

Challenges in E-Commerce Adoption in Iran's Paper Industry: A Barrier Analysis Approach

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ABSTRACT

Paper industry is one of the key sectors in Iran. Similar to other industries, it requires the adoption of electronic facilities—particularly e-commerce—in order to achieve growth and progress. The present study aimed at identifying the barriers to implementing e-commerce in Iran's paper industry. From a methodological standpoint, this research study is exploratory in nature and employs a qualitative approach. Initially, the theoretical foundations of barriers to implementing e-commerce in Iran's paper industry were examined. Subsequently, semi-structured interviews were conducted with 10 experts and professionals engaged in paper-related industries and electronic commerce in Tehran, each with over five years of relevant experience. Following a content validity assessment by experts, a questionnaire was developed using the Delphi technique. After conducting three iterative rounds and achieving expert consensus, the barriers were classified into five categories of regulatory and institutional barriers, financial and infrastructural barriers, organizational and managerial barriers, cultural and behavioral barriers, and technological and operational barriers. Data analysis revealed a total of 46 barriers to e-commerce implementation in Iran's paper industry. Theoretically, this study enriches the literature on e-commerce adoption barriers in developing economies by providing a sector-specific model, while practically it offers policymakers and industry managers actionable strategies to overcome the structural, behavioral, and contextual challenges in Iran's paper industry.

KEYWORDS

E-commerce implementation, paper industry, structural barriers, behavioral barriers, contextual barriers.

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Introduction

E-commerce has a place in the development of digital economy. Especially in today's era of globalization and technology, using online services is becoming more and more popular. E-commerce is a concept that entered the business vocabulary in the 1970s (2024). Digitalization has become increasingly important for economic activities and economic development. E-commerce, as a part of local and international trade, is of increasing importance and is highly correlated with technological advancements and innovations (Paun et al., 2024). E-commerce, as one of the most significant technological advancements of the past two decades, has revolutionized global business practices. Its major advantages include access to new markets, expanded customer bases, streamlined supply chains, enhanced customer service, higher profitability, and reduced costs (Gregory et al., 2019). Broadly, e-commerce refers to commercial transactions conducted via communication and information systems. Although it is a relatively new phenomenon, its vital role in everyday life is indisputable (Henseler et al., 2015). Among its simplest and most effective applications is the purchase and sale of goods and the transfer of funds through smart cards. Importantly, e-commerce holds even greater potential to create value for businesses and consumers in developing countries than in developed economies (Kshetri, 2007).

E-commerce is no longer a complementary tool, but the main driver of digital economy, transforming value creation processes in various industries around the world (Ren et al., 2024). E-commerce has the potential to improve efficiency and productivity across multiple sectors and has therefore attracted increasing attention worldwide. However, skepticism persists regarding its applicability in the context of developing countries. Insufficient economic infrastructure and the absence of national Information and Communication Technology (ICT) strategies constitute major obstacles for adopting and developing e-commerce in these contexts (Lawrence et al., 2010).

The rapid expansion of the Internet has given rise to the concept and practice of e-commerce as a global reality. Internet-based economic structures and networks have become a new business paradigm, enabling individuals and organizations to benefit from the convenience of international trade. Nevertheless, many developing nations remain excluded from this transformation due to persistent barriers (Alyoubi, 2015). Organizational incompatibility is among the critical challenges, as the high costs of website development, difficulties in organizational restructuring, and lack of integration of the Internet into business strategies hinder widespread adoption (Akbari, 2005).

The analysis of e-commerce transactions highlights significant benefits, including reduced costs, faster delivery, improved service quality, expanded market coverage, quicker identification of opportunities and threats, and increased production diversity (Gibbs & Kraemer, 2004). Business growth in e-commerce is closely linked to the exchange of information among industry actors, particularly through business-to-business (B2B) commerce.

B2B e-commerce plays a particularly critical role in the paper industry, given the

need for communication and information exchange between pulp and paper producers as well as in the import of raw materials. The Pulp and Paper Industry (PPI) involves the production of cellulose-based products from wood and constitutes one of the largest industrial sectors globally. Due to its substantial economic value, the PPI has become one of the world's most significant industries (Buzuku & Kraslawski, 2017).

