International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023

Print ISSN: ISSN 2514-9253

Online ISSN: ISSN 2514-9261

Website: https://www.eajournals.org/

Publication of the European Centre for Research Training and Development-UK

An Exploration of Critical Success Factors for Lean Project Management in the Upstream Petroleum Industry in Ghana

Ayanaba, J.[a*], McLellan, I.[a], Kourouklis, T.[b] Cano, M.[a], and Aka, R. O.[a]

a. School of Computing, Engineering and Physical Sciences, University of the West of Scotland, High Street, Paisley, PA1 2BE, United Kingdom
b. School of Business and Creative Industries, University of the West of Scotland, High Street, Paisley, PA1 2BE, United Kingdom
* Corresponding author: john.ayanaba@uws.ac.uk

doi: https://doi.org/10.37745/ijpger.17v6n12144 Published October 29 2023

Citation: Ayanaba, J., McLellan, I., Kourouklis, T., Cano, M., and Aka, R. O. (2023) An Exploration of Critical Success Factors for Lean Project Management in the Upstream Petroleum Industry in Ghana, *International Journal of Petroleum and Gas Engineering Research*, 6 (1), 21-44

ABSTRACT: *Lean project management is quickly gaining acceptance in a variety of industries. The problem is despite the discovery of oil and subsequent exploration, Ghana has always been a net importer of crude oil, petroleum products, and natural gas. Given that lean management implementation inures to better performance and cost efficiencies, this study sought to ascertain the state of lean project management implementation in the upstream petroleum industry using Ghana as a case of an emerging economy context.Employing a Delphi style methodology by seeking experts' opinions in the upstream sector of Ghana's petroleum industry, the study found that even though lean project management implemented to an extent within the sector, its implementation is fraught with challenges such as low leadership to drive the lean process, management, and planning for the entire process. Experts in the field gave opinions as to the key considerations for successful implementation of lean project management in the upstream sector and the study recommended that lean project management should be emphasized more in the petroleum sector for higher performance that may inure to the country being a net exporter instead of a net importer of crude products.The study recommends strong leadership teams for the upstream sector to lead lean implementation with adequate training on lean project management provided to all staff for increased commitment and effective implementation that engenders a lean culture in the sector.*

KEYWORDS: Lean project management, Upstream petroleum sector, Critical success factors

International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023
Print ISSN: ISSN 2514-9253
Online ISSN: ISSN 2514-9261
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

INTRODUCTION

Lean project management is gaining widespread recognition across various industries worldwide. It is a philosophy that revolves around delivering exceptional value to customers while minimizing resource usage, as defined by Schaufelberger and Holm (2017). Terry (2018) underscores that the core principles of lean management encompass maximizing customer value and eliminating waste. In practice, businesses adopting lean methods prioritize identifying market demands and devising innovative solutions to meet them, all the while keeping customer satisfaction at the forefront (Yang et al., 2017). Eliminating waste is a pivotal aspect of establishing lean operations within a company, leading to substantial reductions in production costs.

Effective communication and a clear understanding of roles and responsibilities among all involved parties are essential elements of successful lean project management (Yang et al., 2017). Organizations today must adopt strategic project management approaches to gain a competitive edge, as highlighted by Lima et al. (2023). Lean management extends beyond being just a methodology; it represents a holistic organizational mindset, drawing inspiration from Toyota's history and the Toyota Production System (Lima et al., 2023). Its core objectives involve minimizing waste, expenses, and lead times while upholding quality throughout all business processes.

Compared to traditional mass production, lean operations require fewer workers, less manufacturing space, reduced equipment expenditure, and shorter engineering hours, resulting in fewer defects and reduced on-site inventory (Moujib, 2007). Lean project management stands out by its emphasis on delivering projects that maximize value and minimize waste. It fundamentally differs from traditional project management in terms of objectives, phases, interconnections, and stakeholder involvement (Ballard and Howell, 2003). Terry (2018) emphasizes the importance of lean principles in fostering workflow consistency, eliminating unnecessary steps, and enhancing value creation.

The application of lean concepts is evident across various sectors, including project management, where it is instrumental in executing large-scale projects in both the public and private sectors, as argued by Dahl (2020). Lean project management is particularly advantageous for project owners due to its focus on meeting customer expectations and minimizing waste, assuring on-time, goal-aligned, and cost-effective project completion (Perrotta et al., 2017). It effectively addresses concerns related to exaggerated project costs and delays that often deter project owners from engaging in megaprojects.

Lean project management also underscores the importance of waste reduction at every production step, requiring the quality assurance team to identify and eliminate specific sources of waste (Salah & Rahim, 2018). This study further delves into the application of lean project management within Ghana's upstream petroleum industry, highlighting key considerations for successful

implementation. In conclusion, lean project management represents a transformative approach that optimizes value delivery while minimizing waste, making it a compelling strategy for organizations across diverse industries.

This research holds both practical and theoretical significance as it provides valuable insights into the application of lean project management in Ghana's upstream petroleum companies, aiding in the enhancement of resource efficiency and value creation. The findings are relevant to project managers in applying lean principles to develop standardized methods aligned with client requirements. Additionally, the study sheds light on the challenges associated with lean project management implementation in an emerging economy context, particularly within the petroleum sector, offering recommendations to overcome these challenges. The theoretical contribution of the paper lies in advancing the literature on lean project management, serving as a reference for future research and guiding future researchers towards relevant areas of study.

LITERATURE REVIEW

The literature on lean project management and its critical success factors is extensive and multifaceted. This review aims to synthesize key insights from this body of knowledge, shedding light on the fundamental principles of lean project management, its applications across various industries, challenges encountered during implementation, and the critical success factors identified in the literature.

Project management serves as the cornerstone of lean project management. It encompasses a structured approach to planning, executing, and controlling interconnected tasks within defined constraints, including time, budget, and quality (Marzagão and Carvalho, 2016). The Project Management Institute (2017) expands this definition to encompass products and services, highlighting its ubiquity in diverse domains.

Lean thinking, originating in manufacturing, focuses on minimizing waste while maximizing value. This approach identifies and addresses seven types of waste, leading to streamlined processes and continuous improvement (Byrne, McDermott, and Noonan, 2022). The evolution of lean principles beyond manufacturing into areas such as healthcare, software development, and services underscores its adaptability and effectiveness (Kadarova and Demecko, 2016).

The Lean Project Management Foundation's framework introduces six core principles: serving people, creating value, building knowledge, applying systems thinking, effective communication, and simplification (Lean Project Management Foundation, 2023). These principles provide a holistic foundation for lean project management, emphasizing value creation, continuous improvement, and collaborative teamwork.

Implementing lean practices, particularly in developing countries like Ghana, presents a set of challenges. These challenges include a lack of awareness, resistance to change, inadequate training, and financial constraints (Ghosh, 2013; Panwar et al., 2016). Understanding and addressing these challenges are critical for successful lean adoption.

Critical success factors that significantly influence effective lean project management vary in emphasis across studies, reflecting their contextual nature. Some studies prioritize training and knowledge-building (Barclay et al., 2022; Ramori et al., 2019), while others underscore talent acquisition and management commitment (Aljazzazen and Schmuck, 2022; Elkhairi et al., 2019). The significance of these factors depends on industry specifics, company size, and cultural contexts (Netland, 2016; Aljazzazen and Schmuck, 2022).

Figure 1: Lean Project Management Principles (Adapted from Lean Project Management Foundation, 2023).

