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IMPROVING INTERNATIONAL BUSINESS EFFICIENCY WITH DIGITAL TECHNOLOGIES

The rapid advancement of digital technologies is reshaping international business, offering new opportunities for growth and efficiency. Technologies like AI, Big Data analytics, blockchain, and IoT are revolutionizing business processes, enhancing decision-making, and enabling more effective execution of international projects. The adoption of these technologies has accelerated due to their ability to streamline business operations, improve coordination, and foster collaboration. In the face of intense global competition, businesses increasingly turn to digital solutions to stay ahead. The COVID-19 pandemic further underscored the importance of digital technologies in reducing costs, saving time, and facilitating global trade during times of crisis. While digital technologies offer significant benefits, they also bring challenges, such as the need to balance old and new values within organizations. However, the potential to reduce production and sales costs, improve capacity utilization, and streamline processes outweighs these challenges. Additionally, digital technologies enable direct online interactions with international customers, reducing the need for intermediaries and lowering the cost of sales. The study aims to examine how specific digital technologies impact the efficiency of international business operations. For this purpose, a survey of 101 respondents with experience in international business was conducted. The processing of survey results using regression analysis methods revealed that the implementation of cloud technologies had the greatest impact on increasing the efficiency of operational processes in international business; blockchain technology also played an important role. In

addition, the use of digital technologies in international business has a substantial impact on the cost structure due to a significant reduction in operating costs.

Keywords: *International business efficiency, Digital technologies, Supply chain management, Financial management, Collaboration, Cost reduction.*

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ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ МІЖНАРОДНОГО БІЗНЕСУ ЗА ДОПОМОГОЮ ЦИФРОВИХ ТЕХНОЛОГІЙ

Швидкий розвиток цифрових технологій змінює міжнародний бізнес, пропонуючи нові можливості для зростання та ефективності. Такі технології, як штучний інтелект, аналітика великих даних, блокчейн та Інтернет речей революціонізують бізнес-процеси, покращують процес прийняття рішень і дозволяють ефективніше виконувати міжнародні проєкти. Запровадження цих технологій прискорилося завдяки їхній здатності оптимізувати бізнес-операції, покращувати координацію та сприяти співпраці. В умовах гострої глобальної конкуренції компанії все частіше звертаються до цифрових рішень, щоб залишатися попереду. Пандемія COVID-19 ще більше підкреслила важливість цифрових технологій для зниження витрат, економії часу та сприяння світовій торгівлі під час кризи. Незважаючи на те, що цифрові технології пропонують значні переваги, вони також створюють проблеми, а саме: необхідність збалансувати старі та нові цінності в організаціях. Однак потенціал скорочення витрат на виробництво та збут, покращення використання потужностей і оптимізації процесів переважає ці виклики. Крім того, цифрові технології забезпечують пряму онлайн-взаємодію з міжнародними клієнтами, зменшуючи потребу в посередниках і знижуючи собівартість продажів. Дослідження спрямоване на вивчення того, як конкретні цифрові технології впливають на ефективність міжнародних бізнес-операцій. З цієї метою було проведено опитування 101 респондента, які мають досвід роботи в міжнародному бізнесі. Обробка

результатів опитування, з використанням методів регресійного аналізу, дозволила виявити, що найбільший вплив на підвищення ефективності операційних процесів в міжнародному бізнесі забезпечило впровадження хмарних технологій. Також вагому роль відіграла технологія блокчейн. Крім того, застосування цифрових технологій в міжнародному бізнесі істотно впливає на структуру витрат завдяки суттєвому скороченню операційних витрат.

Ключові слова: ефективність міжнародного бізнесу, цифрові технології, управління ланцюгом поставок, фінансовий менеджмент, співпраця, скорочення витрат.

Formulation of the problem. Modern technologies such as Internet of Things (IoT), Artificial Intelligence (AI), Big Data analytics, blockchain technologies, cloud computing, robotics, and advanced analytics can be used to improve business processes. These technologies notably improve supply chain management effectiveness and financial management. Robotics facilitate automation, while advanced analytics enhance risk and inventory management. Cloud-based collaboration platforms and video conferencing tools significantly improve international business processes such as collaboration and communication. Moreover, the implementation of these digital technologies has led to significant cost reductions in international business operations. The emergence of quantum computing, AI-driven development, and blockchain innovations will greatly impact the efficiency of international business operations in the next decade.