Globally, the pulp and paper sector has witnessed rapid growth, resulting in increasing demand for raw materials. These inputs fall into three categories of wood-based, non-wood-based, and recycled wastepaper (Abd El-Sayed et al., 2020). The pulp and paper industry is considered as the fourth-largest energy-intensive industry worldwide (Santos et al., 2021). Over the recent decades, the industry has experienced notable shifts in regional and global market shares in terms of production capacity and consumption patterns. In Iran, limited domestic resources coupled with growing demand for wood and its derivatives have made imports the primary means of meeting national needs (Dashti et al., 2020). With population growth and rising consumption, the demand for paper imports is expected to increase in the coming years (Namdari et al., 2019).

Given these trends, using e-commerce is increasingly important for facilitating imports and establishing connections with other countries. Moreover, e-commerce can reduce reliance on bilateral agreements, allowing for multilateral contracts that enhance stability, sustainability, and efficiency. By minimizing unnecessary costs associated with bilateral arrangements, e-commerce also reduces expenses arising from human error while improving managerial decision-making at the firm level. Despite its importance, few studies have investigated e-commerce within the Iranian paper industry. Accordingly, this study addresses this research gap by identifying the barriers to implementing e-commerce in this sector.

Literature Review

Definition of E-Commerce

Electronic commerce, or e-commerce, is the buying and selling of goods and services or the transfer of funds or data online, enabled by platforms ranging from global marketplaces to regional portals (Ren et al., 2024). E-commerce refers to conducting processes electronically with the purpose of exchanging money, goods, services, and information (Safari, 2004). The emergence of the Internet has transformed interactions and transactions in all fields including entrepreneurial activity (Kwilinski et al., 2019). At its core, e-commerce encompasses the online purchase and sale of goods and services, as well as related domains such as electronic marketing, e-finance, e-insurance, and e-banking. Technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), management systems, and automated data collection all form the integral components of e-commerce. Beyond transactions, consumers frequently use the Internet as an information resource—for example, to compare prices or review new products.

E-commerce models include:

1. **Business-to-Consumer (B2C):** Direct sales from firms to individual customers.
2. **Business-to-Business (B2B):** Transactions between firms addressing other firms' needs.
3. **Consumer-to-Consumer (C2C):** Peer-to-peer exchanges where individuals sell goods directly to other consumers.
4. **Government-to-Consumer (G2C):** Government services delivered to citizens via online platforms, e.g., utilities and public services.
5. **Business-to-Employee (B2E):** Companies offering online services and products specifically for their employees.
6. **Consumer-to-Business (C2B):** Consumers collectively offering products or services to firms, often through group buying models (Rèklaitis & Pilelienė, 2019).

Barriers to E-Commerce Development

Major barriers to e-commerce adoption in developing countries include:

- Lack of legal frameworks (e.g., acceptance of electronic signatures and documents);
- Limited availability of credit cards and transfer systems for electronic funds;
- Absence of a national e-commerce backbone and related hardware;
- High initial implementation costs, particularly for SMEs;
- Lack of knowledge and cultural readiness for e-commerce;
- Inadequate security and confidentiality in transactions;
- Incompatibility of domestic debit cards with international systems;
- Restrictions on cross-border online sales due to sanctions and lack of international trust in Iranian platforms;
- Absence of domestic institutions to certify online commercial websites (Pourmehdi Borujeni & Amani, 2018).

The Paper Industry in Iran

The Pulp and Paper Industry worldwide has witnessed rapid growth, resulting in substantial demand for raw materials. These materials are generally classified into three groups of wood-based, non-wood-based, and recycled wastepaper (Abd El-Sayed et al., 2020).

The pulp and paper sector is recognized as the **fourth most energy-intensive industry (EII)** worldwide (Santos et al., 2021). Over the recent decades, it has undergone significant changes in regional and global market shares regarding its production capacity and consumption patterns. In Iran, due to limited domestic resources and rising consumption of wood and its derivatives, imports have become the primary means of meeting national demand (Dashti et al., 2020). With the increasing population and higher consumption of paper products, the demand for imports is expected to rise further in the coming years (Namdari et al., 2019).

