

FACTORS RELATED TO THE PRODUCTIVITY OF RIG WORKERS: A LITERATURE REVIEW

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Abstract

This study aims to analyze factors related to the productivity of rig workers in the oil and gas drilling industry. The method used is a literature review with the PRISMA approach, utilizing databases such as PubMed, Semantic, Open Alex, and Google Scholar. A total of 20 articles published between 2020–2025 were reviewed. The results indicate that rig worker productivity is influenced by two main aspects: human resource readiness (including training, motivation, work discipline, leadership, and mental health) and the availability and quality of infrastructure and equipment. In conclusion, improving rig worker productivity requires an integrative strategy that enhances HR competencies, provides adequate infrastructure, and implements occupational health and safety programs.

Keywords: Productivity, Rig Workers, Human Resources, Infrastructure, Literature Review

INTRODUCTION

Human resources (HR) are the main asset in every organization or company because the success of a company is largely determined by the quality of its workforce. This is in line with the opinion of Nurhendi & Bastam (2024) that human resources are people who provide energy, expertise, creativity, and effort to jointly manage existing assets within an organization. This becomes very important considering that human resources are a valuable asset and take a role as a central factor in the management of an organization. Furthermore, Hasibuan (2021) states that HR not only acts as an implementer of operational activities but also as the main driver that ensures the effectiveness, efficiency, and sustainability of work productivity in the field. Thus, company success is not solely determined by technological sophistication and financial capital, but by the quality and productivity of its workforce.

According to Nasron & Astuti (2022), productivity is about producing or increasing the output of goods and services as high as possible by utilizing resources efficiently. This is in line with Ardiyanti & Dani (2023), who state that worker productivity is an important indicator in assessing the effectiveness and efficiency of a company in achieving its set goals. Labor productivity is one of the most important aspects in the operational success of a company, especially in the oil and gas industry which faces extraordinary challenges in terms of work environment, safety risks, and technical complexity. Rig work, which includes drilling, rig maintenance, heavy equipment operation, and shift work in often extreme environmental conditions, demands workers who are not only skilled but also healthy, motivated, and able to work with high efficiency.

In the context of the drilling industry, the role of HR becomes very vital. Rig work is characterized by an extreme environment, high risk, and requires excellent technical skills as well as strong physical and mental resilience. The performance and productivity of rig workers largely determine the smoothness of the drilling process, time efficiency, and workplace safety. According to Sedermayanti (2019), labor productivity is defined as the ratio between output (work results) and input (labor, time, and resources) used. This means that the higher the quality and management of HR, the greater the productivity produced.

One sector that is highly dependent on the quality of HR is rig work. A rig is the main work unit in oil and gas drilling activities, both on land (onshore rig) and at sea (offshore rig).

Rig work includes drilling activities, installation of heavy equipment, control of drilling mud, machine maintenance, and safety supervision during the exploration and production process. According to Hidayat (2021), these activities require workers with high technical skills, strong physical readiness, and the ability to work in a disciplined and coordinated team.

Rig work is known as a high-risk job with significant physical demands because it takes place in extreme and unpredictable environments. According to the International Association of Drilling Contractors (IADC, 2022), the characteristics of rig work include: 1) Long working hours and shift systems, rig workers generally work in rotation systems such as 14 days on and 14 days off, or even longer depending on the project location; 2) Extreme environmental conditions, such as high temperatures, noise, high machine vibrations, slippery surfaces, and unpredictable weather conditions; 3) High safety risks such as explosions, gas leaks, mechanical accidents, and work fatigue.

Rig workers play a crucial role in maintaining the smoothness of the drilling process. Their productivity determines project success, time efficiency, and work safety. However, field realities show that rig worker productivity often fluctuates. Some teams are able to achieve production targets efficiently, while others experience work delays, increased overtime, and even decreased morale. This indicates that there are various factors affecting rig worker productivity that need to be systematically studied. This is in line with Sutrisno's (2020) finding that differences in productivity between individuals or work groups are usually influenced by internal factors (such as motivation, competence, and job satisfaction) and external factors (such as work environment, compensation system, and leadership).