Context of the study

Hydrocarbon exploration in Ghana dates back to 1896 when oil seeps were discovered in the onshore Tano Basin (Tullow Oil Ghana, 2013). Further exploration efforts were made between 1909 and 1957 (Ampofo, 2008). Commercial offshore hydrocarbon production commenced in the Salt Pond Basin in 1975. Despite efforts to improve distribution and storage, regional disparities in liquefied petroleum distribution persisted (Ampofo, 2008).

The Ministry of Energy and Petroleum oversees the energy sector in Ghana, focusing on policy development, implementation, and evaluation (Ministry of Energy and Petroleum, 2013). Its mission is to ensure access to reliable, affordable, and environmentally responsible energy sources for all. In 1985, the Ghana National Petroleum Corporation (GNPC) was established to appraise

existing petroleum discoveries, promote exploration activities, and maximize Ghana's benefits from its petroleum resources.

To ensure a consistent petroleum supply, the Unified Petroleum Pricing Fund (UPPF) was created, incorporating distribution costs into petroleum product prices (Amponsah & Opei, 2017).

The oil and gas industry comprises three segments: upstream, downstream, and exploration (Hayes, 2019). The upstream sector includes activities from exploration to production (Hayes, 2019). Ghana participates in the entire oil and gas value chain, particularly in upstream operations. The Petroleum Commission was established in response to the 2010 commercial production launch at the Jubilee field to manage upstream activities. Major foreign companies such as Tullow Oil, Kosmos Energy, ENI, Aker Energy, and Springfield are active in Ghana's upstream sector (Ghana National Petroleum Corporation, 2014).

In Ghana's emerging oil and gas industry, challenges such as generation of unnecessary waste, poor stakeholder communication, and task allocation to inadequately skilled individuals are particularly relevant as the country continues to import petroleum products despite promising developments in domestic production. Moreover, there is a significant gap in the existing literature regarding the application of lean project management in Ghana's upstream petroleum sector. Thus this aims to investigate the critical success factors for implementing lean project management in Ghana's upstream petroleum industry by evaluating the awareness and knowledge levels of lean project management within Ghana's upstream petroleum sector, examining the specific lean project management techniques used by businesses in Ghana's upstream petroleum industry, identify the essential success factors contributing to the effective implementation of lean project management in Ghana's upstream petroleum sector as well as by investigating the barriers and challenges hindering the adoption and implementation of lean project management practices in the country's upstream petroleum sector.

METHODOLOGY

The philosophy of pragmatism with the mixed method strategy coupled with the deductive approach underlies this study using the cross-sectional design. The population for this study consists of all the project staff of the companies involved in the upstream petroleum sector of Ghana and purposive sampling was employed to take samples from this set for analysis. Closed ended, Likert scale questionnaires were administered to 92 project staff. The questionnaire was administered using Google Forms with the assistance of the Human Resource Department of the various companies to assist in the data collection. The questionnaire has 4 parts (refer to appendix) with the first part made up of questions eliciting demographic information while the second part elicits information about knowledge of lean management practices in the respondents' companies. The third part of the questionnaire investigates challenges to lean implementation while the last section interrogates the critical success factors for lean implementation. Six project managers were

also interviewed to supplement the questionnaire data. Cronbach's alpha was computed to test the reliability of the survey. This method follows the Delphi methodology in that expert opinion is what is sought in order to achieve the objectives of the study but differs from the Delphi methodology in that further iterations to fine tune responses by respondents is absent. The upstream petroleum sector requires specific expertise in operation hence it must be the case that expert opinion reflects the true state of affairs appertaining to this sector hence the choice of this methodology to achieve this study's objectives.

RESULTS

After cleaning the data with elimination of incomplete questionnaires, it was left with 80 responses for analysis. The responses of the survey were tested for reliability and the Cronbach's Alpha was found to be 0.86 indicating that the survey measures related constructs and is thus reliable.

Demographic information

Table 1 presents the demographics of the survey. It is observed that most of the respondents (>80%) are within the 25–54-year age bracket with half of the respondents having oil company work experience between 6 to 15 years and are highly educated with more than 60% of respondents having Masters' degree or higher. The male dominance of this industry is reflected in our data showing more than 76% male respondents to the questionnaires but of note is the caliber of respondents showing 32% project coordinators, 20% project managers, 18% senior project managers as well as 14% entry level project team managers. It can therefore be inferred from the demographic data (see Table 1) that the views captured in the survey are that of high-level decision-making units in the upstream petroleum project management sector with in-depth knowledge of the day-to-day operations withing this sector.

Now using variables extracted from lean literature, the views of these seasoned operators in the upstream petroleum sector were sought on lean project management awareness in the sector (Table 2), followed by an enquiry into the lean project management practices adopted in the upstream petroleum sector (Table 3) as well as obstacles to the implementation of lean project management in the upstream petroleum sector (Table 4).

Variable/ Response	Freq (n=80)	Percentage
Age		
24 and below	1	1.3
25-34	28	35.0
35-44	19	23.8
45-54	20	25.0
55 and above	12	15.0
Gender		
Female	18	22.5
Male	61	76.3
Work Status		
Entry level Project Team Manager	11	13.8
Project Coordinator	26	32.5
Project Manager	16	20.0
Senior Project Manager	15	18.8
Other	12	15.0
Length of work with Oil Firm		
0-5 years	32	40.0
6-10 years	29	36.3
11-15 years	11	13.8
Above 15 years	8	10.0
Highest Educational Qualification		
Bachelor's Degree	30	37.5
Master's Degree	45	56.3
Doctorate Degree	3	3.8
Other	2	2.5

Table 1: Background Information. Source: Field study, 2023.

Lean project management awareness in the upstream petroleum sector

Table 2 summarizes lean awareness amongst respondents of the survey. A detailed view from Table 2 reveals that the highest mean obtained from the responses was 4.475 on a maximum scale of 5. The minimum mean obtained was 3.12 which is higher than half of the scale that ranges from 1 to 5 depicting adequate awareness of the respondents on lean project management. The response that obtained the highest mean response was that lean takes into account everyone and everything involved in projects and streamlines processes. With a mean of 4.22 and a standard deviation of 1.121, the respondents affirmed that lean project management is an approach to managing projects that places a premium on value creation. The respondents also expressed awareness of waste reduction as an approach in lean project management (mean = 4.01) and lean is an approach that entails giving customers' exceptional value while using the fewest resources possible (mean = 3.710). The entire results suggest adequate knowledge of the participants of this study on lean project management since they either agreed or strongly agreed with most of the questions. The interview responses showed that all the respondents knew what lean project management is and its utilization in the upstream petroleum sector. Some statements given with regard to the understanding of lean project management are indicated below.

> *Any form of practice that ensures that wastages are minimized, and resources are utilized effectively is how I understand lean project management. In lean, everything is about cutting down waste* (Respondent 1, Project Manager)

Another respondent stated:

> *Lean project management is derived from the lean manufacturing idea. We apply lean apply lean project management principles in the upstream sector to reduce cost, get best results from our staff and also ensure the satisfaction of our clients* (Respondent 2, Senior Project Manager).

The practices of lean project management in the upstream petroleum sector in Ghana is as presented in Table 3 and Figure 2. From Table 3 and Figure 2, there is an indicate that the specification of value from customers' perspective is given priority (mean = 4.550) as evidenced by 89% of respondents being in agreement that it is so. 91% of respondents are in agreement that periodic organisations of standup meetings are also done by the upstream petroleum companies on lean project management (see Figure 2). The minimization of waste which is a core principle of lean is also stressed by the companies as a strategy for increasing the flow of value as 88% of respondents are in agreement with this lean management assertion (mean = 4.500). The results further depict that the determination of each product-specific value stream (mean = 4.475) and the continual improvement in the quest to achieve perfection (mean = 4.413) are hallmarks of lean management practices in the upstream petroleum sector since 89% and 87% respectively are in agreement with this assertion. The overall results show the highest agreement (Strongly Agree and Agree) is 91% of respondents (mean of 4.550) and the lowest is 84% (mean of 4.225) thus these results suggest that the lean project management practices examined are frequently undertaken by the upstream petroleum companies.