A study conducted in Iranian oil and gas industry revealed that advanced information and communication technology and e-commerce can create significant economic changes in the oil and gas industry. For this reason, Iran's government has realized the

importance of using e-commerce in most industrial fields, but due to specific problems, such as legal, cultural, logistical and infrastructure problems, the use of e-commerce in manufacturing sectors has not been completely possible. In the study of the current situation, it was found that e-commerce in industry faces several problems, but if the obstacles to the establishment and development of e-commerce are removed, then the benefits of using e-commerce will accrue to this industry (Ali Ahmadi, & Hoor Ali, 2005). Research indicates that the most influential factors driving increased paper imports in Iran are Gross Domestic Product (GDP) and the volume of harvested timber from the northern forests. Additionally, exchange rates, import prices (beyond government control), and economic sanctions strongly affect the industry. These findings highlight the urgent need to strengthen the domestic paper production through greater investment and capacity building. Moreover, given the declining timber production in Iranian forests due to environmental concerns and the legal ban on logging, wood cultivation initiatives are necessary. Attention to these measures could significantly reduce paper imports and prevent foreign currency outflow under sanction conditions (Dashti et al., 2020).

Research background

In this section, the prior studies are reviewed. Based on the researcher's knowledge, although no study has been conducted using the same model used in the present research study, several studies have examined the relationships between at least two of the variables included here.

Table 1.
A Summary of Previous Research

	Authors & Year	Title	Objectives	Findings
1	Rathee & Chandraprakash (2017)	Barriers to e-commerce in developing countries	To examine barriers to e-commerce adoption in developing countries	The level of adoption is constrained by numerous factors such as unreliable infrastructure, lack of governmental policy frameworks, absence of banking facilities (e.g., credit cards), and lack of awareness regarding the benefits of e-commerce. Education level, limited access to IT, insufficient skills, and low penetration of personal computers and telephones further hinder the adoption. Despite these barriers, developing countries still hold great potential for e-commerce as a development tool.
2	Zaied (2012)	Barriers to e-commerce adoption in SMEs in Egypt	To identify barriers to e-commerce adoption in SMEs in Egypt	The study emphasizes the need to accelerate e-commerce adoption. Security and privacy were highlighted as top priorities. Developing unified strategic plans for e-commerce projects was considered essential. Cultural and social structures specific to Egypt should also be addressed to raise awareness and encourage acceptance of e-commerce and related services.

	Authors & Year	Title	Objectives	Findings
3	Amirkhani & Motaghi (2011)	Barriers and solutions for implementing e-commerce in insurance industry (case study: Asia Insurance Company)	To examine the relationship between structural, behavioral, contextual, and essential factors with the lack of e-insurance development	Structural factors were significantly related to the underdevelopment of e-insurance. These included weak performance of executive and coordinating bodies, poor organizational structures, technological deficiencies, and insufficient budgets. Weakness in one factor led to underdevelopment in others.
4	Mahmoudi Meymand et al. (2011)	Barriers to e-commerce adoption in dried fruit export industry (case study: East Azerbaijan Province)	To identify barriers with the greatest impact on e-commerce rejection among export-oriented SMEs	The most important barriers included lack of efficient alternatives for payment systems (letters of credit), issues with multilingual websites and marketing, deficiencies in e-banking systems, lack of buyer's trust in product quality, delivery, and added value, shortage of expert staff in consulting, designing, training, and implementing e-commerce, lack of top management support, absence of standards between buyers and sellers, ambiguity in government regulations, weak international agreements, and inadequate security frameworks.
5	Ali Ahmadi, & Hoor Ali(2005)	Studying the status of using information technology and e-commerce in Iran's oil and gas industry	Examining the applications of e-commerce in oil and gas industry and the level of readiness of this industry	E-commerce in industry faces several problems, but if the obstacles to the establishment and development of e-commerce are removed, then, the benefits of using e-commerce will accrue to this industry.
6	Seidi (2024)	Designing a model to improve the behavior of Iranian handicrafts e-commerce customers by increasing the customer trust	To design a model for improving the behavior of Iranian handicrafts e-commerce customers by increasing the customer trust	In the quantitative phase, a four-level model was obtained. The most effective indicator of this model is electronic communication and interaction with customers. Also, its most effective indicator at the seventh level is confidence in purchasing. Therefore, other criteria also play the role of interface factors in this model.

