

EXPLORING CHALLENGES IN IRAN'S KNOWLEDGE-BASED ICT FIRMS: IMPLICATIONS FOR EDUCATIONAL TECHNOLOGIES

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ABSTRACT

This study explores the multifaceted growth challenges faced by Knowledge-Based Firms (KBFs) within Iran's Information and Communication Technology (ICT) sector. The research identifies critical barriers across several domains, including financial constraints, market development limitations, and political, regulatory, and legal complexities. Through a comprehensive analysis, the study reveals that financial challenges are intensified by limited access to high-quality equipment and skilled personnel. Additionally, both domestic and international market development face significant hurdles. Regulatory and legal issues, such as inadequate intellectual property protections and cumbersome administrative processes, further exacerbate these challenges. The study underscores the need for strategic policy reforms, improved governmental coordination, and targeted support mechanisms to address the evolving needs of these firms. The findings highlight the importance of optimizing tax policies, facilitating international market entry, revising regulatory frameworks, and enhancing support for knowledge-based law enforcement to foster sustainable growth and innovation in Iran's ICT sector.

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

ABSTRAK

Penelitian ini mengeksplorasi tantangan pertumbuhan yang kompleks yang dihadapi oleh Perusahaan Berbasis Pengetahuan (KBFs) dalam sektor Teknologi Informasi dan Komunikasi (ICT) di Iran. Penelitian ini mengidentifikasi hambatan kritis di berbagai bidang, termasuk keterbatasan keuangan, keterbatasan pengembangan pasar, serta kompleksitas politik, regulasi, dan hukum. Melalui analisis yang komprehensif, penelitian ini mengungkapkan bahwa tantangan keuangan diperparah oleh terbatasnya akses terhadap peralatan berkualitas tinggi dan tenaga kerja terampil. Selain itu, pengembangan pasar domestik dan internasional menghadapi hambatan yang signifikan. Masalah regulasi dan hukum, seperti perlindungan hak kekayaan intelektual yang tidak memadai dan proses administratif yang rumit, semakin memperburuk tantangan ini. Penelitian ini menekankan perlunya reformasi kebijakan strategis, peningkatan koordinasi pemerintah, dan mekanisme dukungan yang tepat untuk mengatasi kebutuhan yang berkembang dari perusahaan-perusahaan ini. Temuan ini menyoroti pentingnya mengoptimalkan kebijakan pajak, memfasilitasi masuknya pasar internasional, merevisi kerangka regulasi, dan meningkatkan dukungan untuk penegakan hukum berbasis pengetahuan guna mendorong pertumbuhan yang berkelanjutan dan inovasi dalam sektor ICT di Iran..

Kata kunci: Sektor ICT; Tantangan Pertumbuhan; Perusahaan Berbasis Pengetahuan (KBFs); Pasar Iran; Hambatan Regulasi

1. 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 crucial in driving sustainable development through the innovative application of technology, high-level knowledge production, research, and development (Camisón-Haba et al., 2019). 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 significant 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 (Camisón-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 4th, 5th, and 6th development plans, and the twenty-year vision document, emphasize the significance of knowledge-based sectors for economic development (Askari, 2019).

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.

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).

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

domestic and export market development challenges, political, regulatory, and legal challenges, business model challenges, and 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.

To achieve this purpose, this study addresses the following objectives: to critically analyze existing literature on the growth challenges of knowledge-based ICT firms in Iran, synthesizing the findings to identify key themes, gaps, and inconsistencies; and to provide 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.

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 analyse 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.

2. METHOD

This study adopts a systematic review approach to explore the research on KBFs within the ICT sector in Iran, focusing on literature published between 2001 and 2021. The objective is to provide a comprehensive synthesis of the challenges and trends associated with

these firms. To ensure a rigorous and transparent review process, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were employed.

The review encompasses peer-reviewed articles, conference papers, and relevant reports that address knowledge-based ICT firms specifically within the Iranian context. The selection criteria for the studies included the requirement that they be published within the specified time frame and directly pertain to knowledge-based ICT firms in Iran.

The data collection process involved a thorough search across major academic databases including IEEE Xplore, Scopus, Web of Science, and Google Scholar. Search terms such as "knowledge-based firms," "ICT," "Iran," and "challenges" were used to identify relevant literature. Following the initial search, titles and abstracts were screened to assess their relevance to the study's focus. Articles that did not specifically address the research topic or fell outside the scope of the study were excluded.