International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023
Print ISSN: ISSN 2514-9253
Online ISSN: ISSN 2514-9261
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

Lean project management practices in the upstream petroleum sector

Interviews further conducted to probe respondents on the lean project management practices undertaken in their company indicated that planning of productions according to customers' value specifications precedes actual production. Meetings are organized to define roles and schedules the level of waste that can be tolerated. Overall, labour, materials and machinery were used optimally to provide the best output possible (see Table 3 and Figure 2).

The least percentage of respondents in agreement was 84% (Figure 2) showing that overall the respondents agree that there is an appreciable level of lean practice and awareness in the upstream petroleum industry.

Some responses obtained from interviewees are indicated below.

One Project Coordinator emphasized:

> *Before work is started, everyone knows what is expected and the level of effort required. Every activity is executed according to schedule and therefore, there is no time for wastages* (Respondent 3, Project Coordinator).

Another respondent retorted:

> *In the upstream petroleum sector, activities that are non-value adding cannot be tolerated. Staff are expected to put up their best, and continuous improvements are core part of our work* (Respondent 5, Entry level Project Team Manager).

Variables	N	Min	Max	Mean	Std. Dev
Lean takes into account everyone and everything involved in the project and streamlines processes.	80	1.0	5.0	4.475	0.842
Lean project management is an approach to managing projects that places a premium on value creation.	80	2.0	5.0	4.22	1.121
Waste is reduced to minimal level in lean approach.	80	1.0	5.0	4.01	1.110
Lean entails giving customers' exceptional value while using the fewest resources possible.	80	1.0	5.0	3.710	1.104
The upstream petroleum industry can improve productivity by applying lean principles.	80	2.0	5.0	3.22	1.001
Lean is more than just a methodology or a set of tools, it is a way of thinking that can be used across the entire organization.	80	1.0	5.0	3.12	1.023

International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023
Print ISSN: ISSN 2514-9253
Online ISSN: ISSN 2514-9261
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

Table 1: Lean project management awareness. Source: Field Study, 2023.

Variables	N	Minimum	Maximum	Mean	Std. Dev.
Specification of value from customers perspective	80	1.0	5.0	4.550	0.870
Periodic organization of standup meetings	80	1.0	5.0	4.501	0.900
Minimizing waste as a strategy for increasing the flow of value	80	1.0	5.0	4.500	0.914
Determination of each product specific value stream	80	1.0	5.0	4.475	0.842
Continual improvement in the quest to achieve perfection	80	1.0	5.0	4.413	0.837
Allow the customer to pull the flow	80	2.0	5.0	4.387	0.834
Shared project buffers	80	1.0	5.0	4.325	0.938
Work in Progress constraints	80	1.0	5.0	4.287	0.903
Visibility of queues	80	2.0	5.0	4.262	0.882
Prioritization of tasks	80	2.0	5.0	4.250	0.834
Decentralization of planning	80	1.0	5.0	4.225	0.871
Valid N (listwise)	80				

Table 3: Lean project management practices. Source: Field Study, 2023.

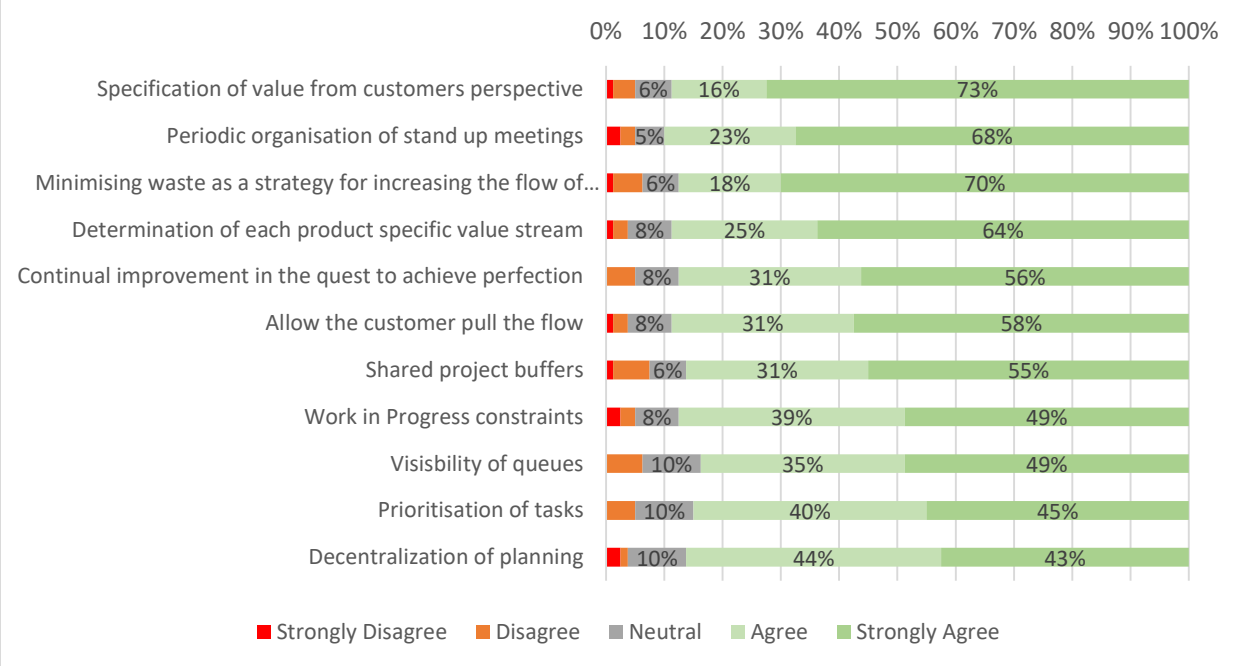

Figure 2: Response distribution for lean project management practices in Ghana's upstream petroleum sector. Source: Field study, 2023.

Obstacles to lean project management implementation in the upstream sector

Referring to Table 4 and Figure 3, the greatest obstacle to lean implementation in the upstream petroleum sector according to this study is issues related to strategic focus as 92% of respondents are in agreement that this is so (see Figure 2). These are leadership to drive the lean process as well as management and planning of the entire process (mean = 4.550). The study respondents also deem lack of commitment and support from management as the second highest challenge to lean project management implementation (mean = 4.410) as 84% of the respondents are in agreement to this. Other obstacles from highest to lowest are inadequate training on lean processes (mean = 4.400), inadequate communication and information sharing (mean = 4.388), lack of resources for lean implementation (mean = 4.387), inadequate consultants for lean implementation (mean = 4.363), and workers attitude and resistance (4.325). Since the mean is all above 4.0 on a scale of 1 to 5 and more than 80% of respondents are in agreement in each case, it can be concluded that, the obstacles outlined pose a great challenge to lean project management implementation in the upstream petroleum sector.

The interviews conducted in support of the questionnaire responses confirmed that the upstream petroleum sector of Ghana is not without challenges in implementing lean. Almost all the respondents stressed that an effective lean implementation required leadership that knows the application of lean principles. Though current leadership is making efforts to make sure that the lean project management idea works, there are still leadership challenges. These leadership challenges are related to effective planning, coordinating, management and executing the programme. The respondents agreed that lean project management requires commitment of resources that the companies sometimes find hard to come by. The resources mentioned include finance, machinery, and expertise for successful program implementation. Some of the interviewees had this to say:

> *Lean project management is a good idea for all companies in the upstream sector. However, successful implementation require resource commitment and we all know that resources are scarce. Our company therefore faces challenges in mobilizing finances and machinery for effective implementation* (Respondent 1, Project Manager).