(Source: Researcher's Findings)

A review of the existing research reveals that the issue of e-commerce has been studied in some industries, but earlier studies have not specifically addressed the issue of e-commerce within the paper industry. This absence highlights a research gap, which the present study aims to fill by identifying and analyzing the barriers to e-commerce implementation in Iran's paper sector.

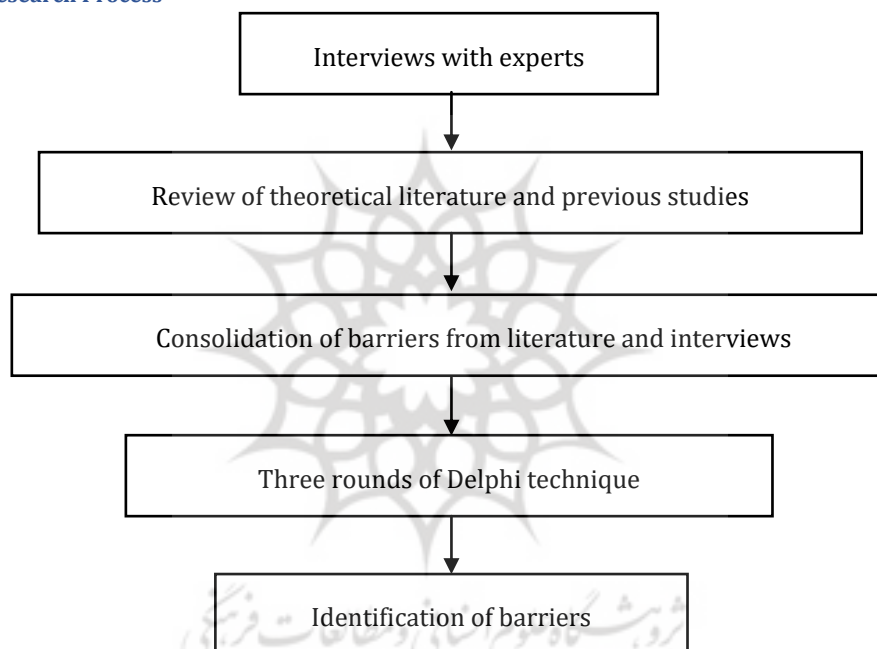
Methodology

This study adopts a qualitative and exploratory research design. The statistical population consists of specialists and experts in paper industry and e-commerce in Tehran. They are active in this field, each with at least five years of relevant experience.

The sample size reached the theoretical saturation of 10 people using a non-random purposive sampling method. Semi-structured interviews were conducted either through telephone conversations or via WhatsApp.

To identify the barriers, initially the potential barriers were extracted from the literature review and interviews. These items were then validated by experts to ensure their content validity. Then, the Delphi technique was employed. The purpose of using the Delphi technique is to refine and identify the importance of extracted barriers. In three iterative rounds, the experts were asked to rate and refine the identified barriers until consensus was achieved. Ultimately, the barriers were classified into five major categories.

Figure 1.
Stages of the Research Process



(Source: Researcher's Findings)

To ensure the **validity and reliability** of the qualitative research (thematic analysis), the following strategies were employed (Creswell & Miller, 2000):

1. **Member checking:** Five experts (including a commercial officer, a senior business consultant, a sales manager, a board member, an IT manager, a business supervisor, and an analyst) reviewed the initial analysis and coding results and their feedback was incorporated.
2. **Peer review:** Three specialists in paper industry reviewed the coding and their recommendations were integrated into the model development.
3. **Participatory approach:** Participants were involved simultaneously in the analysis and interpretation of data.
4. **Triangulation:** The study employed methodological and participant triangulation. Interviews were conducted with both e-commerce experts and paper industry professionals, covering diverse organizational roles and backgrounds.

Thematic analysis was conducted using **MAXQDA (version 12)**. To validate the Delphi process and assess the consensus, **SPSS (version 25)** was used, employing **Kendall's coefficient of concordance**.

Table 2.