There are, however, an array of challenges that can arise in international business processes that impede the full exploitation of digital technology. Complex trade laws are one key barrier to the optimization of global value chains [13]. Despite massive simplification in trade procedures following the 1996 WTO Trade Facilitation Agreement, operational trade costs are still high, especially for developing countries [11]. Imports into many developing countries require, on average, twice as much paperwork as those in high-income countries, with attempts made by various international organizations to eliminate inefficiencies in documentation and hence speed up the release of goods lost out to the higher goal of ensuring security in supply chains [8]. Moreover, trade between developing countries tends to be less facilitating, with 73% of developing countries' exports facing non-tariff barriers from other countries in developing markets [13].

Another potential challenge is missing or incomplete cross-border digital technologies infrastructures [11]. Many countries have active initiatives to stimulate the growth of the digital economy, with many having specific e-trade aims, such as easing e-contracting and dispute resolution, enabling cross border data flows, and promoting trust and confidence in e-identification and e-authentication. However, beyond these initiatives, major roadblocks exist in various areas, such as local data storage regulations, internet censorship, cross-border delivery, and tax structures [13]. Restrictive communications typically affect the trade opportunities of international businesses, and international e-commerce firms run into these barriers particularly when aligned with ICT-enabled enablers such as cloud computing, and non-tariff measures, especially with reference to information and communication services, remain in newer trade agreements such as the Trans-Pacific Partnership [11].

Despite the rapid advancement of digital technologies such as IoT, AI, and blockchain, there is limited research on their specific impacts on international business efficiency. This study aims to address this gap by investigating how these technologies improve supply chain and financial management, enhance collaboration, and reduce operating costs.

Literature Review. The study of the impact of digital technologies on international business is the subject of research by many scientists, in particular Bai H. [1], Bennet D. [2], Hervé A. [4], Holopainen M. [5], Jum'a L. [6], Krasnyuk M. [7], Liu Z. [9], Martínez-Caro E. [10], Meyer K. [11], Purwaningsih E. [12], etc.

Hacioglu (2020) suggests that digital technologies can bring about significant change in international business processes [3]. Holopainen, Saunila & Ukko (2024) explain blockchain as a chain of data blocks linked through cryptography, ensuring data integrity and security [3]. Martínez-Caro et al. (2020) describe cloud computing as delivering computing services over the internet, offering on-demand capabilities with low administration costs [10]. The literature suggests that these digital technologies play a crucial role in enhancing international business efficiency.

The purpose of the article. This research aims to explore how digital technologies enhance international business efficiency, focusing on identifying effective technologies and their impacts, using survey methods to collect data and regression analysis to process the results.

Presentation of the main research materials. Based on the reviewed literature and the identified gaps in literature, the following hypotheses were developed.

H1=Digital technologies are effective in improving business processes in international business, with a significant positive impact on supply chain management and financial management.

H2=The implemented digital technologies have significantly reduced the cost of operations in international business.

Data collection for the study was carried out using a survey, which was conducted in several stages: pre-test study, study survey, data processing.

The pre-test study involved two online surveys: one of prospective consumers and one of the respondents who confirmed that they were participants of international small and medium enterprises. The survey respondents were encouraged through email and communications with the representatives of the research sponsors to complete the survey. It was not possible to guarantee that all of the original firms were represented in the final number of survey completions nor to determine the response rate. It was sufficient to accumulate an adequate number of observations to successfully verify the assumed research question.

Email was used as one of the main channels for the distribution of the possible survey. The respondents were strategically grouped by industry, home region, firm size, and operations profession. Based on experience communication, it was assumed that information about certain business practices conducted in already established enterprises by members of the international business community would provide helpful guidance as to what training and knowledge sharing were available for the entrepreneurs in the planning phase. This information could also provide contributions to members considering entering international business as to what they should include in their operational plans such that they could meet the requirements of their partners abroad.

After the pre-test study, the final questionnaire was formed, which included both general questions (gender, age, years of experience) and special questions about the use of digital technologies, namely:

Q1. Which of the following digital technologies have been implemented in your organization's business operations?

- A. Cloud Computing
- B. Artificial Intelligence (AI) and Machine Learning (ML)
- C. Blockchain

- D. Internet of Things (IoT)
- E. Big Data Analytics
- F. Enterprise Resource Planning (ERP) Systems
- G. Customer Relationship Management (CRM) Systems
- H. Robotics and Automation

Q2. To what extent do you believe that digital technologies implemented in your organization have improved the effectiveness of international business operations?

- A. Reduced operational costs
- B. Increased initial investment costs
- C. Reduced labour costs
- D. Increased maintenance costs
- E. Reduced transaction costs
- F. Increased training costs

Q3. To what extent do you believe that digital technologies implemented in your organization have impacted your overall cost structure?