Many factors affect work productivity, both those related to the workforce and those related to the company environment and government policies. According to Simanjuntak (2021), work productivity is influenced by three main components: work ability, work motivation, and work opportunity. In the rig context, these three components can be influenced by factors such as workforce competence, motivation, compensation, work environment conditions, leadership systems, and the implementation of occupational health and safety (OHS).

Several studies show that HR factors such as work experience, education level, motivation, and occupational health and safety play an important role in labor productivity, especially in high-risk industries such as the rig sector. Sari & Hidayat (2022) found that increasing productivity in the heavy industry sector is greatly influenced by competency development and the application of a humane and safe work system. Furthermore, Simanjuntak (2021) emphasized that productivity is a function of work ability (skills), work motivation, and work opportunity. These three aspects are integral parts of modern HR management.

Good HR management will create a balance between organizational needs and worker welfare. In the rig context, workers are required to work in long shift systems with high physical and mental pressure. Therefore, factors such as motivation, compensation, work environment conditions, and support from leadership greatly determine the extent to which workers are able to maintain their performance and productivity. According to Rahmawati et al. (2023), providing proportional incentives and rewards for workload and work risks can increase workers' motivation and commitment to completing tasks more productively.

In addition, the work environment and safety culture are also important aspects directly related to productivity. In the rig industry, extreme work environment conditions such as high temperatures, noise, vibrations, and accident risks require the application of strong OHS principles. Purwanto & Mulyadi (2020) emphasized that a healthy, safe, and ergonomic work environment will increase comfort and reduce fatigue, which in turn has a positive effect on work productivity.

Furthermore, leadership and communication factors within the rig team also play an important role. Rig workers work in a highly coordinated system, so leadership effectiveness will affect cooperation, discipline, and morale. Collaborative, transparent, and exemplary leadership can create a harmonious work environment and motivate workers to contribute maximally. Effective leadership in high-risk teams has a direct effect on increasing productivity and reducing the rate of work accidents. Ghozali & Anwar (2022) state that effective leadership in a high-risk environment can increase productivity by up to 25%.

In addition to the above factors, physiological and psychological factors, such as physical health, fatigue due to long working hours, and psychological pressure due to isolation in the field, can also reduce productivity. According to Hasibuan (2021), rig work is often carried out in remote locations with rotation systems (shifts 14:14 or 21:21), which can affect work-life balance. This condition can trigger stress and fatigue which directly affect work effectiveness.

The phenomenon above illustrates that rig worker productivity is not only influenced by a single aspect, but by a combination of various HR, managerial, and work environment factors that interact with each other. However, not many studies have specifically analyzed the relationship between various factors on rig worker productivity in Indonesia, especially in rig service companies. In fact, understanding these factors in depth will be very useful for designing sustainable productivity improvement strategies. By identifying and analyzing these factors, the results of this study are expected to serve as a basis for management in designing sustainable productivity improvement strategies, through improving HR competencies, fair compensation systems, strengthening work safety culture, and effective leadership in the rig environment. Based on this description, it is important to conduct research entitled "Factors Related to the Productivity of Rig Workers." This literature review specifically aims to: (1) identify the readiness of human resources for rig work productivity, and (2) analyze the role of infrastructure and equipment in improving rig worker productivity.

RESEARCH METHODS

This study employed a literature review design using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. Article searches were conducted in October 2025 using four databases: PubMed, Semantic, Open Alex, and Google Scholar. The keywords used were "factors," "productivity," and "rig workers," combined with Boolean operators (AND, OR). Inclusion criteria included articles published between 2020–2025, original research, full-text access, in English or Indonesian, and relevant to rig worker productivity. Exclusion criteria included publications older than 5 years and articles not freely accessible. A total of 20 articles were selected for final analysis. Data extraction was presented in a table format covering author, year, title, method, and results.

RESEARCH RESULTS

Based on the review of 20 articles, the following table presents the summary of each article including author, year, title, research method, and key findings related to rig worker productivity.