Sample Quotes from the Interviewees and Extracted Codes

Participants' Quotes	Initial Themes
"There is a lack of a comprehensive framework for regulatory arrangements".	Absence of a comprehensive regulatory framework
"There are unresolved disputes in the field of e-commerce within the paper industry".	Existence of disputes in paper industry e-commerce
"The absence of laws on financial and credit information disclosure creates insecurity".	Lack of laws for financial and credit information disclosure
"The absence of clear regulations for ensuring transparency in contractual obligations is a barrier".	Lack of clear and enforceable contract transparency regulations
"The initial cost of e-commerce infrastructure is extremely high".	High infrastructure costs
"Despite cost-benefit considerations, management decisions tend to focus only on costs without considering long-term benefits".	Cost-centered decision-making

(Source: Researcher's Findings)

Finding

Each of the experts expressed the obstacles to implementing e-commerce in paper industry in Iran. By examining the quotes, related themes were created. Table 3 presents the main themes and sub-themes of barriers to implementing e-commerce in Iran's paper industry, based on the participants' perspectives.

As shown in Table 3, the barriers to e-commerce implementation were categorized into five groups, based on expert consensus from the Delphi method, with 53 identified codes.

Following the identification of barriers, the **Content Validity Ratio (CVR)** was applied. Using the Delphi technique in three stages, the questionnaire was refined from 53 to 48 items, retaining only those items that achieved acceptable CVR scores.

By the third Delphi round, the **Kendall's coefficient of concordance** reached **0.808 (~81%)**, exceeding the 70% threshold, and was statistically significant ($p < 0.01$). This demonstrated substantial consensus among experts. Additionally, one-sample t-tests confirmed that the mean values of all items were significantly higher than the neutral midpoint (3 = "moderate" in the questionnaire).

Table 4 shows the final list of 46 themes that were confirmed from the 53 themes in the Delphi research process and prioritized based on the importance.

Table 3.
Barriers to E-commerce Implementation in Iran's Paper Industry

Main Themes	Sub-Themes (Barriers)	Participant Code
Regulatory & Institutional Barriers	Weakness in comprehensive regulatory frameworks	1,2,4,8
	Existence of disputes in e-commerce	1
	Weakness in laws regarding financial and credit information disclosure	1,2,4,6,7,10
	Low consistency between laws and capabilities	3
	Laws developed based on personal discretion	3
	Weakness in buyer-seller regulations	7
	Weakness in electronic case personalization	9
	Government mismanagement in paper industry	2
	Extensive attempts to restrict the Internet access	4
	Lack of coordination between buyers and sellers	5
	Weak integration into the global value chain	4
Financial & Infrastructural Barriers	High infrastructure costs for e-commerce	1,6,8
	Misallocation of investments	1
	High costs in e-commerce industry	7
	Inadequate commercial infrastructure	3
	Lack of operational infrastructure for e-commerce	5
	Weak technical infrastructure in paper industry	5
	Low investment risk tolerance	4
Organizational & Managerial Barriers	High risk in profits and losses in e-commerce	2,8
	Inadequate performance evaluation	3
	Lack of training for senior managers	3
	Weak training for operational staff	3,5,4,10
	Over-reliance on trial-and-error learning	3,5,9,4,10
	Low managerial awareness	3,10
	Weak managerial culture regarding e-commerce	3
	Weak managerial risk-taking ability	3
	Poor time management in operations	10
	Low levels of stakeholders' dialogues	7
	Insufficient managerial welfare facilities	5
Cultural & Behavioral Barriers	Lack of maturity in e-commerce within the industry	6
	Minimal changes in economic return models	5
	Low level of public awareness	2,6,7,10
	Low awareness among operational staff	4
	Dependence on traditional (paper-based) methods	5
	Low level of trust between buyers and sellers	2
	Low level of national awareness and culture of e-commerce	2
	Low level of digital literacy of operational staff	9
	Poor digital culture among operational staff	9
	High average age of population	1,2,8
	Low valuation of time in society	1
	Lack of time-saving practices	6
	Limited use of modern trade methods	1
Technological & Operational Barriers	Lack of consensus among investors	6
	Low level of trust among investors	2
	Lack of automation in operations	3
	Weak documentation of customer information	3,9
	Low transparency	4,10
	Process complexity	5
	Inefficient user services	5,9
	Limited use of modern data processing software	3,6
	Insufficient electronic services	8
	Weak utilization of digital tools for service provision	6,10
	Limited adoption of new technologies	5

(Source: Researcher's Findings)

Table 4.

