis encompass fluctuating demand for technological products in domestic and emerging export markets, coupled with insufficient focus on product research and development (Jalalpour et al., 2016). Insights underscore that Iranian ICT firms encounter difficulties in their international engagements and face barriers in exporting their products and services to foreign markets.

According to Fartash et al. (2022), further challenges in this domain include:

- Ineffective economic diplomacy strategies aimed at enhancing export activities
- Limited knowledge and experience among commercial company managers regarding international markets
- Insufficient efforts to cultivate and develop domestic markets for ICT products and services
- Reluctance of major international game distributors to invest in Iranian games and collaborate with local entities
- Saturation of the domestic market in specific ICT sectors, resulting in heightened competition among local competitors

Addressing these multifaceted challenges is imperative to bolstering the market development and export capabilities of Iranian knowledge-based ICT firms, thereby fostering their sustainable growth and enhancing their competitiveness on the global stage.

### **Political, Regulatory, and Legal Challenges**

Knowledge-based ICT firms in Iran confront a myriad of political, regulatory, and legal challenges that significantly impact their operations and growth prospects. These challenges encompass several critical areas, including the absence of adequate laws governing technology-related issues, threats from cybercrime targeting information repositories, and vulnerabilities in safeguarding intellectual property (Shukaili et al., 2018). Furthermore, existing legal frameworks often lack clarity and fail to effectively regulate internal competition dynamics within the ICT sector (Fartash et al., 2021). The overall weak legal infrastructure, coupled with the high costs associated with legal recourse, further exacerbates these challenges (Falahdoost, 2020).

Moreover, regulatory hurdles related to customs and exports, governmental regulations, and ineffective oversight mechanisms pose formidable obstacles (Ameen & Willis, 2016; Inyang & Okonkwo, 2021). The Iranian government's initiatives to establish a "national information network" and tighten control over digital communications raise concerns regarding censorship and data privacy, impacting the operational autonomy of ICT firms (Anderson, 2012).

Navigating this intricate regulatory landscape requires ICT firms in Iran to adopt strategic approaches that leverage their core competencies while addressing systemic regulatory shortcomings. For instance, the fintech sector in Iran faces significant regulatory gaps, with companies like Saman Kish operating without a comprehensive legal framework tailored to their specific activities. Additionally, law enforcement practices occasionally infringe upon user rights, highlighting critical gaps in legal protections (Fartash et al., 2022).

A pivotal issue confronting ICT firms is the inadequacy of intellectual property laws, which not only fail to adequately safeguard copyrights but also perpetuate inefficiencies in resource utilization at the

national level. The traditional legal frameworks governing technological sectors are ill-suited to the dynamic nature of information technology, exacerbating regulatory conflicts and stifling innovation (Fartash et al., 2022).

Furthermore, the proliferation of licenses without due consideration for market dynamics, particularly in sectors like banking and payments where state-owned enterprises compete directly with private firms, contributes to market saturation and diminishes competitive fairness (Fartash et al., 2022). The legal system's sluggish responsiveness to fintech challenges, coupled with opaque tax exemption regulations and stringent corporate naming conventions, further compound the hurdles faced by ICT firms seeking to expand internationally (Fartash et al., 2022).

The continuous evolution of information technology laws and their enforcement, alongside lax regulatory oversight in sectors like gaming, underscores the ongoing challenges for ICT companies. Delegating regulatory authority to entities like the Games Foundation has introduced ambiguities in oversight and enforcement, impacting the gaming industry's growth trajectory and compliance landscape (Fartash et al., 2022).

In conclusion, addressing these multifaceted political, regulatory, and legal challenges is paramount to fostering an enabling environment for fintech and ICT companies in Iran. Establishing clear, consistent, and adaptable legal frameworks is essential to supporting innovation, protecting intellectual property rights, and promoting sustainable growth in the digital economy.

### **Business Model Challenges**

Developing effective business models presents a formidable challenge for knowledge-based ICT firms operating in Iran. These companies encounter various obstacles that significantly impact their operational efficiency and growth potential. Key challenges include limited access to high-quality equipment, specialized research tools, laboratory resources, and essential raw materials, exacerbated by economic sanctions and logistical complexities (Tavakkol & Ghazinouri Naeini, 2010; Fartash et al., 2021).

One of the most pressing issues is the annual loss of skilled personnel due to mandatory military service. This continual depletion of talent pools disrupts operations and strategic planning, posing a significant hurdle to long-term sustainability efforts (Fartash et al., 2022). Moreover, retaining skilled human resources remains a costly endeavor within the information technology sector. Companies face substantial salary demands from employees who are often lured by competitive offers from both domestic and international competitors, further straining operational capabilities and innovation potential (Fartash et al., 2022).

Additionally, ICT firms heavily rely on specialized equipment and infrastructure, such as servers, crucial for their operations. However, challenges in customs clearance processes often lead to delays and increased operational costs. The dependence on imported servers sourced through intermediaries further complicates financial management and imposes additional burdens on companies (Fartash et al., 2021).

Addressing these multifaceted business model challenges requires strategic interventions that enhance talent retention strategies, streamline import processes, and optimize operational efficiencies. ICT companies must navigate these complexities to sustain growth and competitiveness within Iran's technology-driven sectors.