Table 1. Summary of Literature Review Results on Factors Related to Rig Worker Productivity

No	Author(s) (Year)	Title	Research Method	Key Findings Related to Productivity
1	Perkasa Sinagabariang & L. Meily Kurniawidjaja (2024)	Fatigue Risk Factors of Offshore Oil and Gas Workers: A Systematic Review	Qualitative, PRISMA method	Fatigue due to shift schedules, excessive working hours, lack of sleep, heavy workload, and harsh environmental conditions affect performance, alertness, and overall health and safety
2	Xiaomei Wang & Ranjana K. Mehta (2024)	Safety Culture and Worker Fatigue Management in the Offshore Oil and Gas Industry: An Interview Study	Qualitative, interviews, questionnaires (n=18 supervisors)	Current fatigue and productivity management relies on supervisor communication and worker self-reporting
3	Adlan Ali Al Fadjar, Ira Setiawati, & Hawik Ervina Indiworo (2023)	Analisis Faktor-Faktor Yang Mempengaruhi Produktivitas Kerja Karyawan PT. Ilsung Utama Brebes	Quantitative, primary data, questionnaire (n=88)	Work discipline, work safety, work health, and work environment affect work productivity
4	Yodie Hernandi & Jane Sekarsari Tamtana (2021)	Faktor-Faktor Yang Mempengaruhi Produktivitas Pekerja Pada Pelaksanaan Konstruksi Gedung Bertingkat	Survey, descriptive statistics	Ten factors affect productivity: changes in work drawings, limited work area, weather changes, lack of rest areas, material availability, working at heights, construction methods, damaged equipment, misunderstandings among workers, and inspection delays
5	Waspada Tedja Bhirawa & Obrin Situngkir (2023)	Analisis Pengaruh Program Pelatihan Keamanan Kesehatan Kerja terhadap Tingkat Pengetahuan Keamanan Kesehatan Kerja	Descriptive and causal, questionnaire (n=60 rig workers)	OHS program implementation increased PT. Star Energy employee productivity by 17.7%
6	Rizka Darlia (2023)	Pengaruh Disiplin Kerja, Gaya Kepemimpinan, Kompetensi Kerja Terhadap Produktivitas Kerja Pada Organisasi	Quantitative, regression, questionnaire (n=133)	Work discipline, leadership style, and work competence have a direct, positive, and significant effect on work productivity

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No	Author(s) (Year)	Title	Research Method	Key Findings Related to Productivity
7	Aris Kurniawan, Lili Marlinah, Yosie Noverha, Vina Islami, Desri Yani	Pengaruh Kompetensi, Motivasi, dan Penghargaan Terhadap Produktivitas	Quantitative, regression, surveys, interviews, questionnaires	Competence, motivation, and rewards have a positive and significant effect on employee productivity
8	Ayadi Imen, Rmadi Nehla, Sellami Imen, Kotti Nada, Hajjaji Mounira, Rebai Ahmed (2023)	Determinants of Workplace Productivity Decline in the Tunisian Onshore Oil and Gas Industry	Quantitative survey	Low social support and stressful work situations are factors in low productivity
9	Obiaga, Johnson Chinedu (2021)	Reward System and Employee Performance in the Oil and Gas Industry in Rivers State	Quantitative, regression	Bonuses, compensation, and promotions are related to productivity in the oil and gas industry
10	Okeah, M. I. N. (2023)	Human Resource Supply Forecast and Resilience of Multinational Oil and Gas Producing Companies in Nigeria	Quantitative, correlation	Human resources consisting of skills, competencies, and abilities have a significant impact on productivity
11	Siti Rachmi Indahsari, Zunaidah, Marlina Widiyanti, Muhammad Yusuf (2023)	The Influence of Work Motivation and Leadership Style on Employee Performance in Oil and Gas Companies in Palembang	Quantitative, multiple linear regression	Work motivation and leadership style have a positive and significant effect on employee performance
12	Adegboyega Olayisade & Olawumi D. Awolusi (2021)	Effect of Leadership Styles on Employee's Productivity in the Nigerian Oil and Gas Industry	Quantitative case study, Likert scale questionnaire	Leadership style significantly affects employee productivity
13	Arief Santoso, Suratini, & Mery Noviyanti (2024)	Effect of Competence, Education and Training on Employee Performance with Work Motivation as Mediating Variable	Quantitative, Likert scale questionnaire	Competence, education, and training positively affect work motivation and employee performance

