International Journal of
Economic Policy
(IJECOP)

Effect of Technology on Nationalization of the Oil Industry in South Sudan

CARI Journals

International Journal of Economic Policy
ISSN: 2788-6352 (Online)
Vol. 5, Issue No. 2, pp 82 - 101, 2025
www.carijournals.org

Effect of Technology on Nationalization of the Oil Industry in South Sudan

[1*]Kadugala J.M Aniceto, [2]Dr. Joshua Matanda Wepukhulu

[1]PhD Student, Unicaf University in Zambia, Lusaka, Zambia

[2]Lecturer, Jomo Kenyatta University of Agriculture and Technology, Kenya

https://orcid.org/0009-0002-5598-0387

Accepted: 6th Mar, 2025, Received in Revised Form: 6th April, 2025, Published: 8th May, 2025

ABSTRACT

Purpose: This paper looks at how technology helps in making nationalization policies work in different industries. Nationalization is when the government takes control of certain industries, like oil, mining, or transport. The study examines how digital platforms, big data, blockchain, and remote sensing tools assist in creating, sharing, and following these policies. While technology makes it easier, problems such as poor internet and low digital skills make it hard for some areas to benefit.

Methodology: The study utilizes a descriptive design to explain how technology supports nationalization. Participants in the study include government officials, industry personnel, and persons affected by the nationalization policies. The participants were carefully selected by the researchers to ensure they had experience with nationalization. The information was collected through interviews, surveys, and document reviews. Data collected were analyzed using numbers (statistics) and themes (main ideas) to identify trends of importance.

Results: From the research, it became evident that the industry would be aided significantly with the implementation of technology. More so, to be able to match the intricacies of lifting crude oil, it was pointed out that advanced tools and technology were of absolute necessity. Furthermore, the research suggested that the integration of state-of-the-art technologies would greatly help in lifting oil in South Sudan. As theorized, these technologies would provide significant value in improving core and overall efficiency.

Unique Contribution to Theory, Practice, and Policy: The e-governance platform helps in the dissemination of policies, big data enhances monitoring, and blockchain enhances transparency. However, all these are out of reach for many people due to poor internet access and skill deficits in using them. The study recommends investing in better internet, training workers, and making policies that ensure technology is used to the benefit of all in nationalized industries.

Keywords: *Technology, Oil Industry, Nationalization, Capacity Strengthening, Transparency, Governance Types, Environmental Concerns*

INTRODUCTION

Nationalization entails the process through which a government acquires ownership and management of private industries, resources or enterprises with the aim of servicing the needs of the country (Veress, 2022). This strategy seeks to increase economic independence, minimize reliance on foreigners, and provide for resources allocation that will aid development in the long run (Florence & Walker, 2021). In the past, nationalization could be said to be one of the guiding strategies for developing nations with abundant resources as the government has the duty to utilize such wealth for the benefit of the society (Robson, 2022). On the other hand, the undertaking of nationalization is often beset by problems of wilful inefficiency, corruption and lack of institutional capacity which may thwart its desired purposes (Durand-Lasserve, 2022).

Notwithstanding these short comings, the propensity for nationalization is still embraced as a powerful policy tool in many countries where controlling external presence while fostering internal development is desired, or in countries that are still undergoing significant socio-economic changes. Its success is linked to effective governance structures, strategies on reinvestment of resources and monitoring systems. For example, Countries with feasible nationalization policies have been able to use this policy to finance various projects geared towards the reconstruction of infrastructure, where healthcare systems, education and the employment of people were improved upon. However, uncoordinated nationalization has led to a diminished economy and conflicts between foreign investors and local firms as well as stagnation of the economy in some of the most favored areas of the economy.

The resource-driven nationalization policies instituted in resource-rich developing nations have resulted in a 40% growth in their internal revenue from 2015 to 2022, with oil exporting states being the major beneficiaries as per the International Monetary Fund estimates. However, the IMF did point out some inefficiencies and have stated that 35% of the nationalized enterprises did not succeed as compared to private enterprises.

The World Bank places governance in the focus of failure or success in the area of nationalization. A state led model which Norway adopted has resulted in creating the biggest sovereign wealth fund in the world, with $1.4t in assets, since oil revenues were reinvested in other industries. However, Venezuela that has been managing its oil industry with an erratic, state-centered approach succumbed to hyperinflation of over 500% by 2023. United Nations Conference on Trade and Development (UNCTAD) makes similar observations when nations which have well-defined and coherent policies for nationalization seem to have 20-25% greater foreign investment in sectors avoiding nationalization resulting in equilibrium between public and private interests (Canton, 2021). This goes to support a widely held view that, nationalization is a double-edged sword: properly applied it can be a mechanism of control and development on the economy, while poorly managed, it becomes another reason for stagnation.

Nationalization has had a significant impact on how each country's economy has developed globally. The cases of Saudi Arabia and Norway exemplify strong economic growth where

industries are state-controlled provided there is efficiency and transparency. In the case of Norway, the revenues that are accrued from the oil assets that have been nationalized are used to cater for social welfare, and infrastructural development, and also yields high returns for the state (AlQahtani, 2022). In 2022, Saudi Arabia's sole national oil company, Aramco made an impressive $161 billion in profit, which means the oil company sits directly in the center of the nation's path toward diversification (Remsey, 2023).

Nationalized oil in Venezuela led to great economic mismanagement and inflation, leading to public debt reaching trillions of dollars and close to 90% of the public living under the poverty line (Lampis et al., 2022). Similar to Venezuela, Argentina also faced its own share of challenges from nationalization which lead to an array of investors walking out of tax disputes and deficits (Murshed et al., 2022). These cases exemplify the need for strong leadership, thorough institutional reforms and sound financial judgment in order to negate the effects that are caused by nationalization policies (Lallana et al., 2021). Other regions especially developing nations can learn how to utilize nationalization policies in order to foster sustainable economic growth from the global experience(Barrera et al., 2022).

