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Scaling Agile And Hybrid Project Management Methodologies For Sustainability In Global Oil And Gas Operations: Overcoming Cultural And Organizational Resistance

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Abstract

This paper explores how agile and hybrid project management practices are scaled in oil and gas operations, their role in promoting sustainability, and the organizational resistance they face. A systematic review of case and empirical studies reveals that Agile offers significant benefits, including flexibility, improved stakeholder collaboration, and adaptability to market changes. However, scalability challenges, regulatory constraints, and entrenched centralized hierarchies hinder widespread adoption. For large projects, a Hybrid approach combining Agile flexibility with traditional project structure is more feasible. Hybrid models have demonstrated success in enhancing coordination, efficiency, and sustainability alignment while maintaining regulatory compliance. They help bridge cultural gaps between conventional and Agile methods, reducing resistance and increasing project success rates. To effectively implement Agile or Hybrid practices, oil and gas companies should prioritize leadership support, provide adequate training, and encourage cross-functional collaboration. These focus areas can overcome resistance, improve project outcomes, and support sustainable operational practices.

Keywords : Agile, Hybrid methodologies, Sustainability, Oil and Gas, Project Management, Cultural Resistance.

1. Introduction

Oil and gas have historically been at the foundation for energy production, economic development, and technological innovation throughout the world. As the world collectively faces the dual challenges of climate change and energy demand, the sector is at a critical juncture (Alita, Ajaegbo, Asu, & Cyprian-Ogah, 2023). Age old operational methodologies based on just 'doing business to make money' are being challenged and forced to adapt towards sustainable practice. As the environmental, resource-restricted, and regulatory climate intensifies, oil and gas companies need to discover alternative means of achieving profitability while accommodating the burgeoning need to incorporate sustainability into companies (Onifade, Zvarivadza, Adebisi, Said, Dayo-Olupona, Lawal, & Khandelwal, 2024), (Simpa, Solomon, Adenekan, & Obasi, 2024). This has created a need for alternative strategies to be used to gain efficiencies in projects, project delivery, and sustainability objectives. Agile and Hybrid project management are among these recent innovations as they provide a more adaptable, flexible, iterative approach to project management even for large-scale projects (Székely, Késmárki-Gally, & Lakner, 2025).

Agile project management originated in the software field, but has become a globally distributed phenomenon used in many different fields (Ndou, Ingrosso, & Di Girolamo, 2024). Agile is a flexible methodology that places a strong focus on customer collaboration and is therefore well suited for projects that need to be rapidly adapted and continuously improved (Amajuoyi, Benjamin, & Adeusi, 2024). Agile is gaining traction in the oil and gas sector for assisting in making operations more efficient, empowering better decisions, and creating greater responsiveness within teams involved in various projects including drilling, exploration and production (Kanu, Dienagha, Digitemie, Ogu, & Egbumokei, 2022). The Agile methodology's iterative feedback loops and incremental delivery, could be invaluable in an industry subject to such volatile markets and demand (Sjödin, Parida, Kohtamäki, & Wincent, 2020).

Agile, but, does have limitations when it is scaled to the scale and complexity of large oil and gas projects. They are also heavily regulated, involve multiple stakeholders, and must comply with strict safety and environmental codes. In these types of environments, pure Agile can lack the framework for oversight, monitoring and compliance needed as noted by Almeida, & Bálint, (2024). As a response, Hybrid project management approaches, which combine the best of Agile with more traditional structures, such as PMBOK or PRINCE2, have come into existence (Almeida, & Bálint, 2024), (Simonaitis, Daukšys, & Mockien 2023). Hybrid models allow organizations to maintain the benefits of Agile's flexibility but also ensure the control and compliance needed in a high-risk field such as oil and gas (Alikornwo, Elechi, & Echendu, 2024).

Hybrid methods combine the strength of different planning, follow the process and risk management approaches to form a system that is also flexible, and thus retains the advantages of Agile (Alikornwo, Elechi, & Echendu, 2024). Agile Hybrid constructs allow oil and gas corporations to operate in an industry that is rapidly shifting, responding to this change to ensure operational and sustainability targets are met (Larbi, Boakye, Fakeyede, Asimolowo, Owusu, Omole, & Omuvwie, 2025). A careful balancing of interests is vital given this sector's transition into greener energies, through investments in renewable energies and carbon reduction technologies, which necessitate rapid adaptation to changing markets and technologies.