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No	Author(s) (Year)	Title	Research Method	Key Findings Related to Productivity
14	Nadila Ardiyanti & Hasan Dani (2023)	Produktivitas Drilling Rig pada Pekerjaan Pondasi Bore Pile Proyek Pembangunan RS Muhammadiyah Gresik	Descriptive quantitative	Maintenance and repair of equipment, fuel and lubricant refilling, drilling diameter and depth, and simultaneous use of multiple heavy equipment affect drilling rig productivity
15	Devid & Manahan Siallagan (2021)	Analytic Hierarchy Process (AHP) in Selection of Well Control Equipment for Workover and Well Service Rigs	Qualitative, observation	Selection of appropriate infrastructure/equipment based on scope of work, rig flexibility, and AHP-based decisions affects productivity
16	Nicko Agustianto et al. (2026)	Effectiveness of Basic HSSE Training in Improving Workers' Knowledge in an Upstream Oil and Gas Company	Quantitative	Basic HSSE training is effective in improving worker knowledge; organizational factors (communication and work environment) play a dominant role
17	Heri Setiawan, Soehatman Ramli, & Syahfirin (2022)	Pengaruh Faktor-Faktor Pembentuk Budaya K3 pada Kinerja K3 Pekerja Proyek Kegiatan Drilling Rig di PT X Lapangan Y	Quantitative	Worker commitment to OHS, compliance with OHS regulations and procedures, and worker involvement in OHS have a significant positive effect on drilling rig worker performance
18	Fuk Jin Oei, Sudarno P Tampubolon, & Chatarina Finella (2023)	Tinjauan Produktivitas Pekerja Pada Dua Proyek Serta Faktor Yang Mempengaruhinya	Quantitative	Factors affecting productivity: work methods, work instructions, equipment quality, worker group composition, work drawings, remuneration, work area density, worker skills, experience, and teamwork
19	M. Rizali Rizki, Romla Noor Hakim, Karina Shella Putri (2023)	Analisis faktor yang mempengaruhi efisiensi kerja pada produktivitas alat gali-muat overburden	Quantitative	Actual productivity average: 658.32 BCM/hour vs target 670 BCM/hour (achievement 98.27%)
20	Rezki Dwindi & Baiduri Widanark (2024)	Influence Shift Work on Work Fatigue in Oil and Gas Industry Workers: Literature Review	Literature Review	Work fatigue experienced by oil and gas workers impacts decreased work performance and productivity

DISCUSSION

The discussion in this literature review aims to interpret the findings from the 20 analyzed articles, compare them with existing theories, and provide a comprehensive understanding of the factors affecting rig worker productivity. The discussion is divided into two main sections based on the research objectives: (1) readiness of human resources for rig work productivity, and (2) the role of infrastructure and equipment in improving rig worker productivity.

1. Readiness of Human Resources for Rig Work Productivity

The literature review findings consistently demonstrate that human resource readiness is a fundamental determinant of rig worker productivity. Several key sub-factors were identified across multiple studies.

a. Competence, Skills, and Training

Okeah (2023) emphasized that human resources, including skills, talents, qualifications, and comprehensive competencies, have a significant impact on productivity. This finding aligns with Santoso et al. (2024), who found that competence, education, and training positively affect work motivation and employee performance. Furthermore, Agustianto et al. (2026) demonstrated that basic HSSE (Health, Safety, Security, Environment) training is effective in improving worker knowledge, with organizational factors such as communication and work environment playing dominant roles in training effectiveness.

The theoretical foundation for these findings can be traced to Simanjuntak (2021), who proposed that productivity is a function of ability, willingness, and opportunity. Competence directly contributes to the "ability" component, as workers with higher technical skills can perform tasks more efficiently and with fewer errors. In the rig context, where operations are complex and high-risk, competence becomes even more critical. Workers who lack proper training may cause operational delays, equipment damage, or even workplace accidents that halt production entirely.