> *I think we have leadership challenges for lean project implementation. I believe our leadership have something more to learn to successfully execute the programme* (Respondent 5, Entry level Project Team Manager).

Critical success factors for lean project management in Ghana's Upstream Sector

Table 5 and Figure 4 below presents the summary of the critical success factors for lean project management implementation as intoned by the respondents to the questionnaires. Table 5 indicates that effective communication and information sharing is the most

important factor (mean = 4.700). The study identifies provision of adequate resources and utilisation of lean tools and methods as the second and third important factors with mean of 4.662 and 4.650 respectively. Having organisational plan for the lean process (mean = 4.637), training, skills and expertise (mean = 4.613) and effective leadership for the lean programme (mean = 4.550) were other critical success factors for lean project management. The overall results with the highest mean being 4.700 and the least being 4.387 suggest that all the factors evaluated in this research are critical to lean project management implementation.

The interviewees also outlined several factors which they believe are critical for lean project management. Prominent among the factors were leadership, communication, resource provision, and adequate training for staff. According to the respondents, leadership is the first factor because they plan, direct and ensure execution of plans related to lean project management. Further, the right resources should be provided for staff who are trained to effectively utilize them for achievement of lean goals. Some interviewees indicated:
Leadership give direction. I believe that having the right leadership who identifies themselves with staff will ensure lean success (Respondent 4, Senior Project Manager).

Another respondent intimated that:
The critical success factors for lean project management are many which work hand in hand. Leadership is good to direct affairs but commitment from staff is equally important. There should be open communication and adequate information to solve problems. Constant improvement in all aspects of work is crucial.

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Strategic focus (leadership, management, planning)	80	1.0	5.0	4.550	0.9126
Lack of commitment and support from management	80	1.0	5.0	4.410	1.0385
Inadequate training on lean processes	80	1.0	5.0	4.400	1.0138
Inadequate communication and information sharing	80	1.0	5.0	4.388	1.1418
Lack of resources for lean implementation	80	1.0	5.0	4.387	1.0125
Inadequate consultants for lean implementation	80	1.0	5.0	4.363	1.1278
Workers attitude and resistance	80	1.0	5.0	4.325	1.0765
Valid N (listwise)	80				

Table 2: Obstacles to lean project management

International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023
Print ISSN: ISSN 2514-9253
Online ISSN: ISSN 2514-9261
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

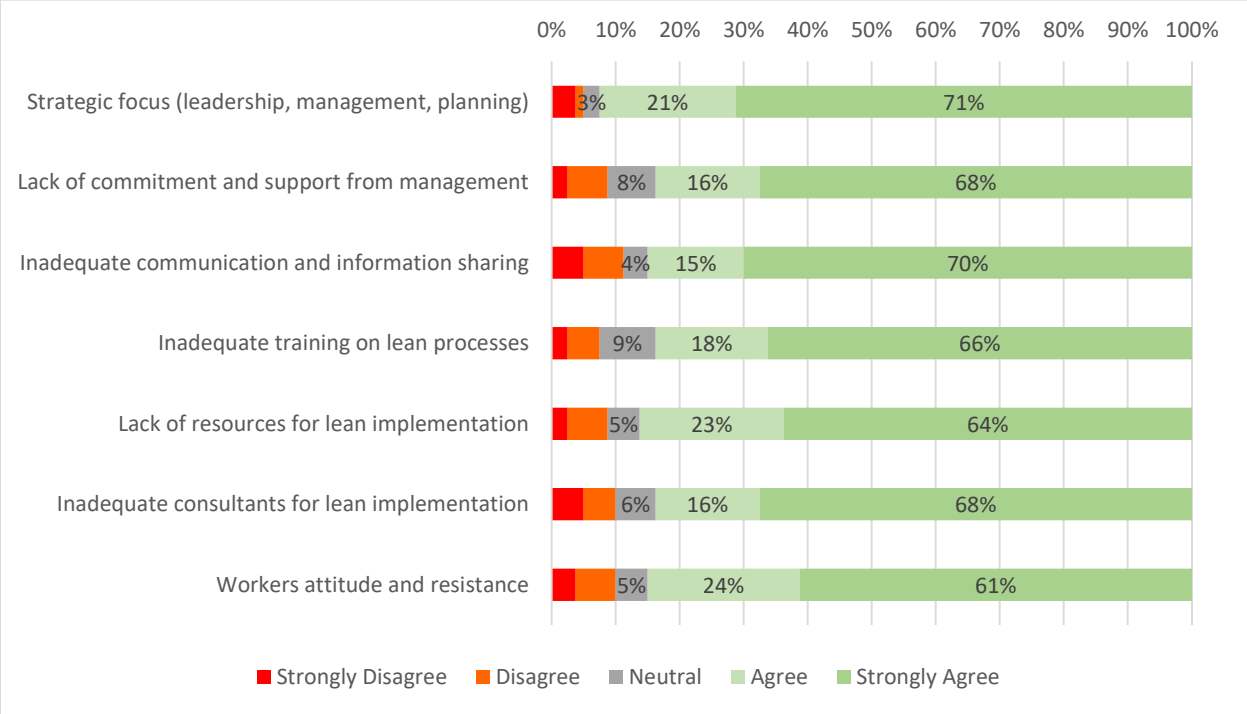

Figure 3: Response distribution for obstacles to lean project management. Source: Field study, 2023.

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Effective communication and information sharing	80	1.0	5.0	4.700	.7531
Provision of adequate resources	80	2.0	5.0	4.662	.7282
Utilisation of lean tools and methods	80	1.0	5.0	4.650	.7811
Organisational plan for the lean process	80	2.0	5.0	4.637	.7334
Training, skills and expertise	80	1.0	5.0	4.613	.8641
Effective leadership for the lean programme	80	1.0	5.0	4.550	.8700
Top management commitment and involvement	80	1.0	5.0	4.538	.8560
Organisational culture	80	1.0	5.0	4.387	.7712
Valid N (listwise)	80				

Table 5: Critical success factors of lean project management. Source: Field Study, 2023.

International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023
Print ISSN: ISSN 2514-9253
Online ISSN: ISSN 2514-9261
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