Articles that met the relevance criteria were then reviewed in full to evaluate their methodological rigor and appropriateness for inclusion. Key information was extracted from these studies, including details on the authors, publication year, study design, and the main findings related to the challenges faced by knowledge-based ICT firms. This systematic approach was conducted to ensure that the review is comprehensive and adheres to the highest standards of research transparency and reproducibility. For data analysis, a qualitative approach was employed to discern common themes and trends within the reviewed literature. Thematic analysis was utilized to systematically categorize the findings into five central challenges. These themes included financial challenges, domestic and export market

development challenges, political, regulatory, and legal challenges, business model challenges, and issues related to the implementation of knowledge-based law. This methodical analysis offered a comprehensive framework for understanding the primary issues reported in the literature, providing clarity on the major obstacles faced by knowledge-based ICT firms.

3. RESULT

This section presents a comprehensive analysis of the key challenges faced by knowledge-based ICT firms in Iran, as identified through the review of relevant literature and data. This section elucidates the core findings related to the financial, market development, political, regulatory, and business model challenges encountered by these firms. By systematically organizing the results under specific subheadings, this section aims to provide a clear and structured overview of the obstacles impeding the growth and sustainability of these firms. Each subsection highlights critical issues derived from the analysis, offering insights into the multifaceted barriers that affect knowledge-based ICT enterprises in the Iranian context. The ensuing discussion is designed to reflect on these findings, aligning them with the research objectives and hypotheses to offer a nuanced understanding of the current state of the industry.

3.1. FINANCIAL CHALLENGES

The ICT industry in Iran is experiencing a transformative phase, with KBFs playing a pivotal role in fostering innovation and economic progress (Saleem et al., 2016). Despite their critical contributions, these firms encounter significant financial challenges that impede their ability to thrive and compete effectively in the market.

A primary obstacle for Iranian ICT start-ups is their struggle to access financing, exacerbated by the country's reliance on oil revenues and the impact of economic sanctions. The transitional nature of Iran's economy presents unique challenges not typically seen in more developed markets, including the volatility of oil prices and restricted access to international financial markets (HamidiMotlagh et al., 2020; Rehman et al., 2021). The economic context is further complicated by limitations in traditional funding sources such as bank loans and venture capital (Farnoodi et al., 2020). Although politically connected firms might have an edge in securing financing, the broader business environment remains difficult for most (Ghasseminejad & Jahan-Parvar, 2021).

Moreover, SMEs in Iran often lack the resources necessary to develop or adapt innovative technologies, which hinders their growth potential (Yadollahi Farsi & Toghraee, 2014). The financial constraints faced by KBFs are substantial, given the high investment required for technology development and the inherent uncertainties surrounding returns on such investments (Ghazinoori et al., 2017). This issue is further aggravated by high implementation costs associated with ICT ventures (Fartash et al., 2021) and complications related to the credit allocation system, high interest rates, taxes, duties, and excessive costs (Inyang & Okonkwo, 2021). To mitigate these challenges, support programs, government loans, venture capital, investment funds, and foreign investment could be instrumental (Shukaili et al., 2018).

The growth of knowledge-based ICT firms is also hindered by a lack of digital financial literacy among Iranian consumers, which limits the adoption of innovative financial technologies and e-banking services (Salehi & Alipour,

2010). The absence of a clear regulatory framework for financial technology (FinTech) further complicates the integration of these technologies into Iran's Islamic banking system. While FinTech can enhance efficiency and align with Shariah principles, the lack of well-defined standards and regulations introduces uncertainty and risk (Haridan et al., 2020).

Another significant challenge is that KBFs' most valuable assets are often their skilled human capital rather than tangible assets like land and buildings. This discrepancy creates difficulties when these firms seek financing, as traditional banks typically require substantial fixed assets as collateral. For instance, companies like Digikala invest heavily in human capital, resulting in a shortage of physical assets needed to secure loans for working capital or development projects. The conventional banking collateral requirements do not align with the intangible assets, such as intellectual property, that constitute the value of these firms (Fartash et al., 2022).

Additionally, the lack of a clear process for accurate tax determination and the stringent tax and insurance regulations pose further financial challenges. Fintech firms, for example, often face tax assessments based on financial turnover due to the high volume of transactions, leading to potentially excessive tax liabilities (Falahdoost, 2020). Difficulties with international currency transfers, such as issues with paying for POS devices and importing essential infrastructure equipment like servers, exacerbate the financial strain. Currency fluctuations can inflate costs, while regulated prices of services and goods prevent firms from adjusting prices accordingly, leading to liquidity issues.