Beyond the project management applications, Agile and Hybrid methods are also being found beneficial in adapting to the changing workforce nature in the oil and gas sector (Larbi et al., 2025). As digital transformation takes hold, there is a growing dependence on data, AI, and real-time analytics to inform decisions across the industry (Koroteev, & Tekic, 2020). This necessitates

teams working in a very collaborative, coordinated way across many sites, and large regions. The transformation toward this reality is also aided by Agile's emphasis on collaboration, communication and flexible processes (Ndou, et al., 2024). On the other hand, they guarantee that safety, legality and risk are never neglected in the name of innovation (Székely, et al., 2025).

The present paper intends to discuss the potential for scaling and applying Agile and Hybrid project management in the oil and gas industry worldwide, to achieve sustainability and address cultural and organizational resistance. It will be practically useful in terms of how they can be used to ensure better project delivery, compliance and alignment with sustainability aspirations in the sector. This paper is structured in first presenting the literature review on the Agile and Hybrid methodologies, then the case study analysis of the oil and gas industry and finally recommendations to combat resistance and adopt these methodologies.

2. Literature Review

2.1 Agile Project Management

Agile project management, developed in the software realm since the early 2000's, is a project management methodology focused on flexibility, collaboration and rapid delivery (Celestin, Sujatha, Kumar, & Vasuki, 2024). Agile, at its essence, advocates for working in iterative cycles, or "sprints," where teams produce small usable pieces of a project, get feedback on those pieces and adjust their work accordingly (Daraojimba, Nwasike, Adegbite, Ezeigweneme, & Gidiagba, 2024). The Agile Manifesto was founded by a collective of software developers and asserts the following four basic values: we value, individuals and interactions over processes and tools, and working software over comprehensive documentation. Customer collaboration over contract negotiation. Responding to change over following a plan (Chathuranga, Jayasinghe, Antucheviciene, Wickramarachchi, Udayanga, & Weerakkody, 2023). The intention behind these values is to have a set of project management ideals that deal with a more flexible and less wasteful form of project management, especially in situations where the scope of work, and needs can change very quickly.

In an agile team, uncertainty and change are both accepted and accommodated, making the agile framework very suitable for use in an industry in which the market conditions are themselves dynamic. Instead of following a fixed linear path Agile allows for constant improvement and re-prioritizing based on stakeholder feedback (Steegh, De Voorde, Paauwe, & Peeters, 2024). This flexibility makes it particularly attractive for any industry that must be flexible in the face of changing demand, and especially those that are subject to constant technological innovation, regulation, and market changes, such as the energy and oil sectors.

Although Agile was originally developed for software construction, its philosophy has been employed effectively in many areas outside software, such as the construction, energy, and oil & gas industries. Agile has been adopted, for instance, in the energy sector to enhance the execution of complex projects such as renewable energy setups where the project scopes and timelines are often not predictable (Famoti, Omowole, Nzeako, Muyiwa-Ajayi, Ezechi, Ewim, & Omokhoa, 2025). Agile processes have been successfully used in large projects where several teams and stakeholders are involved and technology needs are often change rapidly (Amajuoyi, et al., 2024).

In oil and gas, there is a growing perception of Agile as a way for businesses to become more efficient (Kanu, et al., 2022). Agile incorporates the ability to be flexible, which is what the

companies will require to be able to deal with the up and down movements in the industry, particularly in upstream and exploration projects, which all depend on market pricing, weather and regulations (Amajuoyi, et al., 2024). The use of Agile in oil and gas has allowed companies to improve processes, complete projects faster and engage stakeholders with regular feedback cycles (Famoti, et al., 2025). This skill of constantly reviewing goals of projects and being able to adapt them as necessary is essential when it comes to the very uncertain world of oil and gas. Agile's incremental model facilitates rapid provision of working products, making this model advantageous in businesses that need to quickly respond to changing market conditions (Chukwunweike, & Aro, 2024). Additionally, Agile cannot be accepted easily in big industries like the oil and gas as Scalability is one of the primary challenges. Agile approaches are mostly adapted for small self-organizing teams, making adaptation into larger, more complex, multinational, hierarchical projects problematic (Sithambaram, Nasir, & Ahmad, 2021). On top of that, the cultural alignment of Agile to that of oil and gas creates a challenge, as the oil and gas industry has a more entrenched culture of formality and control, and a top-down, controlling, predictability focused management paradigm (Famoti, et al., 2025).