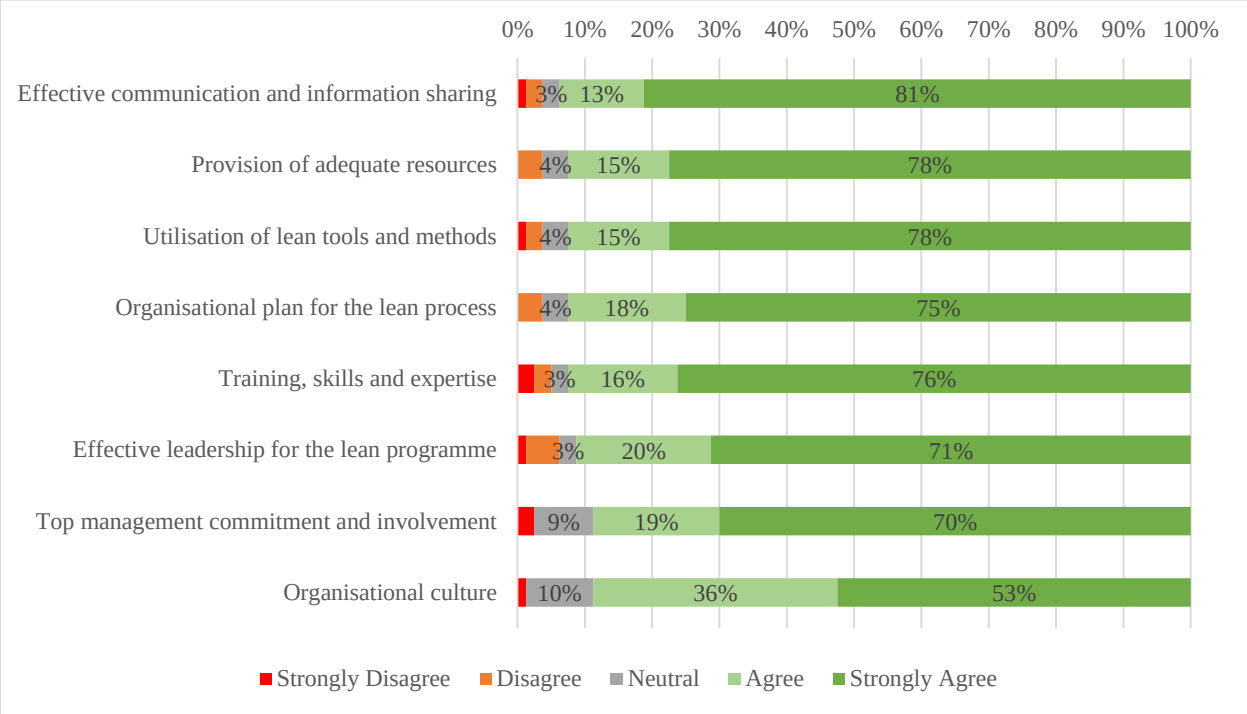

Figure 4: Response distribution for critical success factors of lean project management. Source: Field study, 2023

DISCUSSION

The level of lean project management awareness within the upstream petroleum industry in Ghana.

Findings revealed adequate awareness of the respondents on lean project management. The response that obtained the highest agreement among the respondents was that lean takes into account everyone and everything involved in projects and streamlines processes. The respondents affirmed that lean project management is an approach to managing projects that places a premium on value creation. The respondents also expressed awareness of waste reduction as an approach in lean project management and lean being an approach that entails giving customers' exceptional value while using the fewest resources possible. The entire results suggest adequate knowledge of the participants of this study on lean project management since they either agreed or strongly agreed with most of the questions. The interview responses showed that all the respondents knew what lean project management is and its utilization in the upstream petroleum sector. Ballard and Howell (2003) indicated that projects are considered "lean" when they are managed in such a way as to deliver the product with the highest possible value and the least possible waste and according to Terry (2018), lean requires teams and project managers to cut out wasteful steps, reduce context

switching, and maximize value creation. In lean methodology, ideas of value maximization are covered in great detail. Its use has mostly focused on boosting improvements and eliminating waste in the industrial and manufacturing sectors, where it is widely used because of its high-value aggregation (Rosenfield, 2017). To improve operational performance, lean manufacturers implement a set of guiding concepts, practices, tools, and methodologies (Nepal et al., 2011). Value stream mapping is a methodical strategy for reducing waste across an organization's full value chain to bring real performance in line with what consumers and shareholders need (Minh, 2018). To that end, lean management strives to reduce expenses, speed up production, and enhance product quality and security. Hence, lean management seeks to reduce three major sources of operational losses: waste, variability, and rigidity (Minh, 2018). Therefore, with the high level of awareness of lean project management within the management of the upstream petroleum sector of Ghana, it must be the case that the stage is set for its implementation across the sector.

Lean project management practices adopted in the upstream petroleum industry of Ghana.
Findings indicated that the specification of value from customers' perspective is given priority. Periodic organization of standup meetings is also done by the upstream petroleum companies on lean project management. The minimization of waste which is a core principle of lean is also stressed by the companies as a strategy for increasing the flow of value. The results further depict the determination of each product specific value stream and the continual improvement in the quest to achieve perfection. The overall results showed that the lean project management practices examined are frequently undertaken by the upstream petroleum companies. Ballard and Howell (2003) indicated that lean project management differs from traditional project management in several ways, including its goals, phase structure, phase connections, and amount of involvement in each phase. Lean practices indicated by Hessing (2019) include making efficient use of technology, cutting costs through "Just in Time" inventory management, and maintaining a relentless dedication to innovation. The lean methodology emphasizes activity efficiency and project management effectiveness strategies that improve project performance and satisfy stakeholders (Horman and Kenley, 2018). Lean project management focuses on eight key processes and production stages that are likely to generate waste (Rosenfield, 2017). The first is the removal of flaws from the project process. According to Rosenfield (2017), whether a company works in the automotive, food, electronics, or cosmetics industries, defective products frequently need to be removed from the production line. According to the principles of lean manufacturing by Womack, Jones, and Roos (1990) there are five guiding principles which are defining value, mapping the value stream, establishing flow, utilizing a pull mechanism, and achieving excellence. Following from the previous section, it has been found that lean project management is implemented in Ghana's upstream petroleum sector albeit fraught with some challenges as discussed next.

International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023
Print ISSN: ISSN 2514-9253
Online ISSN: ISSN 2514-9261
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

Obstacles to the implementation of lean project management in Ghana's upstream petroleum industry.

Findings showed that greatest obstacle to lean implementation in the upstream petroleum sector is leadership to drive the lean process, management and planning of the entire process. The study respondents also deemed lack of commitment and support from management as the second highest challenge to lean project management implementation. Other obstacles from highest to lowest are inadequate training on lean processes, inadequate communication and information sharing, lack of resources for lean implementation, inadequate consultants for lean implementation, and workers attitude and resistance. The study concluded that, the obstacles outlined pose a great challenge to lean project management implementation in the upstream petroleum sector. Almost all the interviewed respondents stressed that an effective lean implementation required leadership that knows the application of lean principles. Ghosh (2013) intimated that unawareness of the basics of lean is a major barrier to implementing lean in developing nations. However, the study by Panwar et al. (2016) found "unfamiliarity with lean," "lack of competence," "lack of education and training," and "lack of management support" as obstacles to lean project management. According to Sarhan and Fox (2013) and Gupta and Jain (2013), other significant barriers to adopting lean in a new industry include a lack of top management commitment, inadequate lean awareness and comprehension, and cultural and behavioral issues. All these findings add to the results of this research.

In another consistent findings, Jadhav et al. (2014) found that top-level management's decisions on lean implementation were profoundly influenced by monetary constraints. Other barriers were a lack of commitment and support from upper management and a gap in company culture. Vienazindiene and Ciarniene (2013) also indicated that "backsliding to traditional modes of working," "lack of implementation know-how," and "employee and middle management reluctance" are additional significant obstacles that limit the adoption of lean manufacturing principles and procedures. Poksinska (2010) adds that the absence of educators and trainers with roots in the relevant sector who can simultaneously provide support by sharing experiences and providing examples from the real-life application of lean is one of the challenges when adopting lean in a relatively naive sector for lean. According to Wong and Wong (2011), the main obstacle to implementing lean management is employees' resistance to change or their tendency to go back to the old ways of doing things. Ahmed et al. (2004) concluded that the low acceptance of lean was primarily caused by a lack of comprehension of the principles and uncertainty about their utility. The following ten broad categories can be used to categorize the hurdles to lean implementation, according to Zhang et al. (2017): organizational culture, management, conflict, knowledge, resources, technology, personnel, customers, finance, and experience. The Ghanaian petroleum industry is nascent with ongoing developments hence it is expected that it will take time for the industry to fully optimize to full lean management acceptance.