3.2. DOMESTIC AND EXPORT MARKET DEVELOPMENT CHALLENGES

Knowledge-based ICT firms in Iran encounter numerous obstacles that impede their growth in both domestic and international markets. Among the primary challenges are intense competition and inadequate competitive positioning within national and global arenas. Limited access to distribution channels and difficulties in ensuring timely product or service delivery further complicate these issues (Ibitoye, 2018; Mohan & Ali, 2019). The rapid evolution of the industry exacerbates these challenges, with problems including inaccurate competitor behavior predictions, ineffective advertising strategies, and insufficient market research (Suwannaporn & Speece, 2010). Economic stagnation, domestic market complexities, and customs-related issues further hinder market development efforts (Jalalpour et al., 2016).

Iranian ICT firms face significant barriers in international interactions and exporting their products and services due to embargoes and restrictions. The lack of robust international communication infrastructure poses a major hurdle for these firms trying to penetrate global markets. Despite potential cost advantages in labor and infrastructure, Iran's global limitations restrict its connectivity with key international industry players (Fartash et al., 2022).

Economic diplomacy plays a critical role in expanding market reach and facilitating export activities. For example, fintech companies seeking to expand internationally require high-level political negotiations to ease global financial transactions. The absence of effective diplomatic initiatives limits these firms' growth potential on the global stage. Additionally, many managers within large ICT firms lack the necessary expertise in international marketing,

indicating a need for targeted training and development to improve export capabilities.

Domestically, there is a pressing need to enhance the market for ICT products and services. Many traditional sectors in Iran still require modernization through information technology solutions. Therefore, while pursuing international market opportunities, ICT firms must also focus on strengthening their domestic market presence to achieve balanced growth.

Challenges specific to certain sectors within the domestic ICT market include issues faced by Iranian computer game companies. These companies often encounter reluctance from major international distributors, which limits their international reach and marketability. Additionally, saturation in some segments of the domestic ICT market, such as computer games, heightens competition among local firms and underscores the necessity for both domestic and international market expansion efforts.

A detailed examination reveals critical challenges obstructing market development and export efforts for Iranian ICT firms. These challenges include fierce competition domestically and internationally, compounded by inadequate distribution channels and delays in product or service rollout (Mohan & Ali, 2019). Insufficient market research, technical and commercial risks, and limited capacity to compete effectively in both national and international markets significantly hinder expansion efforts (Ibitoye, 2018).

Further complexities include fluctuating demand for technological products and a lack of emphasis on product research and development (Jalalpour et al., 2016). Iranian ICT firms face difficulties in international engagements and barriers to exporting

their products and services. According to Fartash et al. (2022), additional challenges include ineffective economic diplomacy strategies, limited knowledge and experience among commercial managers regarding international markets, insufficient efforts to cultivate domestic markets for ICT products and services, reluctance from major international game distributors to invest in Iranian-developed games, and market saturation in specific ICT sectors, which increases competition among local competitors.

3.3. POLITICAL, REGULATORY, AND LEGAL CHALLENGES

Knowledge-based ICT firms in Iran face a range of political, regulatory, and legal challenges that significantly influence their operational efficiency and growth prospects. A major issue is the lack of adequate laws addressing technology-related concerns, including cybersecurity threats and intellectual property protection (Shukaili et al., 2018). The legal frameworks currently in place often lack clarity and fail to effectively regulate competition within the ICT sector, which can stifle innovation and create operational uncertainties (Fartash et al., 2021). Additionally, the overall weak legal infrastructure, coupled with the high costs associated with seeking legal recourse, further complicates the operational environment for these firms (Falahdoost, 2020).

Regulatory challenges are also prominent, particularly concerning customs and export regulations, government-imposed restrictions, and ineffective oversight mechanisms (Ameen & Willis, 2016; Inyang & Okonkwo, 2021). Government initiatives such as the establishment of a “national information network” and stricter controls over digital communications have raised concerns about censorship

and data privacy. These measures can significantly impact the operational autonomy of ICT firms, creating an environment of uncertainty and restricted freedom (Anderson, 2012).