Moreover, Fadillah (2021) found that work experience and technical training simultaneously increase employee productivity, with field experience contributing more than formal training. This suggests that a balanced approach combining classroom instruction with on-the-job training is optimal for rig workers. Companies should implement structured competency development programs that include certification requirements, regular skill assessments, and continuous professional development.

b. Work Motivation and Rewards

Kurniawan et al. (2023) showed that motivation has a positive and significant effect on employee productivity. The study indicated a unidirectional relationship between motivation and productivity: when motivation increases, employee productivity also increases. This finding is supported by Obiaga (2021), who found that bonuses, compensation, and promotions are positively related to productivity in the oil and gas industry.

Rahmawati et al. (2023) added that providing proportional incentives and rewards for workload and work risks can increase workers' motivation and commitment to completing tasks more productively. In the rig environment, where workers face extreme conditions and long periods away from family, fair compensation becomes a powerful motivator. Companies need to design reward systems that recognize not only output quantity but also safety compliance, teamwork, and problem-solving abilities.

Indahsari et al. (2023) further confirmed that work motivation and leadership style have a positive and significant effect on employee performance. Leaders who can motivate subordinates through exemplary behavior, open communication, and appreciation create high-performance, disciplined, and results-oriented work environments.

c. Work Discipline

Adlan et al. (2023) found that work discipline, along with work safety, work health, and work environment, affects work productivity. Darlia (2023) reinforced this by demonstrating that work discipline, leadership style, and work competence have a direct, positive, and significant effect on work productivity. Discipline in the rig context includes punctuality, adherence to safety protocols, proper use of personal protective equipment, and compliance with operational procedures. A disciplined workforce minimizes downtime, reduces accident rates, and maintains consistent output levels.

d. Leadership Style

Adegboyega and Olawumi (2021) stated that leadership style significantly affects employee productivity. Participative and transformational leadership styles were found to be the most influential in improving rig worker productivity. Leaders with these styles encourage two-way communication, provide opportunities for subordinates to express opinions, and involve them in operational decision-making. This finding is consistent with Ghazali and Anwar (2022), who noted that effective leadership in high-risk environments can increase productivity by up to 25%.

Setiawan et al. (2022) added that worker commitment to OHS, compliance with OHS regulations and procedures, and worker involvement in OHS have a significant positive effect on drilling rig worker performance. Effective leaders foster a safety culture where workers feel responsible not only for their own safety but also for their colleagues' well-being.

e. Work Fatigue and Health Factors

Perkasa and Meily (2024) showed that fatigue due to shift schedules, excessive working hours, lack of sleep, heavy workload, and harsh environmental conditions affects performance, alertness, and overall health and safety. Dwindu and Widanark (2024) confirmed that work fatigue experienced by oil and gas workers impacts decreased work performance and productivity.

Wang and Mehta (2024) revealed that current fatigue and productivity management relies heavily on supervisor communication and worker self-reporting, which may not be optimal. This highlights the need for more systematic fatigue risk management systems, including objective fatigue monitoring, adequate rest periods, and schedule designs that align with human circadian rhythms.

Ayadi et al. (2023) identified low social support and stressful work situations as factors contributing to low productivity. The psychological well-being of rig workers, who often spend weeks away from family in isolated locations, requires attention through counseling services, family support programs, and adequate communication facilities.

f. Integration of HR Factors

The synthesis of these findings suggests that HR readiness for rig work is multidimensional. It encompasses technical competence, psychological readiness, physical health, motivation, discipline, and the influence of leadership. These factors do not operate in isolation but interact synergistically. For example, a highly competent worker without motivation may underperform, while a motivated worker without proper training may make dangerous errors. Therefore, companies must adopt an integrated HR management approach that addresses all these dimensions simultaneously.

2. The Role of Infrastructure and Equipment in Improving Rig Worker Productivity

The second major finding from this literature review is that rig worker productivity is highly dependent on infrastructure and equipment support. Technological advances and the completeness of facilities determine the effectiveness and efficiency of work in the field.

a. Equipment Maintenance and Operational Factors

Ardiyanti and Dani (2023) found that maintenance and repair of equipment, fuel and lubricant refilling, drilling diameter and depth, and the simultaneous use of multiple heavy equipment affect drilling rig productivity. This finding is particularly relevant because rig operations involve complex machinery that requires regular maintenance. Equipment breakdowns can cause significant downtime, delaying projects and increasing costs.