The critical success factors of lean project management in Ghana's upstream petroleum industry

Findings showed that the critical success factors for lean project management, effective communication, and information sharing. The study names the use of lean tools and methods and the provision of adequate resources as the second and third crucial factors. Other crucial success elements for lean project management were having an organisational plan for the lean process, training, skills, and expertise, and strong leadership for the lean programme. The overall results showed that all the factors examined in this research are critical for lean project management. The interviews also revealed leadership, communication, the availability of resources, and adequate staff training as the critical success factors contributing to lean project management. Consistent with this study, Barclay et al. (2022) established that training is an essential factor in lean implementation. Implementing the most fundamental training across an organization can lead to a unified perspective and a unified mission. Building a culture of continuous improvement in tandem with Kanban can assist to fortify an organization from the ground up. A lean culture can be encouraged by highlighting and rewarding little successes daily. Aljazzazen and Schmuck's (2022) indicated that "picking the most talented workers" was the most important component in the lean implementation's success, followed closely by "high management commitment and involvement." The most crucial factor in the success of lean implementation, according to Elkhairi et al. (2019) is choosing the most skilled individuals, followed by the dedication and engagement of senior management. Ainul Azyan et al. (2017) identified the CSFs as being an understanding of lean by practitioners, strong management leadership, management commitment, thorough pre-implementation training, and clear and frequent communication. Dora et al. (2013) found that the three most crucial CSFs are workforce competence, internal expertise, and organisational culture.

Implication to Research and Practice

The relevance of this research lies in the study having both practical and theoretical implications. The use of lean project management by Ghanaian upstream petroleum businesses was clarified by this study. This study also acts as a manual for putting lean project management into practice because the main goal of lean management is to maximize resource efficiency in order to create value for customers. This study offered insights into the principles of lean management and how they may be used in the creation of a standardized process based on a precise assessment of customer needs. This study is important because it sheds light on the difficulties Ghana faces in putting effective lean project management concepts into practice, particularly in the petroleum sector. Theoretically, this research expands the extant literature on lean project management within the context of an emerging economy. Findings has established awareness of lean project management in the upstream petroleum sector. This research recommends further awareness creation of lean project management in the petroleum sector. This activity will accelerate the adoption of lean.

CONCLUSION

This research set out to answer several questions about lean project management in Ghana's upstream petroleum industry, including how widely it has been adopted, how well-known it is within the industry, what's standing in the way of its widespread adoption, and what factors have contributed most to lean project management's success there.

Findings have revealed adequate awareness of the respondents on lean project management and that lean project management is largely practiced within the upstream sector of Ghana's petroleum industry but is fraught with obstacles consistent with lean literature but given that Ghana's oil industry is very young it is expected that with time industry players will fully implement and immerse lean culture in operations in order to improve cost efficiencies and overall performance.

Future Research

Future research may look at longitudinal studies to investigate the actual benefit of lean implementation to the cost efficiencies and performance of the upstream petroleum industry by looking at degree of implementation concomitantly with performance over time. Construction of a lean implementation index along the lines of Oleghe and Salonitis (2015) will be of assistance in such a case.

REFERENCES

Barclay, R. C., Cudney, E. A., Shetty, S., & Antony, J. (2022). Determining critical success factors for lean implementation. *Total Quality Management and Business Excellence, 33*(7–8), 818–832. https://doi.org/10.1080/14783363.2021.1894919

Ballard, G. and Howell, G. (2003). Lean Project Management. *Building Research & Information,* 31(2), pp.119–133.

Elkhairi, A., Fedouaki, F., & El Alami, S. (2019). Barriers and critical success factors for implementing lean manufacturing in SMEs. *IFAC-PapersOnLine,* 52(13), 565–570. https://doi.org/10.1016/j.ifacol.2019.11.303

Dewey, J. (2008). Reconstruction in philosophy. In J. Boydston & R. Ross (Eds.), The middle works of John Dewey, 1899- 1924 (Vol. 12, pp. 77-202). Carbondale: Southern Illinois University Press. (Original work published 1920)

Ghana Statistical Service (2012). 2010 Population and Housing Census. [online] web.archive.org. Available at: https://web.archive.org/web/20130925192147/http://www.statsghana.gov.gh/docfiles/2010phc/Census2010_Summary_report_of_final_results.pdf.

Hayes, A. (2019). *What Is Upstream? [online] Investopedia.* Available at: https://www.investopedia.com/terms/u/upstream.asp.

Hessing, T. (2019). *History of Lean What You Need to Know for Lean Six Sigma certification. [online] Six Sigma Study Guide.* Available at: https://sixsigmastudyguide.com/history-of-

lean/.

Kawalpreet (2021). *Project Management Characteristics of Project.* [online] GeeksforGeeks. Available at: https://www.geeksforgeeks.org/project-management-characteristics-of-project/.

Morgan, D. L. (2014). Pragmatism as a Paradigm for Social Research. *Qualitative Inquiry,* 20(8), 1045–1053. https://doi.org/10.1177/1077800413513733

Terry, J. (2018). Lean Project Management. *[online] Planview.* Available at: https://www.planview.com/resources/articles/lean-project-management/.

Womack, J.P., Jones, D.T. and Roos, D. (1990). *The Machine That Changed the World.* London Etc.: Simon & Schuster.

Ampofo, K (2008, August 25). GhanaWeb. Retrieved from http://ghanaweb.com/mobile/wap.small/news.article.php?ID=149014

Amponsah, R., & Opei, F. K. (2017). Ghana's downstream petroleum sector: An assessment of key supply chain challenges and prospects for growth 1. *International Journal of Management and Business Studies,* 7(3), 441–448. www.internationalscholarsjournals.org

Ahmed, S., Hassan, H.M. and Taha, Z. (2004) 'State of implementation of TPM in SMIs: a survey study in Malaysia', Journal of Quality in Maintenance Engineering, Vol. 10, No. 2, pp.93–106.

Aljazzazen, S., & Schmuck, R. (2022) 'Critical Success Factors for Successful Lean Six Sigma Implementation in the Service Organizations. Quality - Access to Success, 23(188), 76–85. https://doi.org/10.47750/QAS/23.188.11

Alzubi, E.; Atieh, A.M.; Shgair, K.A.; Damiani, J.; Sunna, S.; Madi, A. (2019) 'Hybrid Integrations of Value Stream Mapping, Theory of Constraints and Simulation: Application to Wooden Furniture Industry', Processes, 7, 816.

Ainul Azyan, Z. H., Pulakanam, V., & Pons, D. (2017). Success factors and barriers to implementing lean in the printing industry: A case study and theoretical framework. *Journal of Manufacturing Technology Management,* 28(4), 458–484. https://doi.org/10.1108/JMTM05-2016-0067

Barclay, R. C., Cudney, E. A., Shetty, S., and Antony, J. (2022) 'Determining critical success factors for lean implementation', *Total Quality Management and Business Excellence, 33*(7–8), 818–832. https://doi.org/10.1080/14783363.2021.1894919

Ballard, G. and Howell, G. (2003) 'Lean Project Management', *Building Research & Information,* 31(2), pp.119–133.

Bhamu, J.; Sangwan, K.S. (2014) 'Lean manufacturing: Literature review and research issues;,. *Int. J. Oper. Prod. Manag*. 34, pp. 876–940.

Bhasin, S. (2015) *'Lean Management beyond Manufacturing',* Springer International Publishing AG: Cham, Switzerland.