Q4. What Metrics does your organization use to measure the ROI from implementing digital technologies for international business operations?

Q5. How frequently do you assess the ROI of your digital technology investments?

Q6. On a scale from 1 to 5, how confident are you in your ability to accurately measure the ROI of digital technologies?

Q7. Which emerging digital technologies do you believe will have the most significant impact on international business efficiency in the next 5-10 years?

Q8. Which among the above digital technologies will most significantly impact the efficiency of international business operations in the 5-10 years?

Q9. On a scale from 1 to 5, how prepared is your organization to adopt these emerging technologies?

The study survey involved 100 respondents who have work experience in promoting the digitalization of international business and access to information on improving international business by using digital technologies, and who work in various sectors of the economy and at different levels of the company. In order to assess and determine the efficiency of the digitalization of international business, the author's analysis of the literature on digital technologies focused on the modernization of international business led to the formation

of the concept of "effectiveness of the use of digital technologies to increase the efficiency of international business" and the creation of a list of factors affecting the improvement of the international business efficiency, through digital technologies based on the implementation of modern solutions for the development of international business, a significant improvement in the efficiency of the business. To measure the responses, a 5-point Likert scale was used. Data was processed in Excel and SPSS Statistics programs.

To test the hypothesis H1 regarding the possibility of the influence of digital technologies on the improvement of business processes in international business, the respondents' answers to the following questionnaire questions were used: Q1. Which of the following digital technologies have been implemented in your organization's business operations? (answers were collected separately for each digital technology from the list A-H); Q2. To what extent do you believe that digital technologies implemented in your organization have improved the effectiveness of international business operations? (a generalized assessment of the impact of digital technologies on organization's business operations on a scale of 1-5, where 1 = "not improve at all", 2 = "not improve", 3 = "slightly improve", 4 = "improve", 5 = "significantly improve").

A regression analysis of the dependence of the efficiency of international business on digital technologies was carried out based on these data (Table 1 – Table 3). According to model summary (table 1), R squared = 0.518, indicating that the independent variables explain 51.8% of the dependent variable, showing that the formed regression model is quite reliable.

Table 1. Model Summary of H1

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.720a	0.518	0.476	0.910
a. Predictors: (Constant), Cloud Computing, Blockchain, Artificial Intelligence (AI) and Machine Learning (ML), Enterprise Resource Planning (ERP) Systems, Customer Relationship Management (CRM) Systems, Internet of Things (IoT), Big Data Analytics, Robotics and Automation.				
b. Dependent Variable: Effectiveness of international business operations (Q2. To what extent do you believe that digital technologies implemented in your organization have improved the effectiveness of international business operations?)				

Source: developed by the authors

The ANOVA statistic was applied to test H1, the specific comparison was between the various digital technologies and their impact on improving international business efficiency. In Table 2, $F(8, 92) = 12.348$, p value <0.05 , suggesting that this model can significantly predict the outcome in this study. The decision rule to support or reject the hypothesis is as follows: if more than 50% of the predictors show statistical significance (p value <0.05), then the hypothesis is supported. Otherwise, it is rejected.

Table 2. ANOVA of H1

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	81.891	8	10.236	12.348	0.000b
	Residual	76.267	92	0.829		
	Total	158.158	100			
a. Dependent Variable: Q2. To what extent do you believe that digital technologies implemented in your organization have improved the effectiveness of international business operations?						
b. Predictors: (Constant), Robotics and Automation, Big Data Analytics, Internet of Things (IoT), Customer Relationship Management (CRM) Systems, Enterprise Resource Planning (ERP) Systems, Artificial Intelligence (AI) and Machine Learning (ML), Blockchain, Cloud Computing						

Source: developed by the authors

In Table 3, five out of eight predictors (cloud computing, blockchain technologies, Internet of Things, Enterprise Resource Planning Systems, Robotics and Automation) showed statistical significance, suggesting that the hypothesis H1 is supported. The implementation of cloud technologies had the greatest impact on increasing the efficiency of operational processes in international business; blockchain technology also played an important role.

To test the hypothesis H2 regarding the possibility of digital technologies to reduce the cost of operations in international business, the respondents' answers to the following questionnaire questions were used: Q2. To what extent do you believe that digital technologies implemented in your organization have improved the effectiveness of international business operations? (answers were collected separately for each possible cost reduction direction: reduced operational costs; increased initial investment costs; reduced labor costs; increased maintenance costs; reduced transaction costs;

Increased training costs); Q3. To what extent do you believe that digital technologies implemented in your organization have impacted your overall cost structure? (a generalized assessment of the impact of digital technologies on the cost structure on a scale of 1-5).

According to model summary (Table 4), R squared = 0.116, indicating that the independent variables explain only 11.6% of the dependent variable. The analytical quality of the formed regression model is low.

Table 3. Coefficients of H1

Coefficients								
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std. Error	Beta			Tolerance	VIF	
1	(Constant)	0.687	0.718		0.957	0.341		
	Cloud Computing	0.819	0.299	0.729	2.736	0.007	0.074	13.537
	Artificial Intelligence (AI) and Machine Learning (ML)	-0.248	0.225	-0.148	-1.103	0.273	0.290	3.451
	Blockchain	0.244	0.240	0.225	1.014	0.013	0.107	9.378
	Internet of Things (IoT)	0.047	0.076	0.047	0.621	0.036	0.915	1.092
	Big Data Analytics	-0.267	0.194	-0.252	-1.371	0.174	0.155	6.469
	Enterprise Resource Planning (ERP) Systems	0.085	0.083	0.086	1.028	0.006	0.743	1.347
	Customer Relationship Management (CRM) Systems	0.019	0.082	0.019	0.236	0.814	0.804	1.244
	Robotics and Automation	0.096	0.185	0.064	0.519	0.005	0.346	2.890

a. Dependent Variable: Q2. To what extent do you believe that digital technologies implemented in your organization have improved the effectiveness of international business operations?

Source: developed by the authors

Table 4. Model Summary of H2

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.340a	0.116	0.069	1.209
a. Predictors: (Constant), Increased training costs, Increased initial investment costs, Reduced labor costs, Reduced transaction costs, Increased maintenance costs				
b. Dependent Variable: Q3. To what extent do you believe that digital technologies implemented in your organization have impacted your overall cost structure?				

Source: developed by the authors

However, ANOVA results (Table 5) show $F(5, 95) = 2.483$, p value < 0.05 , suggesting that this model can predict the outcome in this study.

Table 5. ANOVA of H2

ANOVA						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.142	5	3.628	2.483	0.037b
	Residual	138.848	95	1.462		
	Total	156.990	100			
a. Dependent Variable: Q3. To what extent do you believe that digital technologies implemented in your organization have impacted your overall cost structure?						
b. Predictors: (Constant), Increased training costs, Increased initial investment costs, Reduced labor costs, Reduced transaction costs, Increased maintenance costs						

Source: developed by the authors

Using the same decision rule, Table 6 shows that all the predictors showed statistical significance, suggesting that the hypothesis H2 is supported, and the conclusion made is that the implemented digital technologies have significantly reduced the cost of operations in international business. In other words, the digital technologies have significantly impacted the cost structure of international business.

Table 6. Coefficients of H2

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	5.335	0.706		7.557	0.000		
	Increased initial investment costs	0.340	0.219	0.203	1.551	0.024	0.545	1.835
	Reduced labor costs	-0.054	0.120	-0.059	-0.455	0.650	0.549	1.820
	Increased maintenance costs	-0.022	0.152	-0.023	-0.145	0.885	0.387	2.587
	Reduced transaction costs	-0.428	0.177	-0.320	-2.413	0.018	0.528	1.894
	Increased training costs	-0.144	0.172	-0.133	-0.836	0.05	0.369	2.713

a. Dependent Variable: Q3. To what extent do you believe that digital technologies implemented in your organization have impacted your overall cost structure?

Source: developed by the authors

Conclusions and suggestions. The study concludes that digital technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), Big Data analytics, blockchain, cloud computing, robotics, and advanced analytics are highly effective in enhancing business processes. These technologies have a substantial positive impact on supply chain management effectiveness and financial management. IoT enables real-time tracking of goods, AI aids in forecasting and financial operations optimization, blockchain ensures transparency, big data analytics enhances insight generation, and cloud computing enables scalability and collaboration. Robotics automate critical tasks, while advanced analytics improve risk and inventory management. Cloud-based collaboration platforms and video conferencing tools greatly enhance international business processes by facilitating collaboration and communication.

The implementation of these digital technologies has significantly reduced operational costs in international business. Looking forward, emerging technologies such as quantum computing, AI-driven development, and blockchain innovations are expected to have a profound impact on the efficiency of international business operations in the coming decade.

Future research directions should focus on characterizing digital maturity at different levels, including micro (single enterprise), meso (industry), and mega levels. While this study primarily focused on intrinsic digital technologies that directly contribute to business improvement, there is a growing argument for the importance of extrinsic digital technologies. These technologies change how companies interact with clients, suppliers, partners, and competitors, offering additional avenues for business growth and improvement.

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