In Sub-Saharan Africa, the process of nationalization has emerged as an important strategy for regaining control over natural resources and ensuring a fair distribution (Copinschi, 2022). Through its parastatal, the Nigerian National Petroleum Corporation, Nigeria, the giant of oil production in Africa, also nationalized the petroleum industry (Bala & Tar, 2021). However, while the NNPC controls a number of oil fields, it still suffers low operational efficiency with a noted drop of 15% in oil production (NNPC Report, 2022) partly as a result of oil pipeline vandalism and theft (Adeola et al., 2022). For instance, while the Angolan Sonangol, which is state owned, earned over $30 billion in profits in 2012 (IMF Angola Report 2023), the industry is rife with corruption and aid funds are not reinvested in development (Olowe, 2021).

South Sudan, which is the subject of the research, shows both the advantages and disadvantages of nationalization in post war economies (Hakimi et al., 2022). More than 90% of the overall revenue of the government comes from oil. Nonetheless, it is the nation's primary source of income. The state also has severe problems like corruption, lack of developed infrastructure and shortage of qualified personnel (Katouzian, 2024). So, after several decades of civil war South Sudan emerged as a nation with policies that excluded its citizens from the oil sector and today only 30% of workers are South Sudanese (Ladu et al., 2021).

In addition to this, the nation overall lacks basically any infrastructure with roads only being 2% paved and only 7% of the population in that region having access to electricity (AfDB Report 2023). Furthermore, other problems are made worse by the alleged mismanagement of funds such as $700 million in oil revenue that went missing which made it clear that there is a need for reforms in the institutional framework, building of the essential governance and a stable system and tools needed to use nationalization for positive economic growth and development in South Sudan (Patey, 2024).

Technology should act as a catalyst for nationalization, allowing governments to maximize resource benefits, create employment opportunities for local populations, and strengthen economic self-reliance (Nagtegaal, 2021). The innovations should be able to promote nationalization by enhancing local capacity, reducing reliance on foreign expertise, and ensuring resource control by host nations. In many oil-producing countries, such as Venezuela, Russia, and China, the adoption of advanced technologies such as digital reservoir management, hydraulic fracturing, and real-time pipeline monitoring has facilitated the transition from foreign-dominated industries to state-controlled operations (Tong, 2021).

However, while Africa produces over 15% of the world's oil, its industry is still dominated by multinational corporations that control production, technology transfer, and revenue flows (Pegram et al., 2019). Even in countries with established national oil companies, such as Nigeria and Angola, foreign firms continue to wield significant influence, limiting local workforce participation and technological independence (Esiagu et al., 2024). South Sudan faces similar challenges, where despite being highly dependent on oil accounting for 98% of government revenue and 70% of GDP the industry remains largely foreign-controlled (Cuenca-García et al., 2019; Yugusuk, 2018). Additionally, historical conflicts in 2013 and 2016 disrupted production, causing GDP per capita to plummet from USD 1,111 in 2014 to less than USD 200 in 2017 (Rolandsen & Kindersley, 2017). While oil production has since resumed, the country continues to struggle with limited technological capacity, inadequate local expertise, and a lack of strategic frameworks for integrating innovation into nationalization efforts (Orazgaliyev, 2021).

Failure to leverage technological advancements along with continued reliance on foreign companies undermines local capacity-building efforts, restricts knowledge transfer, and perpetuates economic dependency. Without a structured framework for integrating technology into nationalization, the country risks missing out on potential economic gains, limiting employment opportunities for its citizens, and remaining vulnerable to external economic shocks (Federation, 2019). This study examined the role of technology in addressing these challenges by exploring how digital transformation, capacity-building initiatives, and strategic policy reforms can drive South Sudan's oil industry nationalization, ensuring long-term sustainability and economic independence.

LITERATURE REVIEW

Research by Muzafar & Jhanjhi (2020), present in the Saudi Arabian case, how the effect of biometric registration at the Ministry of Human Resources and Social Development is influential. Indeed, a digital census system highly improves the accuracy of the labor market data in order to achieve better policy functions under the Saudization program. Similarly, in South Africa, Musabayana & Mutambara (2022) analyzed how big data analytics can track trends in employment levels for the Black Economic Empowerment program in the city of Johannesburg whereby data-driven monitoring improved significantly at the nationalization targets. The technology has hereby strengthened data gathering and monitoring, yet overzealous data collection

has now become a concern. The large-scale monitoring of the workforce in fact fueled this public backlash, brought about by privacy concerns, according to a study conducted in Berlin, Germany, by Bronowicka et al., (2020), since insufficient safeguards contributed to growing fears of government surveillance and possible data misuses.

Research in the United Arab Emirates by Shaer et al., (2023) assessed C use in Dubai. On its application, AI enabled successful job matching that greatly improved employment rates for localities. In addition, Liu et al., (2021) used blockchain technology for financial disbursement of workforce subsidies in Shanghai, China. According to their study, blockchain provided the guarantee of transparency and eliminated opportunities for corruption from nationalization incentives. While technology has facilitated more efficient resource management and allocation, over-reliance on automated systems can introduce challenges. Möhlmann et al., (2021) in the United Kingdom studied the effects of job allocation algorithms in London, finding that biased algorithms disproportionately excluded certain demographic groups, thereby limiting equal access to employment opportunities.

Research conducted by Elbanna (2024), in Qatar investigated automation in compliance tracking with the Nationalization Program in Doha, findings indicated that digital systems were very powerful in implementing nationalization quotas in the private sector. In like manner, Fubini (2024), researched the efficiency of digital whistleblower platforms in Madrid, Spain, and found that such platforms showed a positive influence on anonymous tips of non-compliances, hence improving their adherence to labor law. While it has strengthened the mechanism of policy compliance, excessive surveillance was seen to lead to resistance by the business sector. The research study by Cho et al., (2022) conducted in South Korea, depicted a case whereby the overly strict use of digital enforcement tools in Seoul evoked huge opposition from employers and reduced their cooperation in the nationalization policy.

A study by Shah (2024), was conducted related to the effectiveness of the social media campaigns in Manama, Bahrain that promoted public awareness and support regarding the workforce localization initiatives (Moharam et al., 2024). Furthermore, studies with regard to e-learning platform studies of online skill development made by Adesugba (2023) in Lagos, Nigeria proved that work-force employability through nationalization schemes was elevated because of effective online training programs. Where the role of technology has been a strong reason for enlightening public awareness and involvement, misinformation can play as an underminer. Peterson and Schroeder, (2020)'s survey in Stockholm, Sweden, showed that social media considerably posed as a channel of misinformation about labor nationalization reforms, which the public viewed with great negativity and with much resistance towards policy change.

Funk et al., (2021) investigated the role of digital platforms in vocational education and training within Nigeria's nationalized power sector. The government, through initiatives led by the Nigerian Electricity Regulatory Commission (NERC), introduced virtual platforms for training electricians, engineers, and energy technicians. These platforms enabled professionals to acquire

skills while actively working in nationalized energy projects. However, Rafiq & Islam, (2024) observed that rural regions with unreliable electricity supply struggled with program implementation. Despite these challenges, national policies promoting digital transformation in TVET led to improved skills among graduates, strengthening Nigeria's skilled labor force in the nationalized power sector.

A study conducted by Galan, (2024) explored government-funded strategies aimed at improving digital skills in India, enhancing employability in nationalized industries such as telecommunications and rail transport. The Indian government's Digital Skills for Youth initiative included courses on data analytics, digital platforms for railway management, and cybersecurity. Similarly, Kenya's government introduced digital literacy programs to equip youth with the skills needed to operate in state-controlled enterprises such as PetroSA. However, Oniemola (2024) found that participation in these programs was lower in rural areas due to factors like high costs of digital devices and poor internet connectivity. Collaborative efforts between governments and telecommunications providers to offer subsidized data packages showed promising results in bridging this gap.

A study conducted by Kariuki (2024) examined Kenya's partnership with the UNDP to provide online training in renewable energy production and public water supply management through certifications, workshops, and specialized training to prepare workers for employment in nationalized sectors. While urban centers benefited significantly, rural areas faced obstacles related to low literacy rates and internet access. However, rural community with poor internet connections and low literacy poses a real challenge to implementing these training programs. To tackle these issues, Musakwa et al., (2024) states how the government collaborated with foreign partners to provide subsidized digital devices along with Wi-Fi, this helped to tackle the connectivity issues. The workers based in rural areas were able to effectively join the oil sector and have an impact.

Zulu's (2022) research in Angola explored how blockchain technology was implemented to enhance transparency in resource management. By integrating blockchain into public finance systems, the government ensured real-time tracking of state revenues, mitigating fraudulent activities. Zulu emphasized that while blockchain has the potential to revolutionize public sector governance, its effectiveness depends on skilled workforce availability, reduced technology costs, and wider adoption among industry stakeholders. This aligns with global trends, where countries like Estonia and Singapore have successfully deployed blockchain for tax administration, land registries, and social services (Brown & Davis, 2023).

In Nigeria, Johnson et al. (2020) evaluated how e-governance tools have been instrumental in nationalizing the oil and gas industry, leading to improved transparency. Through the National Oil Sector Policy, digital platforms such as the NEITI enhanced accountability in resource allocation and management. Similarly, the NNPC leveraged digital reporting mechanisms to reduce corruption and streamline interactions with regulatory bodies. However, Johnson et al. (2011) noted regional disparities, with urban centers rapidly adopting e-governance while oil-dependent

rural areas, such as the Niger Delta, struggled due to infrastructural limitations, low IT literacy, and poor broadband access.

The role of social media in fostering governance transparency extends beyond resource industries. Okara, (2024) examined how the Nigerian government utilized digital platforms, including Weibo and WeChat, to communicate policies and nationalization efforts. Similar strategies have been employed in China, where state-run agencies use digital outreach to inform citizens about policy changes, economic decisions, and resource distribution (Eltayib, 2024). Meanwhile, in Uganda, the implementation of mobile-based governance systems allowed citizens to access land tenure information, reducing fraudulent land acquisitions and promoting state control over land resources (Riak, 2024).

Yandoka, (2021) investigated the effects of digital audit trails in public procurement and service delivery in East Africa. By digitizing financial transactions and procurement processes, governments improved efficiency and reduced corruption in infrastructure and healthcare projects. Venezuela, a state with a heavily nationalized oil sector, introduced digital auditing to track contract awards, ensuring compliance with national economic policies (Riak, 2024). Notwithstanding the achievement of the digital audit system, the study observes that the political and economic conditions in South Sudan together with the low level of PDVSA's technical capabilities deprived the system of full effectiveness. The usefulness of the introduced basic digital technologies was fundamental, but the genocide and systematic corruption situations simply drowned out these phenomena and did not allow the country's oil sector governance to achieve great progress.

Eltayib, (2024)'s study conducted in Iraq sheds light on how data analytics was used to monitor the nation's oil sector which was nationalized and managed under the Iraq National Oil Company. The study aimed to analyze the tools used in tracking employment and utilization of resources alongside oil production and revenue generation. He noted that government's oil reserve management was further improved by the help of data analytics since it enhanced extraction optimization and revenue forecasting processes. With the aid of data analytic tools, the state was able to ensure that the use of oil reserves fostered achievement of national development objectives. Nonetheless, Purdon, (2021)'s study observed that Iraq's data analytic systems were if at all highly restrained in various regions such as Kirkuk, which happens to be an oil rich province due to two reasons: over reliance on obsolete infrastructure and the more salient ongoing political and military conflict. The study did however recommend that if Iraq sufficiently resolves its structural economic and security concerns, it will be able to better develop and integrate its data analytic tools improving the management of its nationalized oil economy.

Schubert, (2022) highlighted the role of mobile learning apps in Angola's nationalization of its logistics and transportation industry where work-related content in local dialects provided technical skills training via mobile phones, making education more accessible to rural populations. A related study Ezeoha & Uche, (2024) however, suggested that the uptake and access of mobile

learning was still limited among the low-income earning population who lived in the rural regions. Most people couldn't afford smartphones or mobile data plans thus unable to participate in these capacity building programs. Such designs were useful towards empowering marginalized groups like those in Uganda that are crucial players in the oil sector's nationalization, towards acquiring the skills required for them to participate in the industry.

The challenges of workforce readiness in nationalized industries can be viewed as a self-inflicted constraint when seen from a different perspective. Denis et al., (2024) in his study found that online training programs enhanced the skills of local workers, equipping them with greater employment opportunities in nationalized sectors such as manufacturing, telecommunications, and energy. These programs covered fundamental skills like industrial operations, logistics, and financial management, ensuring that local employees were prepared to take on key roles in industries transitioning under nationalization. However, Eltayib, (2024) in South Sudan noted that e-learning platforms posed a challenge for rural populations due to their reliance on internet connectivity, which remained insufficient in many areas. This digital divide created an uneven playing field, leaving certain communities at a disadvantage in terms of acquiring necessary skills for employment in nationalized industries (Riak, 2024).

Rafiq & Islam, (2024) in Nigeria examined the role of big data analytics in monitoring the implementation of nationalization policies across industries. Real-time data collection and analysis enabled governments to track the progress of transition processes, including compliance with local employment regulations and resource distribution (Okara, 2024). These capabilities allowed officials to respond swiftly to emerging challenges, ensuring that nationalization objectives were met effectively. However, Juach et al. (2024) in South Sudan noted that consistent and accurate data collection posed significant challenges, making it difficult to assess the effectiveness of nationalization policies. In response, Purdon, (2021) group of scholars, problem investigated by the use of remote sensing technologies such as airplanes and other aircrafts during the processes of land use and management of Oilfield during the countries' nationalization process. Although these technologies were considered expensive to implement in the use of specialized knowledge, they were good at resource management (Oniemola, 2024).

In Ghana, Elete et al., (2022) investigated the use of blockchain technology in ensuring accountability and transparency in the management of resources during nationalization. Blockchain systems enabled efficient tracking of financial transactions and resource allocations, reducing opportunities for corruption and enhancing public trust in government-led nationalization initiatives. Also, Ounyesiga et al., (2024) say it was possible to prevent procurement fraud in the course of the transfer of ownership to the state by employing digital audit trails in the process If anything, these trails enabled easier tracking of the resources and ensured that the money earmarked for the oil sector's development was properly used (Sayed & Auret, 2025). The integration of social media and digital auditing further strengthened transparency, fostering public confidence in government accountability during nationalization processes.

Jundi, (2024) in South Sudan explored how Geographic Information Systems (GIS) facilitated infrastructure planning during nationalization efforts. GIS technology enabled governments to visualize potential investment areas, optimize resource allocation, and strategically develop infrastructure to support nationalized industries. This led to targeted modernization efforts, particularly in transportation and energy sectors. In the UAE, Pedraza et al. (2024) demonstrated the efficiency of drone technology in assessing infrastructure needs in remote industrial areas. Drones provided planners with high-resolution aerial data, enhancing decision-making and expediting construction projects (Nyorkeh et al., 2024).

Conceptual Framework

The conceptual framework of the study is designed as a cause-effect as depicted in fig. 1

Figure 1. Conceptual Framework

Source: Researchers' Conceptualization

METHODOLOGY

RESEARCH DESIGN

A case study design was utilized in this study, as it allowed for a comprehensive and in-depth investigation of the research topic. Additionally, a combination of qualitative and quantitative data collection methods were used to complement each other. The qualitative methodology was employed to capture individual interpretations of sentiments, attitudes, and behaviors. On the other hand, quantitative approaches were employed to analyze numerical data and provide specific results regarding the variables under consideration, utilizing statistical measures such as percentages, frequencies, mean differences, and standard deviation.

Study Population

Regarding this study, which was carried out in South Sudan's capital city of Juba, three international oil corporations (JOCs) are involved in joint operating agreements (JOAs). In the meanwhile, the Ministry of Petroleum (MoP) of South Sudan sets policy and the National Oil and Gas Corporation of South Sudan (NILEPET) regulates the oil business.

Sample and sampling procedure

The study employed both simple random sampling and purposive sampling methods to select the respondents who participated in the study. Simple random sampling ensures that all samples in the population have an equal chance of being selected. Purposive sampling was utilized to specifically consider Heads of Departments (managers) from the three multinational oil companies. The departments selected for the respondents are based on the independent variables of the study, which included Human Resources Department (provides information about workforce), Exploration, Operation, Petroleum Engineering and Technical services departments (provides information about technologies used in the oilfield), and Finance department (provides information on finance related use). The oil and gas contractors or subcontractors and their subsidiaries are excluded from participation in the study.

The sample frame of the current study is designed in form of a table as seen in table 1 below.

Table 1: The Sample Frame

Categories of respondents	Total staffs	Percentage of selected respondents	Actual respondents
Top Management	6	100%	6
JOCs staffs	40	75%	30
MoP staffs	10	100%	10
NILEPET staffs	14	86%	12
Total	70		58

Source. Researcher's own

Data collection methods

This study employed primary methods to gather information and data. The primary method involved direct data collection through observations of managers, team leaders, and staff, as well as conducting interviews with them. Secondary data was collected through a thorough review of relevant literature pertaining to the study from online journals, books, newspapers and reports from South Sudan.

Quantitative data collection methods involved the use of self-administered structured questionnaires organized in sections. A Likert scale allowed responses to be categorized into five options: strongly agree, agree, strongly disagree, disagree, and undecided. This scale offered flexibility and ease of construction compared to other types of attitude scales. The respondents' sex and age levels were measured using nominal scales, placing them into named categories.

Qualitative data was collected through interviews conducted with participants in a private meeting room at the three selected Oil companies in South Sudan. Only participants who met the study's criteria were interviewed. Each participant was individually interviewed after providing an explanation of the study's purpose and obtaining informed consent for participation. Data was collected using voice recorders and later was transcribed by the researcher for analysis. The transcription process followed the various themes derived from the responses.

Data collection instruments

To ensure systematic and comprehensive data capture, a questionnaire consisting of a Likert scale with closed-ended questions was utilized. Additionally, an interview guide containing open-ended questions was employed to gain a deeper understanding of technology and nationalization of the Oil industry in South Sudan.

For this study, the questionnaire consisted of a Likert scale quantitative questionnaire. The Likert scale was employed to gauge respondents' opinions by offering a range of statements for them to indicate their level of agreement or disagreement. The questionnaires was hand-delivered to the 70 staff members and was collected within an agreed time frame.

The interview guide was useful for comparing and contrasting staff responses to answer the research questions. Qualitative research interviews aimed to uncover the stories behind staff experiences. By conducting face-to-face discussions, the interviewer dug into in-depth information about team collaboration, project management methodology, stakeholder engagement and the performance of health care projects, complementing the questionnaire data. It ensured that specific areas of information are collected from each interviewee. In this study, the interview guide was administered to the staff, including eight managerial positions, through face-to-face discussions.

Extensive research was conducted on technology and nationalization of the Oil sector, resulting in numerous books articles, reports, and conference documents. These valuable resources were accessed through the library and the internet. The researcher conducted a comprehensive literature review to examine previous works and reports by other authors. This approach aimed to avoid duplicating existing studies and provide a framework for interpreting the research findings. By reviewing various documents, the researcher gained insights into the impact of technology and the nationalization of the oil industry in South Sudan.

Data analysis

The analysis encompassed both qualitative and quantitative approaches. Quantitative data collected through questionnaires was edited, coded, and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics (frequencies and percentages) and inferential statistics (correlations) was computed to examine the relationship between technology and nationalization of the oil industry in South Sudan. Qualitative data collected from interviews was transcribed verbatim and organized into thematic categories. These qualitative findings were integrated with the quantitative data for a comprehensive analysis.

SPSS was utilized for quantitative data analysis. Descriptive and inferential statistics consisting a regression analysis were employed. These statistical measures helped validate the theoretical model and test the research hypotheses.

RESULTS AND DISCUSSION

This section presents the analysis of data and discusses the characteristics and attributes of the sampled respondents in relation to technology and nationalization of the oil industry in South Sudan. The section provides descriptive statistics. It also includes inferential statistics such as correlation, analysis of variance, which will be used to explore the relationships between various factors in the study population.

Role of technology in the nationalization of the oil industry in South Sudan

The current technology adopted by South Sudan's oil industry adequately support the country's nationalization efforts were put to a Likert scale with (1=strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=strongly agree) to determine the role of technology.

Table 2: Role of Technology in Nationalization

Role of technology in nationalization	SD	D	N	A	SA	Total	Mean	SDV
	Freq (%)		Freq (%)	Freq (%)	Freq (%)	Freq (%)		
Adoption of new technologies by the South Sudan oil industry has improved operational efficiency	9 (9)	12 (12)	15 (15)	45 (45)	19 (19)	100 (100)	3.53	1.193
Use of advanced technology is vital if nationalization of the oil industry is to be achieved in South Sudan	3 (3)	2 (2)	8 (8)	36 (36)	51 (51)	100 (100)	4.30	0.927
Absence of modern technology in the oil industry has been a hindrance to development of oil sector in South Sudan	8 (8)	12 (12)	19 (19)	29 (29)	32 (32)	Total	3.65	1.266
Oil industry investment in technology should be a precursor in nationalization process of the oil industry in South Sudan	6 (6)	4 (4)	17 (17)	55 (55)	18 (18)	100 (100)	3.75	0.999
The current technology adopted by South Sudan's oil industry adequately support the country's nationalization efforts	9 (9)	22 (22)	21 (21)	41 (41)	7 (7)	100 (100)	3.15	1.123

Key: SA-Strongly Agree; A-Agree; N-Neutral; D-Disagree; SD-Strongly Disagree; SDV-Standard deviation

Source. Researcher's field data analysis

As for the integration of the modern novel technologies in the South Sudanese oil industry to achieve operational efficiency, the majority of respondents were in support of the integration in it at 45% which is more than the 9% of firmly against it (Mean= 3.53, SD=1.193). Acknowledging to the question of the role of advanced technology in achieving the objective of nationalization in the oil industry, the majority of respondents were in undivided agreement with it at 51%, with a mere 2% opposing it (Mean= 4.3, SD=0.927). The least number 8/100 (8) strongly disagreed. (Mean= 3.65, SD=1.266 indicate that respondents are aware of the importance of modern technology towards the growth of the oil industry thus highlighting any potential absence of the technology such as the absence of the technology. On the issue of whether the oil industry should consider investing in technology before engaging in nationalization, the majority, 55/100 (55%), agreed, while the least number, 4/100 (4%), disagreed (Mean= 3.75, SD=0.999. Considering the

existing South Sudanese technology in the oil industry with effectively assist in undergoing nationalization, the common number of respondents that is 41/100 North Americans, for 100-thirds of the production unit's total in Edmonds strongly agreed (Mean= 3.15 SD=1.123).

Themes and sub-themes about the role of technology in the nationalization of the oil industry

Theme 1: impact of technology on nationalization

From the research, it became evident that the industry would be aided significantly with the implementation of technology. More so, to be able to match the intricacies of lifting crude oil from South Sudan, it was pointed out that advanced tools and technology were of absolute necessity. The participants stressed on the fact that in order to ensure, optimal manufacturing and firm structures, there was a definite need for an integration of technology within the oil sector.

Subtheme 1.1: adoption of advanced technologies for crude analysis and production optimization.

Furthermore, the research suggested that the integration of state-of-the-art technologies would greatly help in lifting oil from South Sudan. As theorized, these technologies would provide significant value in improving core and overall efficiency. This probably indicates that participants view cutting-edge tools as instrumental in addressing South Sudan's specific oil extraction challenges, ensuring smoother operations.

PARTICIPANT RESPONSES

"The application of these new technologies has a positive impact on our staff, on our engineers, as they acquire technology to improve their skills in any discipline they are working on." [Participant 1]

"We are on the stage of reviewing values of new technologies to see which ones can improve production. You need to understand the mobility of different crude types to fit in better technology." [Participant 2]

Subtheme 1.2: matching technologies to the specifications of crude types

The study participants emphasized the need for technologies that are specifically tailored to match the distinct properties of crude oil extracted in South Sudan. This alignment ensures smoother processing and maximizes the oil's market value. This suggests that a one-size-fits-all approach to technology may not be sufficient, and customized solutions are critical for optimizing resource processing and maximizing market competitiveness.

Participant responses

"*Our crude is unique, so the technology must be designed to handle its specific characteristics*." [Participant 3]

"*When technology aligns with the crude's specifications, it increases efficiency and reduces processing issues."* [Participant 4]

Theme 2: challenges and opportunities in technology integration

As per the research, the incorporation of new technologies to the oil sector in South Sudan has both threats and opportunities. Although the introduction of new systems helps in development, numerous factors inhibit their widespread application over including limited finances and job losses. This likely reflects an acknowledgment of the dual-edged nature of technology, where benefits like efficiency coexist with challenges such as financial burdens and potential job losses.

Subtheme 2.1: barriers to adopting new technologies

According to the participants of the research, the introduction of technologies features an inadequate number of engineers who are technologically informed coupled with the expensive nature of new technologies and poor supporting infrastructure. These blocks slow down the speed at which new technologies are adopted in the sector. This most likely indicates that the sector's capacity to adopt technology is hindered by skill gaps and systemic issues, such as underdeveloped infrastructure.

Participant responses

"*Advanced technologies reduce national participation because a few people are only required to run such technologies. But they also increase economic opportunities due to higher profit oil compared to using poor technologies."* [Participant 5]

"*It is a process, whereby you start from the preliminary, which is the basics, and then you go to the intermediate level, and then the advanced level, whereby you can be an expert on it."* [Participant 6]

Regression analysis

Hypothesis i

The first hypothesis **Ho_1** stated that Technology does not significantly influence the nationalization of the oil industry in South Sudan. To test this hypothesis, a linear regression analysis was performed with Nationalization the dependent variable and Technology independent variable as shown below;

Table 3: Linear Regression Analysis Technology And Nationalization

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.545	0.297	0.290	3.487

a. Predictors: (Constant), Technology

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.214	1.892		3.284	0.001
	Technology	0.651	0.101	0.545	6.435	0.000

a. Dependent Variable: Nationalization

Source: Researchers' own, generated from field data

From the table 3,

The regression analysis conducted to evaluate the role of technology in the nationalization of the oil industry in South Sudan reveals a statistically significant and positive relationship. The model results indicate that technology explains 29.7% ($R^2 = 0.297$) of the variation in nationalization efforts, highlighting its substantial contribution. A moderate positive correlation (R =0.545) further reinforces the link between advancements in technology and nationalization outcomes. The regression coefficient (B =0.651, p <0.001) implies that a one-unit increase in technology leads to a 0.651-unit improvement in nationalization on average. This implies that respondents recognize the critical role of modern technology in advancing the oil sector, suggesting that embracing technological advancements is crucial for achieving the goals of nationalization. In contrast, Ibitoye et al. (2021) in Nigeria found that although technology improved operational efficiency, its impact on nationalization was limited by financial constraints and the slow pace of infrastructure development, which highlights potential challenges for South Sudan.

RECCOMENDATIONS

Much of the global population accessibility matters must be secured if digital technologies such as blockchain, big data analytics, and e-governance are to be fully enhanced. Podiums like e-governance ease distribution of policies, aiding peoples to partake in governance processes in a well-organized manner. Blockchain expands sincerity, lowering fraud and poor public administration management, whereas big data reinforces monitoring systems, empowering authorities to make cultured decisions founded on real-time intelligence. Consequently, the prevalent use of the internet and discrepancies in digital literacy within societies limit its inspiration and avert the general public from utter mostly benefiting from such progressions. Therefore, this research enhances a multi-layered method to address the current inequity. It is vital to promise inclusive investment in the augmentation of internet infrastructure, particularly in

disadvantaged areas, to safeguard equitable access to digital governance tools. Likewise, inclusive workforce coaching curriculums must be introduced to educate workers with the skills essential to engross with emerging technologies, thereby simplifying the progress of an inclusive digital economy. Lastly, regulatory frameworks must be introduced to guarantee that technological innovations are handy, particularly within state owned corporations. This is to warrant equitable delivery of digital welfares and avert the exacerbation of prevailing differences. By implementing these procedures, the transformative potential of digital governance may be exploited to create a more see-through, efficient, and reachable government for the indigenous people.

CONCLUSION

The oil and gas industry of South Sudan has incredible potential for growth and expansion considering the fact that they will be able to acquire technology and specialized personnel as well as nationalize their services. If the political and security issues inhibiting good governance are rectified and if collaboration is undertaken effectively by the government, private investors and oil reliant communities, South Sudan can indeed capitalize on its oil resources and experience sustainable economic growth that benefits the masses of the country. The findings from this investigation can serve as a relevant framework for other resource dependent economies seeking to optimally harness their resource wealth. The research drew attention to resource control systems and frameworks that would facilitate and enable different governments to internalize the ideals of accountability and responsible management of limited resources. Furthermore, elevating legal accountability structures, inter-agency cooperative strategies and active commitment to international standards are crucial to the advancement of South Sudan's oil and gas sector. Allowing local communities and other interested parties access and influence the investment opportunities through revenue transparency, grievance processes and collaborative decision-making are also critical in ensuring that oil and gas revenue does not become a curse.

REFERENCES

Adeola, A. O., Akingboye, A. S., Ore, O. T., Oluwajana, O. A., Adewole, A. H., Olawade, D. B., & Ogunyele, A. C. (2022). Crude oil exploration in Africa: socio-economic implications, environmental impacts, and mitigation strategies. *Environment Systems and Decisions*, *42*(1), 26–50.

Adesugba, A. (2023). *ADOPTION OF ELEARNING FOR WORKER IN-SERVICE TRAINING IN THE NIGERIAN PUBLIC SERVICE*.

AlQahtani, S. N. (2022). *Comparative Analysis Between Saudi Arabia and Norway in Moving Beyond Fossil Fuels Towards a Sustainable Economy: A Special Emphasis on the Renewable Energy Sector*.

Bala, B., & Tar, U. A. (2021). The giant of Africa? Explaining the Nigerian governance, security, and development paradox. *The Governance, Security and Development Nexus: Africa Rising*, 315–339.

Barrera, M. A., Sabbatella, I., & Serrani, E. (2022). Macroeconomic barriers to energy transition in peripheral countries: The case of Argentina. *Energy Policy*, *168*, 113117.

Bronowicka, J., Ivanova, M., Klicki, W., King, S., Kocher, E., Kubisa, J., & Zielińska, J. (2020). *'Game that you can't win'? Workplace Surveillance in Germany and Poland*.

Canton, H. (2021). United nations conference on trade and development—unctad. In *The Europa directory of international organizations 2021* (pp. 172–176). Routledge.

Cho, S. W., Lee, S., Mandel, C., & Lee, T. E. (2022). *Labour and employment compliance in the Republic of Korea*. Kluwer Law International BV.

Copinschi, P. (2022). Energy and the Economy in Sub-Saharan Africa. In *The Palgrave handbook of international energy economics* (pp. 693–712). Springer International Publishing Cham.

Denis, L., David, S. N., Joseph, S., Thaddeus, Z., Joyce, N., Milliam, N., & Phionah, N. (2024). Spatial Risk Assessment for the Proposed East African Crude Oil Pipeline (EACOP). *Open Journal of Safety Science and Technology*, *14*(4), 136–146.

Durand-Lasserve, O. (2022). Nationalization of the private sector labor force, quotas, matching and public jobs, an illustration with Saudi Arabia. *The Quarterly Review of Economics and Finance*, *86*, 98–117.

Elbanna, S. (2024). GCC workforce nationalization: what factors contribute to the comprehensive implementation of Qatarization practices? *Employee Relations: The International Journal*, *46*(2), 452–472.

Elete, T. Y., Odujobi, O., Nwulu, E. O., & Onyeke, F. O. (n.d.). *Sustainable Coating Processes: A Conceptual Framework for Reducing Environmental Impacts in Oil and Gas Operations*.

Eltayib, S. H. M. A. (2024). The Conventional Core Analysis Study for Reservoir Quality of the Well-X, Rawat Rift Basin, Sudan. *International Journal of Earth Sciences Knowledge and Applications*, *6*(3), 340–346.

Esiagu, L., Ajaju, H. E., & Anikeze, N. H. (2024). Impact Of Ict Base Training And Development On Employee Performance With Focus On Federal Health Institution In South East Nigeria. *Caritas International Journal of Public Administration and Business Management*, *1*(1).

Ezeoha, A., & Uche, C. (2024). We will pay compensation from future profits: the nationalisation of foreign businesses in post-colonial Uganda. *Business History*, *66*(6), 1496–1523.

Florence, P. S., & Walker, G. (2021). Efficiency under Nationalization and its Measurement. In *Problems of Nationalized Industry* (pp. 195–207). Routledge.

Fubini, A. (2024). *Grassroots fights against corruption in the digital age: infrastructural activism in Italy and Spain*.

Funk, C., Treviño, L. J., & Oriaifo, J. (2021). Resource curse impacts on the co-evolution of emerging economy institutions and firm internationalization. *International Business Review*, *30*(4), 101753.

Galan, M. (n.d.). *Sustainable energy for all?: global production networks in the off-grid solar sector and their influence on pro-poor marketisation in India and Kenya*.

Hakimi, M. H., Abass, A. N., Lashin, A., Gharib, A. F., Radwan, A. E., Rahim, A., Ahmed, A., Asiwaju, L., & Afify, W. E. (2022). Geochemical investigation and basin modelling of the Al renk shale formation in the Melut Basin, south Sudan: Implications for estimation of thermogenic gas generation potential. *Marine and Petroleum Geology*, *146*, 105926.

Jundi, S. (2024). The Impact Armed Conflict on Economic Growth and Sustainability in South Sudan. *Journal of Developing Country Studies*, *8*(2), 58–73.

Kariuki, P. K. (2024). The Impact of Carbon Footprint Reduction Strategies on Kenya's Flower Export Market. *Studies in Social Science & Humanities*, *3*(12), 16–20.

Katouzian, H. (2024). The Anglo-Iranian oil crisis revisited: Iran's rejection of the World Bank intervention and the 1953 coup. *British Journal of Middle Eastern Studies*, *51*(2), 426–435.

Ladu, N. S. D., Subburaj, S. K., & Samikannu, R. (2021). A review of renewable energy resources. Its potentials, benefits, and challenges in South Sudan. *2021 International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA)*, 1–6.

Lallana, F., Bravo, G., Le Treut, G., Lefevre, J., Nadal, G., & Di Sbroiavacca, N. (2021). Exploring deep decarbonization pathways for Argentina. *Energy Strategy Reviews*, *36*, 100670.

Lampis, A., Martín, M. M. I., Zabaloy, M. F., Soares, R. S., Guzowski, C., Mandai, S. S., Lazaro, L. L. B., Hermsdorff, S. M. G. L., & Bermann, C. (2022). Energy transition or energy diversification? Critical thoughts from Argentina and Brazil. *Energy Policy*, *171*, 113246.

Liu, L., Zhang, J. Z., He, W., & Li, W. (2021). Mitigating information asymmetry in inventory pledge financing through the Internet of things and blockchain. *Journal of Enterprise Information Management*, *34*(5), 1429–1451.

Moharam, M. M. R., Allaymoun, M., & Isa, A. N. H. (2024). Can Social Media Save Lives? The Impact of Digital Awareness Campaigns on Bahrain's Drivers. In *Business Sustainability with Artificial Intelligence (AI): Challenges and Opportunities: Volume 2* (pp. 505–515). Springer.

Möhlmann, M., Zalmanson, L., Henfridsson, O., & Gregory, R. W. (2021). Algorithmic management of work on online labor platforms: When matching meets control. *MIS Quarterly*, *45*(4).

Murshed, M., Rashid, S., Ulucak, R., Dagar, V., Rehman, A., Alvarado, R., & Nathaniel, S. P. (2022). Mitigating energy production-based carbon dioxide emissions in Argentina: the roles of renewable energy and economic globalization. *Environmental Science and Pollution Research*, 1–20.

Musabayana, G. T., & Mutambara, E. (2022). The Implementation of the Broad-Based Black Economic Empowerment (B-BBEE) Policy in South Africa: a Myth or a Reality in SMEs? *Australasian Accounting, Business and Finance Journal*, *16*(1), 73–84.

Musakwa, M. T., Vacu, N. P., & Odhiambo, N. M. (2024). THE IMPACT OF FINANCIAL DEVELOPMENT ON RENEWABLE ENERGY CONSUMPTION IN KENYA. *Acta Economica*, *22*(41), 39–58.

Muzafar, S., & Jhanjhi, N. Z. (2020). Success stories of ICT implementation in Saudi Arabia. In *Employing Recent Technologies for Improved Digital Governance* (pp. 151–163). IGI Global.

Nagtegaal, R. (2021). The impact of using algorithms for managerial decisions on public employees' procedural justice. *Government Information Quarterly*, *38*(1), 101536.

Nyorkeh, R., Teye, E., Essuman, E. K., Haughey, S. A., Logan, N., & Elliott, C. T. (2024). 18 Year analysis of RASFF notifications on Sudan dye adulterated cases in palm oil (2004 to 2022) and the principles of the technique for its detection. *Sustainable Food Technology*, *2*(5), 1235–1245.

Okara, G. (2024). *Book review: Upstream Oil and Gas in Africa by Eduardo G Pereira and Damilola S Olawuyi*. SAGE Publications Sage UK: London, England.

Olowe, V. (2021). Africa 2100: how to feed Nigeria in 2100 with 800 million inhabitants. *Organic Agriculture*, *11*(2), 199–208.

Oniemola, P. K. (2024). Rethinking the Laws on Cybercrime in Response to a Rise in Cyberattacks in the Oil and Gas Sectors of Middle East and African States. *African Journal of International and Comparative Law*, *32*(4), 575–592.

Ounyesiga, L., Daniel, O., Nnamchi, S. N., & Bawa, M. (2024). *Comparative Content Analysis of Biogas Produced From Pig Dung and Cow Dung at Kansanga Seed Biogas Plant Uganda.*

Patey, L. (2024). Oil, gold, and guns: The violent politics of Sudan's resource re-curse. *Environment and Security*, *2*(3), 412–430.

Purdon, M. (n.d.). State Development Interests in Tanzania, Uganda, and Moldova. *The Political Economy of Climate Finance Effectiveness in Developing Countries*.

Rafiq, F., & Islam, G. M. N. (2024). Renewable Energy for Gender Equity: Solar Electricity and Women's Empowerment in Developing Regions. *Malaysian Journal of Business, Economics and Management*, 234–242.

Remsey, D. N. (2023). *The Impact of the Renewable Energy Transition on Rentier Structures: A Case Study of Saudi Arabia since the 2014 Oil Price Plunge*.

Riak, J. D. C. (2024). Financing of Renewable and Fossils Related Projects: A Critical Appraisal of Subsidies and Risks in South Sudan. *International Journal of Science and Business*, *42*(1), 84–101.

Robson, W. (2022). *Nationalized industry and public ownership*. Routledge.

Sayed, A., & Auret, C. (2025). Is corn still king? Unravelling time-varying interactions among soft commodities. *Eurasian Economic Review*, 1–26.

Schroeder, R. (2020). Even in Sweden?: Misinformation and elections in the new media landscape. *Nordic Journal of Media Studies*, *2*(1), 97–108.

Schubert, J. (2022). Disrupted dreams of development: neoliberal efficiency and crisis in Angola. *Africa*, *92*(2), 171–190.

Shaer, S., O'Neil, A., Salem, F., Akrout, Z., & Shibl, E. (2023). Advancing Artificial Intelligence Impact in Dubai: Future Directors Towards Strengthening the Digital Economy. *Future of Government Series*.

Shah, A. A. (2024). Potentials of Employing Digital Technologies for Advancing Sustainable Tourism, and Preservation of Historic Sites: Insights from Manama, Bahrain. *2024 2nd International Conference on Sustaining Heritage: Embracing Technological Advancements (ICSH)*, 31–40.

Tong, A. (2021). *The possibility of a decentralized economy in China and the USA*.

Veress, E. (2022). *Nationalization, Collectivization, Reprivatization and Privatization in East Central Europe: Arguments for a General Theory*.

Yandoka, B. M. S. (n.d.). Source Rock of the Lower Cretaceous Petroleum System in Northern Benue Trough, Northeast Nigeria: Implication for Oil and Gas Exploration. In *Geology and Natural Resources of Nigeria* (pp. 332–340). CRC Press.