Blijleven, V., Gong, Y., Mehrsai, A., & Koelemeijer, K. (2019). Critical success factors for lean implementation in IT outsourcing relationships: A multiple case study. *Information Technology & People,* 32(3), 715–730. https://doi.org/10.1108/ITP-01-2016-0002

Byrne, B.; McDermott, O.; Noonan, J. Applying Lean Six Sigma Methodology to a Pharmaceutical

Manufacturing Facility: A Case Study. Processes 2021, 9, 550.

Elkhairi, A., Fedouaki, F., and El Alami, S. (2019). Barriers and critical success factors for implementing lean manufacturing in SMEs. *IFAC-PapersOnLine,* 52(13), 565–570. https://doi.org/10.1016/j.ifacol.2019.11.303

Dat MINH, N. (2018). Critical Success Factors of Lean Implementation in Vietnam Manufacturing Enterprises. *Journal of Production Engineering,* 21(1), pp. 1–5. https://doi.org/10.24867/jpe-2018-01-001

DE Jesus, R.C.; Vieira, G.P.; DE Gouvêa, D.G.T.; and Filho, E.D.J. O Impacto das Soft Skills na Gestão Lean no Setor de Facilities no Rio de Janeiro. In Proceedings of the Anais do XLI Encontro Nacional de Engenharia de Produção, Foz do Iguaçu, Paraná, Brazil, 18–21 October 2021

Dewey, J. (2008). Reconstruction in philosophy. In J. Boydston & R. Ross (Eds.), The middle works of John Dewey, 1899- 1924 (Vol. 12, pp. 77-202). Carbondale: Southern Illinois University Press. (Original work published 1920)

Dora, M., Kumar, M., Van Goubergen, D., Molnar, A., & Gellynck, X. (2013). Operational performance and critical success factors of lean manufacturing in European food processing SMEs. *Trends in Food Science & Technology,* 31(2), 156–164. https://doi.org/10.1016/j.tifs.2013.03.002

Fernandes, G., Ward, S., and Araújo, M. (2013). Identifying useful project management practices: A mixed methodology approach. *International Journal of Information Systems and Project Management,* 1(4), 5–21. https://doi.org/10.12821/ijispm010401

Fotopoulos, C. and Psomas, E. (2009) 'The use of quality management tools and techniques in ISO 9001: 2000 certified companies: the Greek case', International Journal of Productivity and Performance Management, Vol. 58, No. 6, pp.564–580.

Ghana Statistical Service (2012). 2010 Population and Housing Census. [online] web.archive.org. Available at: https://web.archive.org/web/20130925192147/http://www.statsghana.gov.gh/docfiles/2010phc/Census2010_Summary_report_of_final_results.pdf.

Ghana National Petroleum Corporation. (2014, May 13). History of exploration in Ghana.

Gebauer, H., Kickuth, M. and Friedli, F. (2009) 'Lean management practices in the pharmaceutical industry', International Journal of Services and Operations Management, Vol. 5, No. 4, pp.463–481.

Ghosh, M. (2013) 'Lean manufacturing performance in Indian manufacturing plants', Journal of Manufacturing Technology Management, Vol. 24, No. 1, pp. 113–122.

Gupta, S. and Jain, S.K. (2013) 'A literature review of lean manufacturing', International Journal of Management Science and Engineering Management, Vol. 8, No. 4, pp.241–249

Hayes, A. (2019). *What Is Upstream? [online] Investopedia.* Available at: https://www.investopedia.com/terms/u/upstream.asp.

Hessing, T. (2019). *History of Lean What You Need to Know for Lean Six Sigma certification. [online] Six Sigma Study Guide.* Available at: https://sixsigmastudyguide.com/history-of-lean/.

Hines, P.; Holwe, M.; Rich, N. (2004). Learning to evolve - A review of contemporary lean thinking. Int. J. Oper. Prod. Manag. 2004, 24, 994–1011

Hokoma, R.A., Khan, M.K. and Hussain, K. (2010) 'The present status of quality and manufacturing management techniques and philosophies within the Libyan iron and steel industry', The TQM Journal, Vol. 22, No. 2, pp.209–221.

Jadhav, J.R., Mantha, S.S. and Rane, S.B. (2014) 'Exploring barriers in lean implementation', International Journal of Lean Six Sigma, Vol. 5, No. 2, pp.122–148.

Kadarova, J.; Demecko, M. New Approaches in Lean Management. Procedia Econ. Financ. 2016, 39, 11–16.

Kawalpreet (2021). *Project Management Characteristics of Project.* [online] GeeksforGeeks. Available at: https://www.geeksforgeeks.org/project-management-characteristics-of-project/.

Kwak, Y. H. and F.T. Anbari (2009) "Availability-Impact Analysis of Project Management Trends: Perspectives From Allied Disciplines," *Project Management Journal,* 40(2), pp. 94-103, 2009

Lai, E. T. H., Yun, F. N. J., Arokiam, I. C., & Joo, J. H. A. (2020). Barriers affecting successful lean implementation in Singapore's shipbuilding industry: A case study. *Operations and Supply Chain Management,* 13(2), pp. 166–175. https://doi.org/10.31387/OSCM0410260

Lean Project Management Foundation (2023). Your Guide to Lean Project Management. https://kanbanize.com/lean-project-management

Lima, B.F.; Neto, J.V.; Santos, R.S.; Caiado, R.G.G. A Socio-Technical Framework for Lean Project Management Implementation towards Sustainable Value in the Digital Transformation Context. Sustainability 2023, 15, 1756. https://doi.org/10.3390/su15031756

Marzagão, D. S. L., & Carvalho, M. M. (2016). Critical success factors for Six Sigma projects. International Journal of Project Management, 34(8), 1505-1518.

Marques, P.A.; Carvalho, A.M.; Santos, J.O. Improving Operational and Sustainability Performance in a Retail Fresh Food Market Using Lean: A Portuguese Case Study. Sustainability 2022, 14, 403.

Martínez-Jurado, P.J. and Moyano-Fuentes, J. (2014) 'Key determinants of lean production adoption: evidence from the aerospace sector', Production Planning and Control, Vol. 25, No. 4, pp.332–345.

Melton, T. (2005) 'The benefits of lean manufacturing: what lean thinking has to offer the process industries', Chemical Engineering Research and Design, Vol. 83, No. A (6), pp.662–673.

Ministry of Energy and Petroleum (2013, November). Retrieved from http://www.energymin.gov.gh/.

Morgan, D. L. (2014). Pragmatism as a Paradigm for Social Research. *Qualitative Inquiry,* 20(8), 1045–1053. https://doi.org/10.1177/1077800413513733

Nepal, B.P., Yadav, O., & Solanki, R. (2011), "Improving the NPD Process by Applying Lean Principles: A Case Study", Engineering Management Journal, Vol. 1, pp. 52-68.

Nordin, N., Deros, B.M. and Wahab, D.A. (2010) 'A survey on lean manufacturing implementation in Malaysian automotive industry', International Journal of Innovation, Management and Technology, Vol. 1, No. 4, pp.374–380

Oleghe, Omogbai, and Konstantinos Salonitis. "Improving the efficacy of the lean index through the quantification of qualitative lean metrics." Procedia Cirp 37 (2015): 42-47.

Panwar, A., Jain, R., & Rathore, A. P. S. (2016). Obstacles in lean implementation in developing countries - some cases from the process sector of India. *International Journal of Lean Enterprise Research,* 2(1), 26. https://doi.org/10.1504/ijler.2016.078228

PMI (2017). *Pulse of the Profession: Success rate rises*. Newton Square, PA.

Project Management Institute. (2017). A guide to the Project Management Body of Knowledge (PMBOK guide) (6th ed.). Project Management Institute.

Poksinska, B. (2010) 'The current state of lean implementation in health care: literature review', Quality Management in Healthcare, Vol. 19, No. 4, pp.319–329.