Final Barriers to E-commerce Implementation in Iran's Paper Industry

Barriers to E-commerce Implementation in Iran's Paper Industry	
1	Weakness in comprehensive regulatory frameworks
2	Existence of disputes in e-commerce
3	Weakness in laws on financial and credit information disclosure
4	Laws developed based on personal discretion
5	Weakness in electronic case personalization
6	Poor documentation of customer information
7	Low transparency
8	Complex processes
9	High costs of e-commerce infrastructure
10	Misallocation of investments
11	High operating costs in e-commerce
12	Lack of training for senior managers
13	Weak training for operational staff
14	Over-reliance on trial-and-error training
15	Inadequate commercial infrastructure
16	Lack of operational e-commerce infrastructure
17	Weak technical infrastructure
18	Inefficient user services
19	Insufficient electronic services
20	Weak use of digital tools for service delivery
21	Low level of public awareness
22	Low level of managerial awareness
23	Low level of operational staff awareness
24	Dependence on traditional (paper-based) methods
25	Low level of buyer-seller trust
26	Lack of investor consensus
27	Low level of investors' trust
28	High average age of population
29	Minimal adoption of modern trade
30	Government mismanagement in paper industry
31	Extensive Internet restrictions
32	Lack of buyer-seller coordination
33	Lack of maturity in e-commerce
34	Low valuation of time in society
35	Lack of time-saving practices
36	Poor time management by staff
37	Low level of national e-commerce awareness and culture
38	Weak digital literacy of operational staff
39	Weak managerial culture in e-commerce
40	Weak digital literacy of staff
41	High profit/loss risk in e-commerce
42	Low level of investment risk-taking
43	Low level of managerial risk tolerance
44	Limited adoption of new technologies
45	Low levels of stakeholders' dialogues
46	Insufficient managerial welfare facilities

(Source: Researcher's Findings)

The structural barriers include weaknesses in infrastructure, lack of adequate digital platforms, absence of integrated databases, limited access to reliable Internet services, high costs of technology implementation, and insufficient legal support for e-commerce transactions.

Behavioral barriers relate to human factors such as resistance to change, low

motivation among managers and employees, lack of trust in online transactions, and limited awareness of the benefits of e-commerce.

Contextual barriers involve broader environmental and institutional challenges, including economic instability, insufficient government support, legal uncertainties, sanctions, lack of international cooperation, and weak financial and banking systems.

Overall, the findings suggest that structural and contextual barriers exert a stronger influence than behavioral ones in hindering the adoption of e-commerce in Iran's paper industry.

Discussion

Given the paper industry's reliance on imports of raw materials and international trade, e-commerce could serve as a powerful tool for improving efficiency, reducing costs, and expanding global partnerships. However, unless structural deficiencies and contextual barriers are addressed, the potential of e-commerce in this sector will remain underutilized.

The present study made an attempt to identify the barriers to implementing e-commerce in Iran's paper industry. Initially, the barriers to implementing e-commerce in Iran's paper industry were studied from the viewpoint of theoretical foundations. Subsequently, interviews were conducted with the experts, and using the results of these interviews and implementing content analysis, the barriers to implementing e-commerce in Iran's paper industry were extracted and categorized. Having assessed the validity and reliability of the content analysis section, a questionnaire was prepared for the first stage of the Delphi technique. Finally, after conducting three stages of the Delphi technique and reaching a consensus among experts regarding the barriers to implementing e-commerce in Iran's paper industry, the barriers were presented in five sections.

The results of this study confirmed the existence of multifaceted barriers to implementing e-commerce in Iran's paper sector. Structural obstacles, such as inadequate ICT infrastructure and high technology costs, remain critical. These findings align with previous studies emphasizing the importance of infrastructure readiness as a prerequisite for successful e-commerce ([Alyoubi, 2015](#); [Lawrence et al., 2010](#)).

Behavioral barriers also play a role, albeit to a lesser extent. The reluctance of industry stakeholders to shift from traditional practices to digital solutions reflects the persistence of cultural and attitudinal constraints. However, as international experience shows, behavioral resistance can often be overcome through training, holding awareness programs, and showcasing the tangible benefits of e-commerce ([Gibbs & Kraemer, 2004](#)).