In conclusion, the strategic resolution of these challenges is pivotal for fostering an environment conducive to the sustainable development of knowledge-based ICT firms in Iran. By overcoming these obstacles, companies can enhance their operational resilience and capitalize on emerging opportunities in the global digital economy.

## **Challenges related to the implementation of knowledge-based law**

Legal protections are indispensable for the success of KBFs, yet several challenges in Iran hinder their effective implementation and enforcement. These challenges encompass a range of issues from inadequate support frameworks to systemic inefficiencies and regulatory shortcomings (Falahdoost, 2020; Akbarzadeh & Shafizadeh, 2011; Moradipour, 2013).

One of the primary challenges identified is the imbalance in support systems designed for knowledge-based enterprises. Despite efforts from the vice presidency responsible for these companies, the current support framework often fails to adequately meet the diverse needs of larger, more established firms. This disparity in support allocation can hinder the growth potential of companies with higher success prospects (Fartash et al., 2022).

Moreover, stringent criteria governing the allocation of academic support further complicate matters. Many initiatives under the Scientific Vice Presidency, such as those tailored for science and technology parks, may not align with broader operational requirements like tax incentives and working capital support. This mismatch underscores the need for more flexible and inclusive support mechanisms that cater to the dynamic needs of KBFs (Fartash et al., 2022).

Another critical issue lies in the insufficient dissemination of information about available support packages. This lack of awareness limits companies' ability to leverage resources effectively and hampers their strategic planning efforts. Additionally, fluctuations and reductions in support over project durations contribute to instability, undermining long-term planning and sustainability efforts within the sector. Furthermore, the current support mechanisms under the vice presidency have shown inefficiencies in facilitating international market penetration and expansion for KBFs. This limitation poses a significant barrier to their ability to compete globally and capitalize on international growth opportunities.

Addressing these challenges requires a comprehensive approach to reforming support frameworks and enhancing regulatory clarity. It is essential to foster an environment that supports innovation, transparency, and sustainable growth for KBFs in Iran. By aligning support mechanisms with the specific needs of these firms and improving regulatory efficiency, Iran can better position itself to harness the full potential of its knowledge-based economy.

In conclusion, overcoming these challenges demands a strategic realignment of policies and support frameworks to create a conducive environment for innovation and growth within the knowledge-based sector. This strategic alignment is crucial for enhancing competitiveness, fostering entrepreneurship, and driving economic development in Iran.

## **Concluding remarks and recommendations**

This research has systematically explored the growth challenges encountered by knowledge-based ICT companies in Iran, shedding light on critical barriers across several key areas: financial constraints, limitations in domestic and export market development, political, regulatory, and legal complexities, business model intricacies, and challenges related to knowledge-based law enforcement. Unlike prior studies that often focus narrowly on isolated factors, this research provides a comprehensive overview of the multifaceted challenges faced by ICT firms within the Iranian context, particularly under the framework of knowledge-based laws which are pivotal yet under-explored.

Addressing these challenges necessitates substantial reforms in policy frameworks, improved coordination among governmental bodies, and targeted interventions that align support mechanisms with the evolving needs of knowledge-based enterprises in Iran.



Based on the findings, particularly the research carried out by Fartash et al. (2022), several policy recommendations are proposed to guide policymakers and executives in fostering an environment conducive to the growth of ICT companies:

- **Taxation Challenges:**

Engage specialized experts in ICT and e-commerce to ensure fair and accurate tax assessments, preventing overburdening of ICT companies and promoting a conducive tax environment.

- **International Market Entry:**

Collaborate closely with the Ministry of Foreign Affairs to enhance diplomatic efforts aimed at facilitating international partnerships for Iranian ICT firms. Develop streamlined financial transfer mechanisms to support international transactions and foster trust among global partners.

- **Political, Regulatory, and Legal Challenges:**

Revise existing regulations to better reflect market realities and adopt pragmatic approaches that reduce bureaucratic hurdles for ICT companies. Streamline export-import regulations and customs procedures to facilitate smoother operations.

- **Knowledge-Based Law Enforcement:**

Strengthen the evaluation processes within governmental support frameworks to ensure they effectively meet the needs of KBFs. Revise collateral and guarantee systems to better support ICT firms, particularly in accessing tax incentives and recognition as knowledge-based entities.

- **Support Packages:**

Involve ICT industry experts in designing and implementing support packages under governmental initiatives, ensuring these initiatives are tailored to address the specific challenges faced by ICT companies in Iran.

- **Intellectual Property:**

Streamline legal processes for the efficient resolution of intellectual property disputes, facilitating greater domestic and international collaboration in technology development and innovation.

- **Financial Challenges:**

Optimize the utilization of banking resources, including development banks and the National Development Fund, to provide adequate financing for ICT projects. Promote ICT firms' access to the capital market for larger-scale financing and encourage financial institutions to participate actively in supporting ICT growth.

- **Human Resources:**

Address the talent retention challenge by aligning higher education curricula with the skill needs of the ICT sector. Implement performance-based incentives to attract and retain skilled professionals within the industry.

Implementing these policy recommendations will be instrumental in creating a supportive ecosystem that empowers ICT companies in Iran to overcome their growth challenges, foster innovation, and enhance their competitiveness both domestically and internationally.

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