Radnor, Z. (2011) 'Implementing lean in health care: making the link between the approach, readiness and sustainability', International Journal of Industrial Engineering and Management, Vol. 2, No. 1, pp.1–12

Ramdhani, A., Ramdhani, M. A., & Amin, A. S. (2014). Writing a Literature Review Research Paper: A step-by-step approach. *International Journal of Basic and Applied Science,* 03(01), 47–56.

Ramori, K., Cudney, E., Elrod, C., & Antony, J. (2019). Lean business models in healthcare: A systematic review. *Total Quality Management & Business Excellence,* https://doi.org/10.1080/
14783363.2019.1601995

Raymond L. and F. Bergeron, "Project management information systems: An empirical study of their impact on project managers and project success," International Journal of Project Management, vol. 26, no. 2, pp. 213-220, 2008.

Sarhan, S. and Fox, A. (2013) 'Barriers to implementing lean construction in the UK construction industry', The Built and Human Environment Review, Vol. 6.

Salaheldin, S.I. (2005) 'JIT implementation in Egyptian manufacturing firms: some empirical evidence', International Journal of Operations and Production Management, Vol. 25, No. 4, pp.354–370

Shamah, R.A. (2013) 'Measuring and building lean thinking for value creation in supply chains', International Journal of Lean Six Sigma, Vol. 4, No. 1, pp.17–35

Sharma, V., Dixit, A.R., and Asim, M. (2014). Analysis of barriers to lean implementation in machine tool sector. International Journal of Lean Thinking 5 (1), pp. 5 – 25.

Sohi, A.J.; Hertogh, M.; Bosch-Rekveldt, M.; Blom, R. Does lean & agile project management help coping with project complexity? In Proceedings of the 29th IPMA World Congress WC2015, Panama City, Panama, 28 September–1 October 2015; Volume 226, pp. 252–259

Terry, J. (2018). Lean Project Management. *[online] Planview.* Available at: https://www.planview.com/resources/articles/lean-project-management/.

Tullow Oil Ghana. (2013,October). Tullow Oil Ghana. Retrieved from

http://www.tullowoil.com/ghana/index.asp?pageid=27

van Dun, D.H.; Hicks, J.N.; Wilderom, C.P.M. Values and behaviors of effective lean managers: Mixed-methods exploratory research. Eur. Manag. J. 2017, 35, 174–186.

Vienazindiene, M. and Ciarniene, R. (2013) 'Lean manufacturing implementation and progress measurement', Economics and Management, Vol. 18, No. 2, pp.366–373

Williams, P., Ashill, N. J., Naumann, E., and Jackson, E. (2015). Relationship quality and satisfaction: Customer-perceived success factors for on-time projects. *International Journal of Project Management*, *33*(8), 1836-1850.

D. White and J. Fortune, "Current practice in project management -- an empirical study," International Journal of Project Management, vol. 20, no. 1, pp. 1-11, 2002.

Womack, J.P.; Jones, D.T. Lean Thinking - Banish Waste and Create Wealth in Your Corporation, 3rd ed.; Simon and Schuster: London, UK, 1996.

Womack, J.P.; Jones, D.T. and Roos, D. (1990) The Machine That Changed the World: The Story of Lean Production, Toyota's Secret Weapon in the Global Car Wars That Is Now Revolutionizing World Industry; Free Press: New York, NY, USA.

Womack, J.P., Jones, D.T. and Roos, D. (1990). *The Machine That Changed the World.* London Etc.: Simon & Schuster.

Wong, C. and Wong, K.Y. (2011) 'Approaches and practices of lean manufacturing: the case of electrical and electronics companies', African Journal of Business Management, Vol. 5, No. 6, pp.2164–2174.

Zhang, L., Narkhede, B.E., and Chaple, A.P. (2017). Evaluating lean manufacturing barriers: an interpretive process. *Journal of Manufacturing Technology Management,* 28 (8), pp. 1086 – 1114

Barclay, R. C., Cudney, E. A., Shetty, S., and Antony, J. (2022) 'Determining critical success factors for lean implementation', *Total Quality Management and Business Excellence, 33*(7–8), 818–832. https://doi.org/10.1080/14783363.2021.1894919

Ballard, G. and Howell, G. (2003) 'Lean Project Management', *Building Research & Information,* 31(2), pp.119–133.

Bryman, A. and Bell, E. (2011) 'Ethics in business research', *Business Research Methods,* 7(5), pp. 23-56.

Chinelo I. (2016) 'Fundamentals of Research Methodology and Data Collection', *LAP Lambert Academic Publishing,* May, 4–5.

Corbin, J., and Strauss, A. (2008) '*Basics of qualitative research (3rd ed.): Techniques and procedures for developing grounded theory',* SAGE Publications, Inc. https://dx.doi.org/10.4135/9781452230153

Creswell, J.W. and Poth, C.N. (2017) '*Qualitative inquiry and research design: Choosing among five approaches'* Sage publications.

Elkhairi, A., Fedouaki, F., and El Alami, S. (2019) 'Barriers and critical success factors for implementing lean manufacturing in SMEs', *IFAC-PapersOnLine,* 52(13), 565–570. https://doi.org/10.1016/j.ifacol.2019.11.303

Denzin, N. K., and Lincoln, Y. S. (2011) *'The SAGE Handbook of Qualitative Research',* Thousand

Oaks, CA: Sage.

Dewey, J. (2008) 'Reconstruction in philosophy', In J. Boydston & R. Ross (Eds.), The middle works of John Dewey, 1899- 1924 (Vol. 12, pp. 77-202). Carbondale: Southern Illinois University Press. (Original work published 1920)

Dudovskiy, J. (2018) '*The Ultimate Guide to Writing a Dissertation in Business Studies: A Step-by-Step Assistance',* New York; Sage Publications.

Ghana Statistical Service (2012) *'2010 Population and Housing Census',* [online] web.archive.org. Available at: https://web.archive.org/web/20130925192147/http://www.statsghana.gov.gh/docfiles/2010phc/Census2010_Summary_report_of_final_results.pdf.

Hayes, A. (2019) '*What Is Upstream?' [online] Investopedia.* Available at: https://www.investopedia.com/terms/u/upstream.asp.

Hessing, T. (2019). *History of Lean What You Need to Know for Lean Six Sigma certification. [online] Six Sigma Study Guide.* Available at: https://sixsigmastudyguide.com/history-of-lean/.

Kawalpreet (2021) '*Project Management Characteristics of Project',* [online] GeeksforGeeks. Available at: https://www.geeksforgeeks.org/project-management-characteristics-of-project/.

Morgan, D. L. (2014) 'Pragmatism as a Paradigm for Social Research', *Qualitative Inquiry,* 20(8), pp. 1045–1053. https://doi.org/10.1177/1077800413513733

Saunders, M., Lewis, P. and Thornhill, A. (2016) '*Research methods for business students*', 7th ed. Harlow: Pearson.

Saunders, M., Lewis, P. and Thornhill, A. (2019) '*Research methods for business students*' 8th edition, England: Pearson Education Limited.

Terry, J. (2018) 'Lean Project Management;, *[online] Planview.* Available at: https://www.planview.com/resources/articles/lean-project-management/.

Womack, J.P., Jones, D.T. and Roos, D. (1990) '*The Machine That Changed the World',* London Etc.: Simon & Schuster.

International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023
Print ISSN: ISSN 2514-9253
Online ISSN: ISSN 2514-9261
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

International Journal of Petroleum and Gas Engineering Research, 6 (1), 21-44, 2023
Print ISSN: ISSN 2514-9253
Online ISSN: ISSN 2514-9261
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK