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THE IMPACT OF DIGITAL TRANSFORMATION ON OIL AND GAZ COMPANIES USING A MODEL SWOT ANALYSIS (SONATRACH AS A MODEL) 2022

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Abstract

This study aims to analyses the digital transformation environment, in the Algerian Oil & Gas Industry, headed by the national company Sonatrach, using SWOT analysis method. The first part of this study discussed the theorical infrastructure of the digital transformation, while the se

cond part presented a general overview of the Sonatrach transformation plan titled SH30 and the main result of the SWOT analysis. the results of the study show a great potential of SH30 plan and several positive spots in Algerian environment that will push the transformation process (the law, the digital infrastructure, the startups initiative) meanwhile, the study indicated some limitation that it must be considered in the transformation process (the fallen behind in terms of Internet penetration, Resource silos etc…).

Keywords: Digital Transformation, Oil and Gas Companies, Sonatrach, SWOT analysis.

JEL classification: F31,C32,C10

1. INTRODUCTION

COVID-19 and the resultant global economic downturn are driving oil prices into the ground. To stay competitive, oil companies need next-generation information technologies, which will allow them to adapt quickly and efficiently to the new economic landscape. The easy-to-exploit oil and gas resources have largely been exhausted. Today's industry is pivoting toward deep water, pre-salt, and unconventional reservoirs. As such, oil and gas companies require high-precision and powerful computing to address new challenges (Repporter, 2021) .As the global demand for oil continues to decline, and as nations impose new environmental protections, the world's energy markets are gradually shifting toward clean energy. This shift is driving the oil industry to promote clean energy production and development. Such a transformation depends on efficient Information Technology (IT) systems with robust data management and analysis capabilities (hongyuan, 2019), With new technologies such as cloud computing, big data, IoT, and AI, which can pivot towards cloudification and intelligence, using powerful computing and resource sharing through cloud data centers. therefore (hongyuan, 2019), Given the data of this changing climate Algeria's national oil & gas company Sonatrach is trying to become independent from oil price volatility and dependent on the volume, by working to introduce new technologies to offset declining production decline and optimize output, by drilling 80 wells annually and conduct seismic surveys to generate prospects moreover Sonatrach hopes also for 8,500 km per year of 2-D and over 20,000 km per year of 3-D seismic surveys by 2022 (Henni, 2018). in addition, Sonatrach would commence offshore drilling on the eastern coast between Bejaia and Skikda for the first time in its history (Hedley, 2019) , as result the implementation of digital transformation will allow Sonatrach to facilitate fulfillment all the previews objectives. According to SONATRACH's vision for 2030 and the One Cloud strategy, and in a corporation, with the Chinese tech company Huawei, (which develops a customized cloud-based solution to centrally manage multiple data centers, eliminate resource silos and allocate resources on demand). Sonatrach will significantly optimize the use of resources, support more services, and accelerate service rollout. Moreover, the One Cloud system and the ERP will transform SONATRACH's IT system, which will drive optimization and reduce costs. In parallel to this process, SONATRACH will construct a digital oilfield that will reap benefits well into the future. (Repporter, 2021).

2. METHODOLOGY

In terms of the study tool, we have adopted a set of tools in order to collect data that will help in the understanding of the subject of digital transformation, and extracting results that help in finding answers to the problem of the study, where we relied on the following tools:

A. The interview: The most important tools used in the collection of information, we have conducted many interviews with the manager of departments and divisions in order to know the reality of digital transformation in the company.

B. Statistical reports: Most of the data relied upon in this type of study lies in its annual statistical reports for companies.

And to study of all aspects of the subject and answer the question we relied on:

- Descriptive method in order to provide a description of the study variable (digital transformation);

- The analytical method in order to analyze and interpret various data presented in this study.

3. THE DIGITAL TRANSFORMATION IN OIL & GAS INDUSTRY

Today, the Oil and Gas sector has the opportunity to redefine its boundaries through digitalization. a period of falling crude prices, frequent budget and schedule overruns, greater demands of climate change accountability, and difficulties in attracting talent, and the potential effect of Covid 19 epidemic (forum, 2017) (See figure N°2) Oil and Gas companies can provide practical solutions. In the short term, digitalization can act as an enabler to tackle these challenges and, in the long term, provide value to all of the industry's stakeholders. Digitalization can be a source of transformational change, Given the diverse starting points and an array of choices, O&G companies could benefit from a coherent framework that helps them achieve their near-term business objectives, measures their digital progression through stages of evolution and, above all, gives them a pathway to ultimately transform the core of their operations, the real assets and the business model itself.

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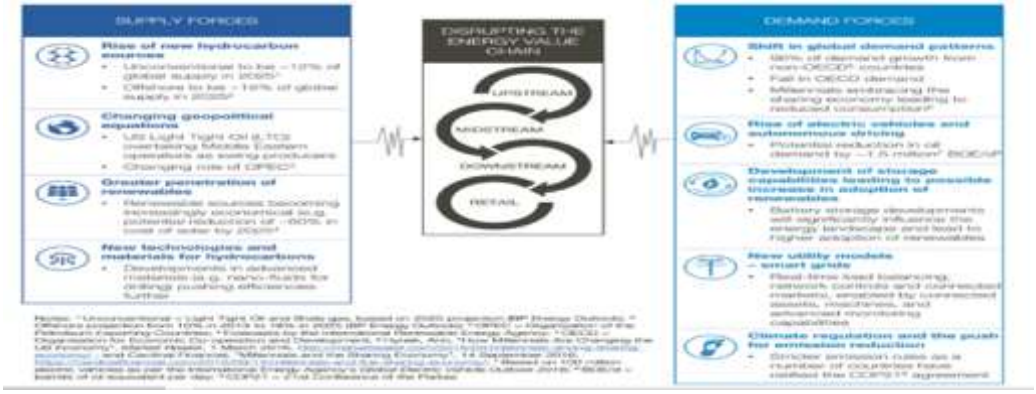
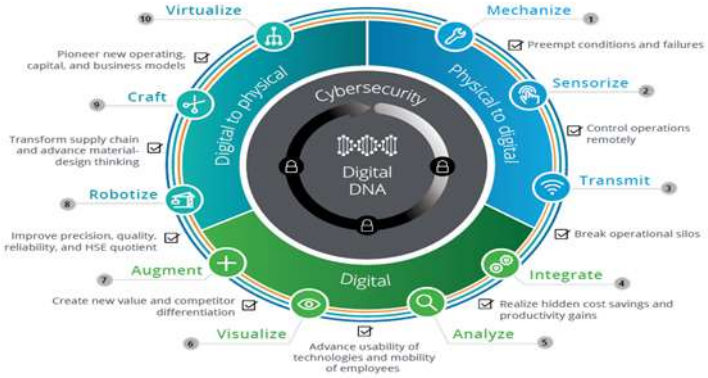
Figure N°01The different forces driving dedital transformation in oil and gas



Source: Anshu Mittal,and others, "From bytes to barrels"

The Digital Operations Transformation (DOT) model is such a road map—a digital journey of 10 milestones (see figure N°03), where the leap from one stage to another marks the achievement of specific business objectives and puts cyber security and an organization's digital traits at the core. Although the journey technically completes at stage 10 for a specific asset or operation, it should be broadened and extended into a never-ending loop to include a wider set of assets or business segments, the entire organization and, ultimately, the ecosystem of a company, including supply chain and external stakeholders (Anshu Mittal).

Figure N°02The Digital Operations Transformation



Source: Anshu Mittal,and others, "From bytes to barrels" The digital transformation in upstream oil and gas, Deloitte Center for Energy Solutions, P:04

3.1. Challenges in oil and gas industry: There are three major pain points in the digital transformation of the oil and gas industry as Mr.Zhang Tiegang, former Deputy Chief Engineer of Daqing Oilfield Exploration and Development Research Institute, introduced, at the Huawei Oil and Gas Virtual Summit 2020 held on 15 July. (Africa, 2020).

- **Massive Data Growth:** Compared with other industries, oil and gas manages an even larger amount of data. For example, the amount of seismic data is increasing at an unprecedented speed. As oil and gas exploration becomes more difficult, the process requires more precise seismic wave exploration techniques. Broadband, wide-azimuth, and high-density (BWH) seismic data collection is particularly important, amounting to nearly 1 TB/km2. The exploration area is constantly expanding and the originally collected high-resolution seismic data in just a single work area may amount to over 17 TB. In addition, the continuous increase in historical data records further speeds up data growth. (Africa, 2020) .

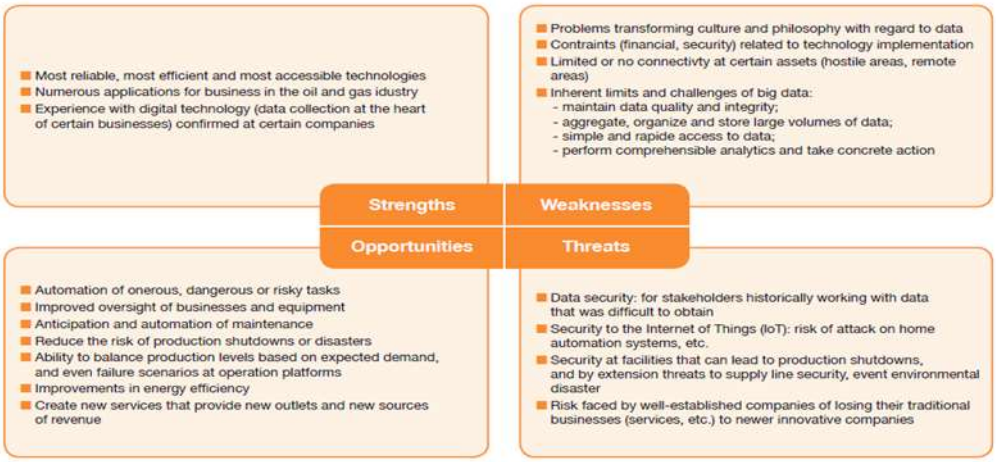
- Increased Computation Workload and Complexity: The ever-increasing data volume leads to a sharp increase in the computation workload. For example, the computation workload of pre-stack reverse time migration (RTM) and storage volume are 10 and 50 times higher than before, respectively. To ensure comprehensive and accurate understanding of oilfield production dynamics, the computation requirements of large-scale reservoir numerical simulation also increase significantly. Therefore, oilfield companies have increasingly high requirements on data processing technologies. More and more complex algorithms — such as anisotropic pre-stack depth imaging, RTM, and full waveform inversion (FWI) — also pose higher requirements on computational capabilities (Africa, 2020).

- Equipment rooms, computing, storage, and IT O&M constitute the information infrastructure system of oil and gas enterprises. Most companies used to build their own, resulting in many equipment rooms with high energy consumption and low security. At the same time, low server configuration and utilization are no longer able to meet the requirements of massive data processing. In addition, the existing shared storage devices come from different providers and feature low capacity, unable to store massive data. Moreover, O&M departments face increasing pressure to hire highly skilled personnel to ensure the O&M of independent and scattered IT with a poor intelligence level (Africa, 2020).

3.2. The swot analysis of digital transformation in oil and gas industry:

SWOT is an abbreviation of strengths, weaknesses, opportunities, and threats. Strengths and weaknesses are internal factors, and opportunities and threats are external. SWOT-chart (scheme) allows analyzing an innovative project, taking into account every factor on which the development of the organization depends (Kudriavtceva, 2019).considering oil and gas industry (energy sector) SWOT analysis was widely used in different litterateurs, as to describe the digital environment of the industry , using this methods the following results were presented in figure N°03.

Figure N°03 SWOT analysis in energy sector



Source: Energies Nouvelles, Digital transformation in the oil and gas industry, panorama 2018, 2018, P:05.

4. THE POTENTIAL OF DIGITAL TRANSFORMATION IN ALGERIAN OIL AND GAS INDUSTRY

Digitalization represents a huge opportunity for the African continent ،and for Algeria. The characteristics of the digital economy open up real prospects for all African countries due to demographics, a less dramatic disruption of traditional industrial productive models and the capacity for innovation that nourishes and ensures the development of digitalization, an overview of digital transformation in the Algerian oil industry will be presented as follows;

4.1. General overview of Sonatrach's digital transformation plan SH 30:

Sonatrach through the new long-term strategy ("SH 2030") aims to and aims to become one of the world's top performing NOCs (Series, 2020), by facilitating foreign involvement, developing the country's huge shale gas deposits, and revitalizing downstream markets. The ultimate target is to make some US$ 70 billion in additional revenue by 2030, with 50 per cent looking to be reinvested in new production. In line with its SH 2030 plans, Sonatrach is aiming to produce 2 Bcf/d of unconventional resources in 2030 and 7 Bcf/d by 2040 (ADES, 2019). The SH2030 strategy sets the course for the new policy implemented to transform the company in depth. This transformation aims to place performance at the heart of the company's businesses (Sonatrach), thanks to an Enterprise Resource Planning (ERP) deployed throughout all the company for (Sonatrach):

- Manage the business through an integrated and optimized vision of the activity.
- Speed up decision making, increase productivity and improve performance.
- Ensure optimal communication and collaboration.
- Reduce management and operating costs.
- Anticipate and reduce risks through data integrity and financial control.

A Transformation Department responsible for monitoring the execution of the HS2030 strategy has been specially created for this purpose. It has undertaken to simplify activities and modernize the management of the Group, notably with the creation of a Corporate Department to respond to new strategic challenges.

As part of this in-depth reorganization, new Central Structures have been set up within the Activities themselves, to optimize processes and support the new SH2030 strategy (Sonatrach). The Group's Communication is notably elevated to the rank of Management. To give more weight to the transverse functions in the company and to streamline the operating modes in this macrostructure, this transformation also involves strengthening the regulatory, transversal and expertise roles of the operational center. The representatives of the Central Functions in the Activities are given a dual reporting mission intended for the line manager in the Activity (VP, Divisional, Director, etc.) and the manager in the function (DEX, DC, Manager of 'Activity…) (Sonatrach).Digital transformation is a process of continuous evolution. After studying Sonatrach's approach to ICT and the company's future business development requirements, Huawei proposed a three-phase digital transformation strategy (hongyuan, 2019):

a- The HUAWEI CLOUD Stack (HCS): the first enterprise-grade, full-stack hybrid cloud solution is introduced. Existing IT resources are integrated, which eliminates resource silos. This approach achieves unified resource management and on-demand resource provisioning for multiple data centers, and it enables a quick service rollout.

b- The SAP Enterprise Resource Planning (ERP) system is deployed on the cloud platform. This facilitates unified management of group-level resources and business modules, including finance, HR, asset management, budget management, and logistics. The system promotes comprehensive collaboration and data sharing between upstream and downstream business, which greatly improves the daily work efficiency of management personnel at all levels, and it enhances the effectiveness of the group's operation management.

c- Innovative service platforms and big data services are implemented. These services can be rapidly developed and tested. Data-value mining helps lay a foundation for the evolution of digitally-enhanced oil fields.

4.2. SH30's Sonatrach planvs top 7 oil and gas companies initiatives: Digital Transformation is the key to oil and gas companies driving new and better customer experiences while maximizing value creation across asset and operations lifecycles to improve profitability, maximize return on capital and improve their overall competitive edge (Newton, 2019).Through digital transformation, operators can mash up real-time process data with current economic conditions giving operators the ability to make informed decisions at an expedited rate. Information sharing increases while stakeholders increase their ability to visualize results and key performance indicator data across process and overall plant production. Online process optimization and reporting offers a large potential impact on the process (Newton, 2019).

Table 1. SH30's Sonatrach planvs top 7 oil and gas companies initiatives

Description	Partners	Company
BP works on digital transformation as a part of energy transition process and its focus includes block chain, robotics and cognitive computing. BP introduced a subsidiary – Launchpad, which is a business incubator, its goal is create five $1bn companies by 2025 in digital low-carbon sphere. BP has invested into companies like Beyond Limits –	Launchpad, AVEVA Beyond Limits	BP

artificial intelligence company, Power Share – provides transport solutions through online platforms and Drover, which is a virtual marketplace for car sharing, also the recent investment was in Grid Edge – provider of AI technology, that enables customers to optimize their building's energy, moreover, BP implements industrial software from AVEVA with advanced modeling to optimize supply chain management from source materials and feedstock to planning, scheduling, operations and distribution	Power Share Drover Grid Edge	
Chevron accelerates digital transformation by collaborating with Microsoft in terms of implementing AI technologies ("DELFI") into Chevron operations. Overall company's aim in digital transformation is to "streamline information technology (IT) operations around a digital core connecting the company's engineers and operations through nimble analytics and increased automation"	Microsoft	Chevron
At Eni technological innovation and digitalization are incorporated into business model in a broad way – it covers all three levels of value creation (operational excellence, carbon neutrality and local development). Eni leads digital transformation through the whole company aspects, including changes in company culture. Eni firmly links digitalization and sustainable development. This transformation is supported by HPC5 supercomputer of Green Data Center, which is a digital technology center of a company and also by Digital Business Unit and Digital Competence Center.	Green Data Center Digital Business Unit Digital Competence Center	Eni
Equinor puts digitalisation at the forefront in achieving its three main strategic goals – being safe, having high value and low carbon. Saying, that digitalisation is part of our DNA", the company considered to be one of the best examples, of successful digital transformation, which led to sustainability and financial success. Company believes, that they will "produce oil and gas more effectively with lower greenhouse gas emissions", also investing in CCS and renewables. Company approached digital transformation as a business transformation and used a wide digital roadmap.		Equinor

ExxonMobil made a partnership with Microsoft on its operations in Permian Basin and anticipates to receive improvement in capital efficiency and also establish largest O&G acreage with cloud technology. ExxonMobil also collaborated with FuelCell Energy, Inc. to "enhance carbonate fuel cell technology for the purpose of capturing carbon dioxide from industrial facilities", thus contributing to reducing GHG emissions	Microsoft FuelCell Energy Inc	ExxonMobil
Shell is concentrated on implementing digital solutions to its existing business, such as standardizing the operations on their territories across the globe or simplifying the processes in a supply chain. Also, company is focusing on creating new business models by investing into digital ventures and combining them with their industry leader's experience. Shell also has a partnership with Microsoft, which will leverage AI application in Shell's operations	Microsoft	Shell
Sinopec in a petrochemical corporation, and in terms of digitalisation its development is directed at intelligent manufacturing. Company has a long history in establishing smart manufacturing models, starting from 2003 and having constructed different kinds of factories: smart factories, fully automated warehouse, 3D digital factory and others. The biggest achievement is the application of smart factory solution, which brought many digital changes in Sinopec operations.	Pro-MACE	Sinopec
The transformation strategy in collaboration with Huawei aims at improving the performance of all activities, applies to optimizing our organization and modernizing our processes. Using ERP,	Huawei	Sonatrach

Source: Prepared by the authors.

4.2. SWOT analysis of digital transformation in Algerian oil and gas industry:

As for the digital transformation environment in Algerian oil and gas industry the results are as follow;

a. Strength

- Algeria had 123,000 km of fibre optics installed in 2017, making it the largest network in Africa, with an additional 7000 km planned to connect the southern wilayas (cybersecurity)

- Algeria has taken into consideration the intra-city metro fibre connections, with traditionally only long inter-city or intercontinental connections taken into account (cybersecurity).
- The MPTDT has the overarching aim to improve bandwidth capacity, as well as navigate the challenges surrounding the introduction of two fibre-optic cables expected to connect Algeria to international connection points.
- The submarine fibre-optic cable Medex, connecting the eastern city of Annaba to the US west coast will have a capacity of 4.4 TB. In addition to Medex, the cable Orval will connect the west Mediterranean city of Oran to Valencia, on the east coast of Spain. The new connections, expected to be operational by the beginning of 2019, add to two pre-existing international cables, increasing Algeria's internet bandwidth 10-fold to 6.4 TB. This increase will improve connectivity as little domestic content is available or stored in data centres (cybersecurity).

b. Weaknesses

- Algeria has fallen behind both in terms of Internet penetration (31.9%) and the development of e-government (130th in the United Nations ranking of countries) or attractiveness for companies (166th in the World Bank's Doing Business ranking), quite far behind its North African neighbors.
- Resource silos:Sonatrach has five data centers that are discrete and operate independently of one another. Because of this, they lack unified management and scheduling. If one data center becomes overloaded, services cannot be distributed to other data centers. The physical machine + virtualization architecture creates a silo-like system that complicates the rollout of new services. Core services are deployed in a single data center and lack Disaster Recovery (DR) measures, which makes it difficult to ensure service continuity (hongyuan, 2019) .
- Information silos: Sonatrach has more than 200 subsidiaries and more than 10 horizontal functional departments. However, the IT hardware is provided by different vendors, which can cause compatibility issues. Information has to be manually transferred through Excel spreadsheets or other electronic reports, limiting mobile access and resulting in data silos between departments and subsidiaries. Operating data from subsidiaries and departments cannot be extracted and compiled in a unified manner. This makes it difficult for the management team to monitor the data, leading to low operational efficiency (hongyuan, 2019) .

c. Opportunities

- Sonatrach's digital transformation strategy SH30 which will outline the company's priorities and objectives for the next decade, seeks to reform the state-owned firm and give it a long-term strategy (Henni, 2018).
- Based on SONATRACH's vision for 2030 and the One Cloud strategy, Huawei develops a customized cloud-based solution to centrally manage multiple data centers, eliminate resource silos, and allocate resources on demand. Over the course of the project, this will significantly optimize the use of resources, support more services, and accelerate service rollout. With the One Cloud system, the ERP will transform SONATRACH's IT system, which will drive optimization and reduce costs. In parallel to this process of digital transformation, SONATRACH will construct a digital oilfield that will reap benefits well into the future (Repporter, 2021) .
- the creation of the Digital Development Support Company (EADN), and the new law on unbundling will generate a new dynamic in the national wholesale market, with various players who have different or even antagonistic visions and interests (the regulator, Algeria Telecom, other operators, or infrastructure managers such as Sonatrach, which has its own fiber optic network). The development of broadband penetration will involve striking a balance between measures to promote lower prices and to increase investment. This new law should also make it possible to develop convergent fixed-mobile offerings, similar to European markets. The development of digital financial services and the associated framework may also be an opportunity for the improvement of financial inclusion in the country
- Sonatrach signed a cooperation agreement with the Algerian Space Agency (ASAL) to provide Sonatrach with space data and images as well as satellite communication systems. "This agreement is part of our drive to strengthen our technology acquisition and to boost coordination between the two parties through the exploitation of space technologies (Henni, 2018).
- The new vision of the new Algerian through the support of the startups (the new Algerian prospection to start ups environment) which will allow Sonatrach to get the access to different innovation solution from local companies .

d. Threats

- Law specialists assert that the digital revolution in Algeria is first lawful before it is technical. In fact, Algeria knows a legal vacuum in the field of information and communication technology (Nabila, 2019).
- As a matter of method, this reflection should be extended to energy specialists to ensure its effectiveness. And this can only be successful with the opening of Sonatrach to the community of researchers, experts and professionals in the sector (dévoilée, 2020) .
- The Sonatrach's strategy should be part of an overall energy policy that is currently scarcely defined. All this invites a real national debate on the country's energy strategy for 2050. Without these prerequisites, Algeria risks, once again, lacking a global vision, detrimental to the future of the hydrocarbon sector and to that of energy in general (dévoilée, 2020).
- the execution and implementation of the strategy could be difficult for a company that has seen six CEOs in less than seven years, with each new CEO changing the direction of the company. Add to this challenge associated with political meddling, red tape and corruption (Henni, 2017).

5. CONCLUSION

This study presents an analytical approach using SWOT method of the Algerian's oil and gas industry digital transformation strategy, the results show the great contribution of the implementation of this strategy on the Algerian oil and gas sector, under the global complicated situation of the oil & gas industry due to the decline of oil prices, the environmental challenges and the Covid 19 consequences, The study stopped on different oil & gas companies experiences and successful digital transformation processes (ENI, BP, Exon mobile etc..) as well as, Sonatrach's transformation strategy SH30.the results and through the implementation of SWOT analysis also indicated several positive spots in Algerian environment that will push the transformation process (the law, the digital infrastructure, the startups initiative) meanwhile, the study indicated some limitation that it must be considered in the transformation process (the fallen behind in terms of Internet penetration, Resource silos etc…) considering the impact of digitalization on the industry's historical players as well as Will their philosophy on data, historically a highly-prized asset, it is worthwhile to ask

whether and how they will adapt to changes at certain companies, can they delegate analysis to outside companies? Or on the contrary, will their philosophy remain unchanged, driving them to process everything internally? (Energies nouvelles, 2018) ,in this case, Sonatrach is no different from the others, therefor, creating an incubator and encouraging local startups and which are able to test their solutions within the group's various business lines and seeking digital innovative solutions that are new to the market, or creating new digital industrial services company encompassing the entire oil and gas value chain. Instead of the full dependent of one tech company solution (Huawei) will allow Sonatrach to ensure the most important treasure which is data (Cybersecurity).

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