2.2 Hybrid Project Management Methodologies

The hybrid project management methods incorporate aspects of at least one traditional project management method, such as PMBOK or PRINCE2, as well as Agile methods (Gemino, Reich& Serrador, 2020). The idea is to obtain the structure and predictability of "Waterfall" practices but combine it with the responsiveness and flexibility of Agile. Hybrid models are flexible and can be adapted or developed based on the organization's requirements providing a solution to the challenges of project management in a complex high-risk environment (Mirzaei, Mabin, & Zwikael, 2024).

The Hybrid model divides the project into phases utilizing Agile practices in phases where flexibility is beneficial like in the executing phase while normal project management practices create a framework for planning, monitoring, and closing. It also allows a project to be flexible and change while also having a high level of oversight and documentation which is critical in highly compliant/regulatory industries (Azenha, Reis, & Fleury, 2020).

The combination of approaches is useful, for example, in the oil and gas industry where projects tend to be large, resource heavy, and heavily regulated. These generally involve extensive planning, risk and safety and environmental management. You can plan for every single detail and mitigate risk using traditional project management such as waterfall or PMBOK. But Agile attitude can be adopted in order to increase flexibility of execution and allow the project team to react quickly to changes in environmental conditions or market needs (Gemino, et al., 2020), (Bassi, 2025).

As an example, Hybrid approaches have been applied to complex oil and gas exploration projects with multiple stakeholders and degrees of uncertainty (Faria, Lima, Secchi, & De Souza, 2024). The Hybrid model enables teams to adapt both work processes and workflows using real-time information but still within the bounds of regulations and timelines where necessary. The structure, flexibility and adaptability offered by Hybrid methodologies provide a suitable approach to counteract the problems associated with the complexity and volatility of the industry.

2.3 Cultural and Organizational Resistance in Oil and Gas

The oil and gas sector has a more traditional, hierarchical management style that is mostly top-down and focuses on control, predictability, and avoiding risk. The culture that results from operating in this way for decades is not conducive to Agile, which empowers local decision making, transparency and iteration. Oil and gas companies are used to strict processes and documentation processes for a long time and thus may find the focus and processes of Agile to be disruptive or inefficient (Ndou, et al., 2024), (Hanson, Nwakile, Adebayo, & Esiri, 2024), (Abedin, Gabor, Susanu, & Jaber, 2024).

On top of that, the nature of the industry and its emphasis on safety as well as regulatory considerations makes Agile even more difficult to apply. Agile's focus on flexibility and ongoing evolution can be seen as dangerous in a context where standards and protocols must be rigidly followed. This means the resistance to Agile culture within oil and gas often has its origins in hesitance to move away from existing practices and into more reflective, less controlling practices that rely on adaptation instead of responding to resistance to change, or even outright rejection of Agile in the first place (Adebayo, 2022).

One way to address the cultural resistance to Agile practices that exists in oil and gas is for organizations to change their mindset, which can be aided by dedicated leadership support. Leaders who promote Agile and Hybrid Mindsets can be the leaders in promoting the benefits and addressing the concerns of the Agile and Hybrid Mindsets within the organization. Also, using cross-functional teams assists in eliminating silos and can promote a teamwork attitude towards project management. If diverse areas of the organization participate, then Agile philosophies can take a stronger hold within the functioning of the organization (Hanson, et al., 2024), (Abedin, et al., 2024), (Adebayo, 2022).

2.4 Sustainability in Oil and Gas Operations

The oil and gas industry has many sustainability problems from carbon to resource depletion (Simpa, et al., 2024). The energy industry is thus challenged to implement sustainable practices that decrease environmental impact and responsibly use resources as 'the world's energy consumption continues to grow (Olabi, Elsaid, Obaideen, Abdelkareem, Rezk, Wilberforce, Maghrabie, & Sayed, 2023). This has caused oil and gas companies to reimagine their business models as governments and regulators impose more stringent emissions and green energy initiatives (Osman, Chen, Yang, Msigwa, Farghali, Fawzy, Rooney, & Yap, 2022).

Beyond regulation there is increasing social expectation that businesses operate sustainably. As consumers, investors, and the general public demand more sustainable practices from the companies publicized as leaders in the industry, those companies that don't follow the trend risk losing competitive advantage.