Navigating this complex regulatory landscape requires ICT firms in Iran to adopt strategic approaches that leverage their core competencies while addressing systemic regulatory deficiencies. For instance, the fintech sector faces notable regulatory gaps, with companies like Saman Kish operating without a comprehensive legal framework tailored to their specific needs. This lack of clarity extends to law enforcement practices that sometimes infringe on user rights, underscoring critical gaps in legal protections (Fartash et al., 2022).

A particularly pressing issue is the inadequacy of intellectual property laws. Current legal frameworks do not effectively protect copyrights or address inefficiencies in the utilization of resources at the national level. These outdated laws are not well-suited to the rapidly evolving nature of information technology, exacerbating regulatory conflicts and stifling innovation (Fartash et al., 2022).

Additionally, the proliferation of licenses in sectors like banking and payments, where state-owned enterprises often compete directly with private firms, has led to market saturation and reduced competitive fairness. The slow responsiveness of the legal system to challenges in the fintech sector, combined with opaque tax exemption regulations and stringent corporate naming conventions, further complicates the expansion efforts of ICT firms (Fartash et al., 2022).

The ongoing evolution of information technology laws and their enforcement, coupled with lax regulatory oversight in the gaming industry, highlights the persistent challenges faced

by ICT companies. The delegation of regulatory authority to entities like the Games Foundation has introduced ambiguities in oversight and enforcement, affecting the growth trajectory and compliance landscape of the gaming sector (Fartash et al., 2022).

3.4. BUSINESS MODEL CHALLENGES

Developing effective business models is a significant challenge for knowledge-based ICT firms operating in Iran, impacting their operational efficiency and growth potential. These companies face several obstacles that complicate their ability to establish and sustain effective business models. A major issue is the limited access to high-quality equipment, specialized research tools, laboratory resources, and essential raw materials, which is further 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 constant depletion of talent disrupts operations and strategic planning, presenting a significant challenge to long-term sustainability efforts (Fartash et al., 2022). Additionally, retaining skilled human resources is costly, as companies face substantial salary demands from employees who are often enticed by competitive offers from both domestic and international competitors. This situation places further strain on operational capabilities and innovation potential (Fartash et al., 2022).

The reliance on specialized equipment and infrastructure, such as servers, is another critical issue. The challenges related to customs clearance processes frequently lead to delays and increased operational costs. The

dependency on imported servers, often procured through intermediaries, complicates financial management and adds additional burdens on companies (Fartash et al., 2021).

Addressing these multifaceted business model challenges necessitates strategic interventions that focus on improving talent retention strategies, streamlining import processes, and enhancing operational efficiencies. ICT firms must adeptly navigate these complexities to sustain growth and remain competitive within Iran's technology-driven sectors.

3.5. CHALLENGES RELATED TO THE IMPLEMENTATION OF KNOWLEDGE-BASED LAW

Legal protections are vital for the success of KBFs, but several challenges in Iran impede their effective implementation and enforcement. These challenges include inadequacies in support frameworks, systemic inefficiencies, and regulatory shortcomings (Falahdoost, 2020; Akbarzadeh & Shafizadeh, 2011; Moradipour, 2013).

A significant challenge is the imbalance in support systems designed for knowledge-based enterprises. While efforts from the vice presidency responsible for these companies have been made, the current support framework often fails to adequately address the diverse needs of larger, more established firms. This disparity in support allocation can stifle the growth potential of companies that have demonstrated higher success prospects (Fartash et al., 2022). The need for a more nuanced support system that can accommodate the varied requirements of different KBFs is evident.

Additionally, the stringent criteria governing the allocation of academic support present further complications.

Initiatives under the Scientific Vice Presidency, such as those meant for science and technology parks, may not align well with broader operational needs like tax incentives and working capital support. This misalignment highlights the necessity for more flexible and inclusive support mechanisms that address the dynamic needs of KBFs (Fartash et al., 2022).

Another pressing issue is the insufficient dissemination of information regarding available support packages. This lack of awareness limits companies' ability to effectively leverage resources and hampers their strategic planning efforts. Furthermore, the fluctuations and reductions in support over project durations contribute to instability, undermining long-term planning and sustainability within the sector.

Moreover, the current support mechanisms, particularly those under the vice presidency, have shown inefficiencies in facilitating international market penetration and expansion for KBFs. This limitation presents a significant barrier to their global competitiveness and ability to capitalize on international growth opportunities.

Addressing these challenges necessitates a comprehensive approach to reforming support frameworks and enhancing regulatory clarity. It is crucial to create an environment that fosters innovation, transparency, and sustainable growth for KBFs in Iran. Aligning support mechanisms with the specific needs of these firms and improving regulatory efficiency will enable Iran to better leverage its knowledge-based economy and support the growth of its KBF sector.

4. DISCUSSION

The findings from this study reveal a complex interplay of challenges faced by knowledge-based ICT firms in

Iran, spanning financial, market development, political, regulatory, and business model domains. These findings underscore the multifaceted nature of obstacles that impede the growth and sustainability of these firms, each area contributing uniquely to the overall landscape.

In examining the financial challenges, it is evident that Iranian ICT firms grapple with significant constraints including difficulties in securing bank loans, navigating inaccurate tax assessments, and overcoming restrictions on international currency transfers. These issues resonate with the observations of Fartash et al. (2021) and Inyang & Okonkwo (2021), who highlighted similar financial barriers. The persistence of these financial difficulties suggests a critical need for reform in the financial sector to better support ICT firms. The constraints on capital return uncertainties further aggravate the liquidity challenges faced by these firms, which directly impacts their operational stability and growth potential.

The domestic and export market development challenges identified reflect a pressing need for Iranian ICT firms to overcome both local and global barriers. The difficulties in establishing competitive positioning, accessing distribution channels, and addressing market saturation are consistent with the struggles reported by Mohan & Ali (2019) and Suwannaporn & Speece (2010). These challenges are compounded by economic stagnation and customs-related issues, which are significant impediments to market expansion. The findings underscore the necessity for enhanced economic diplomacy and strategic market development efforts to bolster both domestic and international market presence.

Political, regulatory, and legal challenges represent another critical

dimension impacting ICT firms. The study's results align with Fartash et al. (2021) and Inyang & Okonkwo (2021) in highlighting the inadequacies in legal frameworks and regulatory oversight. The lack of clear regulations, coupled with high legal costs and the evolving nature of ICT laws, creates an uncertain operating environment for these firms. This instability in the regulatory landscape necessitates a more robust and adaptive legal framework to support innovation and safeguard intellectual property.

The analysis of business model challenges reveals that ICT firms face substantial operational hurdles, including limited access to quality equipment and the high cost of retaining skilled personnel. These challenges are exacerbated by mandatory military service and logistical issues related to imported equipment, echoing concerns raised by Tavakkol & Ghazinouri Naeini (2010) and Fartash et al. (2021). Addressing these issues requires strategic interventions to streamline import processes, enhance talent retention, and optimize operational efficiency.

Lastly, the challenges related to the implementation of knowledge-based law highlight systemic inefficiencies and regulatory shortcomings. The study confirms findings from Falahdoost (2020) and Fartash et al. (2022), showing that inadequate support frameworks and insufficient dissemination of information about available resources hinder the effectiveness of knowledge-based policies. Reforming support mechanisms and improving regulatory clarity are essential to fostering a conducive environment for innovation and growth.

Overall, targeted reforms and strategic interventions can mitigate these issues while significant challenges persist across multiple domains. By addressing financial constraints, enhancing market

development strategies, strengthening legal frameworks, and resolving business model inefficiencies, Iran's knowledge-based ICT firms can achieve sustainable growth and bolster their competitiveness in the global digital economy. These findings contribute to a deeper understanding of the multifaceted barriers faced by ICT firms and highlight the need for coordinated efforts to create a more supportive and dynamic environment for innovation.

5. CONCLUSION

This research systematically examined the growth challenges faced by knowledge-based ICT firms in Iran, revealing critical barriers in financial constraints, domestic and export market development, political and regulatory complexities, business model issues, and the enforcement of knowledge-based laws. Unlike previous studies that focus on isolated factors, this study offers a comprehensive analysis of these multifaceted challenges within the Iranian context. The findings underscore the need for substantial policy reforms, enhanced governmental coordination, and targeted interventions. Key recommendations include refining tax policies, improving international market entry strategies, revising regulatory frameworks, and optimizing support mechanisms for knowledge-based enterprises. While this study provides a detailed overview of the challenges and solutions, it acknowledges limitations such as the generalizability of findings beyond Iran and the potential impact of evolving global economic conditions. Future research should explore longitudinal impacts of policy changes and investigate the effectiveness of proposed reforms in facilitating sustainable growth and innovation within the ICT sector.

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