Contextual barriers are perhaps the most formidable barriers in Iran. Economic sanctions, international trade restrictions, and the incompatibility of Iranian banking systems with global financial networks have severely limited the growth of e-commerce in paper industry. In this regard, the Iranian case illustrates how political and institutional conditions can hinder technological adoption, even when structural and behavioral readiness is partially present.

Conclusion

This study set out to identify the barriers hindering the adoption of e-commerce in Iran's paper industry. Using the Delphi method, 46 barriers were identified and classified into five categories of regulatory and institutional barriers, financial and infrastructural barriers, organizational and managerial barriers, cultural and behavioral barriers, and technological and operational barriers. The results highlighted that contextual and structural barriers pose the greatest challenges.

Based on the research findings and identification of barriers to e-commerce implementation in Iran's paper industry, the following practical strategies are proposed:

1. Strengthening Legal and Regulatory Frameworks

- Establish a comprehensive, transparent, and unified legal system for digital transactions.
- Develop clear and enforceable laws concerning financial and credit information disclosure.
- Eliminate ambiguities in regulations and reduce reliance on personal discretion in lawmaking.
- Ensure continuous updates of regulations to align with global standards in e-commerce.

2. Enhancing Infrastructure

- Invest in upgrading technical and operational infrastructures of the paper industry.
- Reduce the high initial costs of establishing e-commerce platforms through government subsidies, tax incentives, or public-private partnerships.
- Expand the use of digital tools and modern software for data management, customer relationship management, and online transactions.

3. Capacity Building and Training

- Organize targeted training programs for senior managers to raise their awareness about the strategic role of e-commerce.
- Provide operational training for employees to improve their digital literacy and reduce their dependence on trial-and-error learning.
- Promote a culture of continuous professional development in digital commerce across all organizational levels.

4. Promoting Awareness and Cultural Readiness

- Conduct national campaigns to raise awareness regarding the benefits and opportunities of e-commerce among the general public.
- Encourage media, universities, and professional associations to play a more active role in fostering digital literacy.
- Cultivate a cultural shift that emphasizes time management, efficiency, and trust in digital interactions.

5. Building Trust and Reducing Risks

- Establish mechanisms for consumer protection, including secure payment

systems, dispute resolution centers, and transparent service guarantees.

- Develop certification and accreditation systems for commercial websites to enhance credibility and trustworthiness.
- Encourage insurance companies to offer risk coverage for e-commerce transactions.

6. Improving Governmental Support and Policy Alignment

- Ensure greater government coordination and effective management in paper industry, particularly in supporting the technological adoption.
- Remove unnecessary restrictions on the Internet access that hinder e-commerce development.
- Facilitate Iran's integration into the global e-commerce value chain through international agreements and partnerships.

7. Encouraging Investment and Innovation

- Create financial incentives for investors to engage in e-commerce projects within the paper industry.
- Foster innovation by supporting startups and SMEs working in digital trade solutions for the industry.
- Promote the adoption of emerging technologies such as Blockchain, AI-based platforms, and Big Data Analytics.

By addressing these barriers, Iran's paper industry can move toward digital transformation, improving its competitiveness and sustainability in both domestic and international markets.

Limitations and Future Research Directions

The limitations of this study are as follows:

1. Since the study is qualitative, the generalizability of the findings should be approached with caution.
2. The study population was limited to experts, specialists, and authorities in paper and e-commerce sectors. Including opinions of active industry practitioners could have further enriched the identification of barriers.
3. The study could not control certain unrelated or confounding variables such as response motivation, fatigue during participation, or some external factors affecting the participants.
4. Another limitation is the scarcity of domestic research on barriers to e-commerce adoption.

Research Recommendations

Future researchers are advised to employ semi-structured interviews to obtain more precise results. It is recommended that future studies examine user experiences in conducting e-commerce activities to gain insights into mental models and practical experiences that can enhance the status of e-commerce in the country. Some research suggestions are presented here.

- Design and Implementation of a Specialized E-Commerce Platform for Iran's paper industry: A Case Study Based on the Needs of Producers, Distributors, and End Users;
- The Impact of E-Commerce on Reducing Supply Chain Costs in Paper Industry;
- Analysis of Success Factors and Barriers to E-Commerce Adoption in Small and Medium-Sized Paper Manufacturing Firms in Iran: An Integrated TAM-TOE Model.

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