2.4.1 Role of Agile in Sustainability

The oil and gas industry can make use of Agile's iterations in reaching its sustainability goals (Larbi, et al., 2025). Agile processes have the inherent flexibility to allow businesses to respond quickly to shifts in regulations, market conditions, and technologies. For instance, aspects of Agile such as continuous feedback and improvement could help to innovate the development and deployment of renewable energy technologies or improve resource management (Ebirim, Portillo Montero, Ani, Ninduwezuor-Ehiobu, Usman, & Olu-lawal, 2024).

Also, Hybrid project management plays the role of incorporating the iteration aspects of Agile with the risk management and compliance project management processes that serve as a structure within which the sustainability work occurs. The application of Agile beyond general projects to sustainability projects like carbon reduction or green energy projects can further fuel the efficiency and cost cutting benefits for oil and gas companies and ensure that sustainability initiatives stay aligned with long term sustainability goals (Adedokun, Akunna, Olalemi, Sanni, & Hammed, 2025), (Ahmad, Ravi, Chitta, Yellepeddi, & Venkata, 2018).

On top of that, Agile can promote more teamwork among stakeholders, which is particularly important in sustainability projects that may have many different actors with diverse perspectives. Agile allows organizations to continuously involve stakeholders, who continuously provide feedback on development iterations, ensuring their issues are addressed and the project remains aligned with sustainability goals (Tettey, Sunday, Azumah, Nwosu, Oluwatobi, & Chrisben, 2025)

3. Methodology

A systematic literature review was performed in order to discover how Agile and Hybrid project management are being utilized and having an impact within the oil and gas industry specifically. These reviews used Scopus, Web of Science and Google Scholar databases. The search used the keywords Agile, Hybrid, Oil and Gas, and Sustainability. A narrative synthesis was conducted to extract common themes, challenges and solutions from the chosen studies. It sought to understand the adaptation of Agile and Hybrid approaches, the challenges it encountered and how it overcame institutional resistance. The key findings were then extracted, classified and compared with a view to provide a fuller picture of how these methodologies are applied in this context

4. Results and Discussion

4.1 *Agile Methodology in Oil and Gas*

The benefits of employing Agile within the Oil and Gas sector are apparent in the ability to increase efficiency and responsiveness in projects. For example, in the case of Nigeria's own downstream oil and gas sector the Iterative Technology Transfer Framework which draws on concepts of Agility, substantially enhanced local capacity through more effective continuous knowledge transfer (Abu, Aun, & Oluwasanmi, 2018). It provided each of their teams with a process of iterative evolution, of responding to the growing sector, and developing processes with an eye toward sustainable solutions. This flexibility was also instrumental in fostering innovation and entrepreneurship of local businesses.

A Hybrid approach, incorporating aspects of Agile and the traditional Waterfall approach, has similarly found advantage in large Engineering, Procurement, and Construction (EPC) projects in the Middle East (Al - Hajji, & Khan, 2016). Despite Agile's flexibility being constrained by regulatory requirements and a need for documentation common in traditional methodologies, the adoption in a hybrid manner within a framework resulted in fewer delays and more control over costs.

4.1.1 Cultural and Organizational Adaptation

Some of these cultural changes are required to allow for the successful adoption of Agile within the oil and gas industry. The industry has traditionally functioned within a controlled, predictable, and risk aversive, highly structured, top-down model. The Agile philosophy of working in

collaboration, being flexible and iterative tends to be antithetical to this environment. The support of leadership is crucial to help topple those barriers. Also, assuming leadership support and complete training as essential to the successful embedding of Agile in the culture of the organization, the answer is the establishment of cross-functional teams that cross the silos between departments. Agile relies on these groups cooperating, communicating and iterating on results. Transitioning from a traditional mindset to an agile mindset requires the same sort of paradigm shift that is only achieved through a managed change that does not overwhelm or panic the organization but rather equips them to be successful in the agility approach. Also included in adapting to this are iterative planning processes that help teams keep up with current project needs and industry demands (Celestin, et al., 2024), (Ndou, et al., 2024), (Alikornwo, et al., 2024), (Hanson, et al., 2024), (Adebayo, 2022).