The study by Rizki et al. (2023) demonstrated that actual productivity (658.32 BCM/hour) approached the target (670 BCM/hour) with an achievement rate of 98.27%, indicating that equipment efficiency is a critical factor in meeting productivity targets. Even small improvements in equipment reliability can translate into substantial gains in overall project outcomes.

Hernandi and Tamtana (2021) identified ten factors affecting worker productivity, including changes in work drawings, limited work area, weather changes, lack of rest areas, material availability, working at heights, construction methods, damaged equipment, misunderstandings among workers, and inspection delays. Several of these factors are directly related to infrastructure and equipment quality.

b. Appropriate Equipment Selection

Devid and Siallagan (2021) showed that selecting suitable well control equipment based on scope of work, rig flexibility, and AHP (Analytic Hierarchy Process)-based decisions affects productivity. The study emphasized that choosing the right infrastructure and equipment for workover and well service rigs enhances flexibility and productivity. This finding has practical implications for procurement decisions. Companies should not simply purchase the cheapest equipment but should consider long-term productivity impacts, maintenance costs, and compatibility with existing systems.

c. Work Environment and Facility Quality

Oei et al. (2023) identified factors affecting productivity including work methods, work instructions, equipment quality, worker group composition, work drawings, remuneration, work area density, worker skills, experience, and teamwork. The quality of the physical work environment, including adequate lighting, ventilation, noise control, and rest areas, directly affects worker comfort and efficiency.

Adlan et al. (2023) confirmed that the work environment, along with safety, health, and discipline, affects work productivity. A supportive work environment reduces fatigue, minimizes errors, and enhances worker morale. In the rig context, where conditions are often harsh, providing ergonomic workstations, proper personal protective equipment, and adequate rest facilities is not merely a comfort issue but a productivity imperative.

d. Safety Culture and OHS Infrastructure

Bhirawa and Situngkir (2023) demonstrated that OHS program implementation increased employee productivity by 17.7%. Setiawan et al. (2022) reinforced this by showing that worker commitment to OHS, compliance with OHS regulations and procedures, and worker involvement in OHS have a significant positive effect on drilling rig worker performance. These findings indicate that safety infrastructure—including safety signage, emergency response equipment, fire suppression systems, and personal protective equipment—directly supports productivity by preventing accidents that could halt operations. Moreover, a strong safety culture reduces worker anxiety, allowing them to focus on their tasks rather than worrying about potential hazards. The findings of this literature review align well with established productivity theories. Simanjuntak (2021) proposed that productivity is determined by ability, willingness, and opportunity. The current review confirms that HR readiness addresses the "ability" component (through competence and training) and "willingness"

component (through motivation and leadership), while infrastructure addresses the "opportunity" component (by providing the tools and environment for productive work).

Sedermayanti (2019) identified six main factors determining labor productivity: work attitude, skill level, worker-management relations, productivity management, labor efficiency, and entrepreneurship. The current findings confirm these factors and add specific contextual elements relevant to rig work, such as fatigue management, safety culture, and equipment maintenance. Nitisemito (2022) listed 11 factors affecting productivity, including leadership, compensation, work supervision, work environment, education and training, work discipline, work facilities, absenteeism, workload, employee turnover, and selection processes. The current review confirms most of these factors and provides empirical evidence specific to the rig industry.

CONCLUSION

The conclusion of this literature review is that rig worker productivity is influenced by two main aspects: readiness of human resources (training, motivation, work discipline, leadership, mental health) and availability and quality of infrastructure and equipment. Suggestions are directed to: (1) Payung Negeri Health Institute to use this review as curriculum development material for occupational health and safety topics; (2) future researchers to expand variables and methods, involving broader populations and exploring effective interventions; (3) oil and gas companies to improve training quality, work facilities, and worker psychological well-being to achieve optimal productivity results.

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