4.2 Hybrid Project Management in Oil and Gas

Hybrid models that incorporate elements of both Agile and more traditional project management methodologies are most beneficial to the oil and gas projects due to the large scale, innovative nature and compliance aspects of oil and gas projects. One of the main benefits of Hybrid methodologies combine the structured project planning especially associated with Waterfall model, while maintaining the flexibility, adaptability of Agile practices (Almeida, & Bálint, 2024), (Simonaitis, et al., 2023), (Alikornwo, et al., 2024), (Sithambaram, et al., 2021), (Gemino, et al., 2020). Oil and gas projects in the Middle East also have found implementation of Hybrid approaches interesting in being able to effectively manoeuvre through the regulatory Roadblocks as well as experience innovative Risk solutions to the feedback loops of Agile and the stage gates of Waterfall that keep oil and gas projects on schedule with critical milestones and compliance needs while allowing for ‘on the fly’ adjustment based on real data and emerging needs of the project (Farahat, & Defina, 2022). This is particularly useful for sustainability projects where regulations often evolve as well and innovation is centrally important to enabling stakeholders to meet over the long-term objectives.

4.2.1 Case Studies

The successful use of Hybrid models in complex oil and gas projects is illustrated in a few case studies. One case study on a major EPC project in the Middle East, where Agile was adapted into the traditional Waterfall method, found that the project was more efficient, exhibited less time overruns and had more control over costs (Farahat, & Defina, 2022). Similarly, Hybrid models in oil and gas supply in Norway helped the companies maintain a good level of innovation while also respecting regulations and creating a competitive advantage that was also in line with sustainability goals show that Hybrid models, when well embedded, can scale in places where structure and flexibility are both required (Åkvik, & Nesse, 2023), (Sletten, Jonasmo, & Solheim, 2023).

4.3 Sustainability Outcomes

4.3.1 Agile’s Role in Sustainability

Given its flexibility and iterative process, Agile is well suited to address sustainability concerns in the oil and gas sector. Agile also emphasizes continuous improvement, which allows teams to adapt swiftly to changing standards in environmental regulations, market conditions, and technology. For instance, deploying Agile methods in the projects for carbon and green energy

allows oil and gas companies to remain extremely responsive in the ongoing shifts in sustainability expectations (Larbi, et al., 2025), (Abedin, et al., 2024), (Olabi, et al., 2023).

The collaborative and feedback-oriented nature of Agile also leans towards a participatory process for sustainability. Involvement of stakeholders all through the life cycle of the project helps to ensure that it is aligned with sustainability objectives. Agile's capacity to quickly iterate ideas and solutions based on feedback is critical in an ever-changing and uncertain energy transition world. The cycles of iteration enable oil and gas companies to evaluate and recalibrate their fossil fuel- based sustainability practices in response to emerging challenges, for instance changes in renewable energy regulations or innovation (Kanu et al., 2022).

4.3.2. Hybrid Approaches for Compliance

As Agile is good at being adaptive, Hybrid is critical to compliance in the oil and gas sector. Hybrid models provide a way to balance Agile's flexibility with the necessary compliance and regulations that are so important to the industry. Furthermore, Hybrid models to create renewable energy systems in Latin America have led to projects that lower carbon emissions while remaining highly compliant within regulatory frameworks (Borges, Rampasso, Quelhas, Filho, & Anholon, 2022). Hybrid approaches, which incorporate the flexibility of Agile with the stringent controls of traditional models, allowing for both innovation and compliance, are especially relevant for sustainability projects.

Also, Hybrid methods reduce the fear of "not following" by delivering structure and phases into the project but also the freedom to adapt when it is needed. Such a balance is especially important in industries such as oil and gas, where legal structures are in constant flux and can lead to large penalties for not adhering to environmental regulations (Székely, et al., 2025), (Larbi, et al., 2025).

4.4. Overcoming Resistance

4.4.1. Cultural Shifts

There is also a strong need to transform the culture in order to overcome organizational resistance to Agile and Hybrid approaches within the oil and gas industry. Agile also focuses on collaboration, flexibility, and quick decisions which is not easy to find in the hierarchical / compliance culture that is prevalent in most oil and gas firms' conventional oil and gas companies. Agile transition can be one approach to tackle this resistance. Companies can transform to an Agile approach without needing to change their entire workflow to do so by implementing parts of Agile (Székely, et al., 2025), (Hanson, et al., 2024), (Adebayo, 2022).

In this transformation, support from leadership is crucial. Leaders should be the flag bearer of Agility and Hybridization promoting its advantages in promoting efficiency operationally and sustainably. On top of that, it is important to arm workers with training and tools to make the transition to Agile practices. It has been shown that those organizations that apply training and development of Agile, tend to break cultural barriers to successfully apply Agile and Hybrid models (Székely, et al., 2025).

In the long run, the eventual Resistance to Agility and Hybridity will continue to provide organizations with benefits such as more efficient operations, higher levels of stakeholder inclusion, and a more sustainable practice. Because of this flexibility, Agile teams are able to respond to unexpected challenges and new opportunities and deliver projects more quickly and of better quality. On top of that, one of the virtues of Agile is that it's emphasis on continuous

feedback improves relationships with stakeholders so that projects stay aligned with sustainability goals.

The hybrid approach blends the two, allowing both flexibility and structured approaches to effectively deal with the complex nature of a large scale, compliance driven project. They allow oil and gas corporations enough control of key processes and yet nimble enough to innovate and adapt to new market conditions. In the long term this not only creates better project deployment but also establishes these companies as the leaders of the energy transition to a more sustainable future. Ultimately, the effective use of Agile and Hybrid methodologies is one pathway to the oil and gas companies surviving in the long run in a world challenged by sustainability and regulatory issues.

DISCUSSIONS

The results of the systematic literature review indicate that there is an expanding opportunity for Agile and Hybrid project management to enhance efficiency and sustainability within the oil and gas industry. Agile approaches are particularly adaptable given that this industry is in fact very dynamic with changing market conditions, technologies, and regulations. Agile enables teams to respond quickly to such changes and provides a means for incorporating change as a strategy for dealing with projects that may be difficult to implement using traditional techniques which are often based on uncertain or delayed projects.

There are, but, downsides to the use of Agile approaches on large-scale oil and gas projects. The largest and most significant challenge is, ironically, the hierarchical bureaucracy and reliance on process, documentation, and compliance in the sector itself. Such practices, needed for safety and regulations, could be viewed as diametrically opposed to Agile's flexibility and decentralized nature. Given the nature of the oil and gas industry, where high financial and regulatory compliance risk is the norm, there is an inherent inclination towards traditional project management that focuses on control, predictability, and detailed up-front project planning. This clash of Agile values with the norm of culture in the industry is one of the fundamental reasons many companies are reluctant to embrace Agile practices.

A more adaptable approach are Hybrid models that include aspects of both Agile's flexibility and aspects of traditional methodologies' structure. The oil and gas industry requires all compliance and regulatory controls, which are essential for workplace safety and success of operations, but can also use the feedback loop and team collaboration in Agile, and in these models, they can do so. Hybrid models combine the advantages of both Agile and traditional projects by applying Agile during implementation while relying on traditional practices for planning and compliance. It allows for appropriate regulation, but also allows oil and gas companies to remain flexible to changing circumstances.

The successful application of Hybrid approaches in the oil and gas sector in the Middle East and Norway demonstrates time and cost savings. This is an example of how Hybrid models can improve operational efficiency, stakeholder communications and sustainability efforts. Agility provides the opportunity for ongoing assessment and recalibration, an important aspect of meeting long-term sustainability targets such as carbon and energy reduction and efficiency. Hybrid models can also efficiently be scaled to larger, more complex projects, which makes them particularly useful for multinational oil and gas operations that must juggle multiple regulatory frameworks and stakeholder interests.

Considering the benefits, there are also shortcomings of Agile that could impact the oil and gas domain. For one, scalability. Agile works great in small teams or small projects but is problematic when trying to implement in larger programs with many teams in various locations and countries. On top of that, Agile's focus on being flexible and adaptable, can also produce a dearth of documentation that could be a challenge for very regulated fields like oil and gas. These drawbacks indicate that Hybrid models would probably represent the best path forward, as they would combine the best of both traditional project management methodologies and Agile practices. Hybrid models are an especially good fit for tackling the scalability issue, as they provide the possibility of a more controlled, structured approach where that is needed while maintaining the flexibility to adapt to new conditions.

Agile is also initially expensive and requires extensive training. Sometimes it is the case that the oil and gas industry does not adopt Agile simply because it does not know the advantages it can provide. The implementation of the processes requires training and change management to support the inevitable resistance, to get team members tooling to use Agile, etc. Adopting this culture is difficult yet once achieved it pays off in terms of better efficiency in operations and a good relation with stakeholders.

5.2 Practical Recommendations

5.2.1 Implementation Framework

If the oil and gas industry hope to adopt Agile and Hybrid methodologies in the successful previous industries, a good starting framework should be established in both technical and cultural dimensions of Agile implementation. This is invaluable in leading the change by reinforcing the benefits of Agile to run projects more efficiently, effectively and collaboratively. Awareness of Agile ideas, and the application of it in oil and gas should be developed through training programs for employees. On top of that, these trainings should help provide guidance on the successful integration of Agile practices into existing frameworks to maintain aspects of compliance and safety.

In the case of Hybrid models companies must define a governance approach that brings in the strengths and advantages of the Agile and traditional approaches. This framework should outline methods for application of Agile processes during the implementation phases, all while using traditional practices to oversee, manage risks, and remain compliant. As long as roles and responsibilities are well defined and there is a cross functional nature to the teams involved, companies can create the collaboration needed to be successful with Hybrid approaches.

5.2.2 Sustainability Integration

To promote sustainability within the oil and gas sector, Agile and Hybrid approaches need to be linked with sustainability-specific goals and objectives right at the project initiation phase. One way to accomplish this is to develop sustainability metrics that are included in the project backlog, intermingled with project criteria such as cost and schedule, so that environmental objectives of carbon reduction and energy efficiency are set and achieved in tandem with the project type objectives. This real-time ability to monitor and adapt lends itself well to the rapidly changing problems associated with sustainability because of the iterative nature of Agile.

The hybrid models set a particular powerful framing to merge sustainability, as they also incorporate the best of both worlds between Agile's flexibility and compliance-oriented structure

large scale, need for a compliance-oriented structure for large scale environmental projects. Utilizing Agile processes to encourage innovative ideas and flexible processes while relying on traditional practices to enforce environmental regulations enables oil and gas firms to pursue sustainability efforts more efficaciously.

5.3 Future Research Directions

Though this study contributes to the understanding of how Agile and Hybrid approaches are being adopted in oil and gas industry, there are some gaps in this research. The sustainability of the sector as affected by Agile is one important area of future research. What is the impact of Agile and Hybrid methodologies on oil and gas companies in relation to long-term sustainability objectives? Measurement of the impacts of sustainability projects from an Agile perspective could be from areas including carbon reduction and renewables.

The construction of new Hybrid models for the oil and gas sector is another possible direction for future research. Though existing Hybrid models have proven successful, there is still a lack of hybrid methodologies which are concerned with the particularities of different industries, such as the oil and gas industry within specific areas of safety, environmental compliance, or stakeholder management. Future studies could address the extent to which these models can be tailored to better support Agile and find the best way of making it flexible and regulatory compliant within this industry.

5. Conclusion

This study's findings highlight the potential for agile and hybrid project management approaches to be used as an effective strategy to addressing the cultural and organizational inertia prevalent within the oil and gas sector, in a way that leads to sustainability impacts. Agile methods focus on flexibility, iteration, and stakeholder collaboration and therefore represent a potentially appropriate set of practices for an industry that experiences constantly changing market, environmental, and technological landscapes. But the oil and gas industry is not particularly conducive to agile methods due to its entrenched hierarchies and inflexible processes that emphasize control and predictability, while agile requires a certain amount of flexibility and agility to be able to react quickly.

The most effective solution is using hybrid project management methodologies, which already blends the flexibility of agile with the structure of traditional project management approaches. The hybrid model enables oil and gas companies to achieve the rigors of regulatory compliance, with innovation and responsiveness. The combination of mechanisms instituted by hybrid models allows for a compromise between structure and agility that nicely accommodates the peculiarities of the construction industry by embedding the agility of iterative feedback loops in the formality inherent in a compliance-driven model.

Culturally, agile and hybrid approaches have been successfully implemented in oil and gas with leadership support, a move away from silo functions, and moving away from long range upfront planning. These shifts not only help improve projects and stakeholder involvement, but help oil and gas companies meet their sustainability focuses. The need to respond to dynamic challenges,

for what agile is known for, in combination with hybrid's strengths in compliance, presents a solid approach for scaling up sustainability.

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