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Analysis of Upstream Cloud Technology Acceptance at Pertamina Hulu Energi Regional 4

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ABSTRACT

This study aims to analyze the factors influencing the acceptance of Upstream Cloud technology at PT Pertamina Hulu Energi Regional 4. Upstream Cloud is part of the company's digital transformation strategy, expected to improve operational efficiency and competitiveness in the oil and gas industry. Using the Technology Acceptance Model (TAM) approach, this research examines the influence of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Confidence Level of Users (CL), and Cost Effectiveness (CE) on the level of technology acceptance within the organization. The research was conducted through a survey involving employees of PT Pertamina Hulu Energi Regional 4, with data analyzed using inferential statistical methods to determine the relationships and the magnitude of influence of each variable. The results indicate that PU has a positive and significant effect of 33.3%, PEOU of 9.2%, CL of 39.1%, and CE of 14.9% on technology acceptance. Simultaneously, these four variables contribute a total of 96.5% to the acceptance of Upstream Cloud technology. These findings have important strategic implications for the company, including the need to enhance user competence and confidence through technical training and mentoring, intensify communication regarding the tangible benefits of cloud technology, and strengthen technical support. Additionally, although PEOU has a relatively small influence, ensuring ease of use remains essential to minimize adoption barriers, particularly for non-technical users. Regular evaluations of the technology's effectiveness are also recommended to adapt to the dynamic operational needs and technological advancements in the oil and gas industry.

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1. INTRODUCTION

The oil and gas industry is currently undergoing a significant transformation driven by digital technologies, aiming to improve operational efficiency and data management. One of the key innovations in this transformation is the implementation of cloud computing technology, particularly in upstream operations where large volumes of geological, geophysical, and operational data require reliable, fast, and secure storage and processing systems. Pertamina Hulu Energi Regional 4, as one of Indonesia's upstream oil and gas operators, has adopted Upstream Cloud technology as part of its digital transformation strategy to enhance data integration, operational decision-making, and business agility.

However, the successful implementation of new technology in any organization depends not only on infrastructure readiness but also on user acceptance. Without adequate acceptance from internal users, the benefits of technological innovation may not be fully realized. Therefore, understanding the factors influencing employee acceptance of Upstream Cloud technology becomes a crucial concern in ensuring the effectiveness of digital transformation initiatives within the company.

Previous studies have widely employed the Technology Acceptance Model (TAM) developed by [1] to predict and explain user behavior toward new technologies. TAM identifies two primary determinants of technology acceptance: Perceived Usefulness (PU) and Perceived Ease of Use (PEU). In the context of upstream oil and gas operations, additional factors such as Confidence Level of Users (CLU) and Cost Effectiveness (CE) are considered equally important, given the critical and capital-intensive nature of the industry.

This study aims to examine the influence of Perceived Usefulness, Perceived Ease of Use, Confidence Level of Users, and Cost Effectiveness on the acceptance of Upstream Cloud technology at Pertamina Hulu Energi Regional 4. The findings of this research are expected to provide valuable insights for both academic development in the field of technology adoption and practical recommendations for industry practitioners in managing digital technology implementations within complex and high-risk operational environments like upstream oil and gas.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) developed by [1] is one of the most widely applied theoretical frameworks for explaining user acceptance of new technologies. According to TAM, two core factors determine an individual's intention to use a technology: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).

a. Perceived Usefulness is defined as the extent to which a person believes that using a particular system would improve their job performance.
b. Perceived Ease of Use refers to the degree to which a person believes that using the system would be effortless.

In various operational sectors, including the oil and gas industry, research consistently confirms that both PU and PEU significantly influence user acceptance, as users are more likely to adopt technologies they perceive as beneficial and user-friendly within their daily work processes.

2.2 Confidence Level of Users (CLU)

Confidence Level of Users (CLU) describes the degree of user confidence in operating a new technology. [2] suggested that user confidence is a significant determinant of technology adoption, particularly in complex operational environments such as upstream oil and gas operations. Higher confidence levels typically reduce resistance to change and promote positive user engagement with new digital systems.

2.3 Cost Effectiveness (CE)

Cost Effectiveness (CE) refers to the perception that the adoption of a technology brings operational and financial efficiency relative to the resources invested. In capital-intensive industries such as upstream oil and gas, where operational decisions are often driven by economic feasibility, the perception of cost-benefit plays a critical role in influencing technology adoption decisions.

A study by [3] in their article *"Investigating Factors Influencing Individual User's Intention to Adopt Cloud Computing: A Hybrid Approach Using PLS-SEM and fsQCA"* also demonstrated that cost-benefit evaluation is one of the most significant factors affecting an individual's intention to adopt cloud computing services. Their findings revealed that users' perceptions of cost efficiency are directly related to their adoption intentions — the lower the perceived costs and the higher the perceived benefits, the greater the likelihood that individuals and organizations will adopt the technology.

This aligns with earlier research by [4] and [5], who found that a positive cost-benefit assessment significantly increases the intention to adopt new technologies. Therefore, when organizations and users perceive tangible operational benefits and cost savings from adopting cloud-based systems, their acceptance and implementation rates are likely to improve substantially.

2.4 Hypothesis Development

Based on the Technology Acceptance Model (TAM) framework and several supporting studies, this research formulates four hypotheses to explain the factors influencing the acceptance of Upstream Cloud technology at Pertamina Hulu Energi Regional 4. Based on this reasoning, the first hypothesis is formulated as follows:

Perceived Usefulness (PU) is considered one of the most critical factors in determining user acceptance of technology. According to Davis (1989), perceived usefulness refers to the extent to which a person believes that using a particular system will enhance their job performance. In the context of upstream oil and gas operations, where operational decisions rely heavily on accurate and timely data, technologies that provide operational advantages are more likely to be accepted. Research by [2] demonstrated that the higher the perceived usefulness of a system, the stronger the individual's intention to adopt it. In line with this, the adoption of Upstream Cloud technology in Pertamina Hulu Energi Regional 4 is expected to be influenced by employees' perceptions of how the system improves work productivity, data accessibility, and operational efficiency. Based on these considerations, the following hypothesis is proposed:

H1: Perceived Usefulness has a positive and significant effect on the acceptance of Upstream Cloud technology at Pertamina Hulu Energi Regional 4.

Perceived Ease of Use (PEOU) is another fundamental determinant of technology acceptance, referring to the degree to which a person believes that using a system would be free of effort (Davis, 1989). In technology implementation projects, especially in industries such as oil and gas with complex workflows and high operational demands, ease of use becomes crucial for encouraging adoption. Research by [2] emphasizes that when a system is perceived as easy to operate, users are more inclined to adopt it as part of their work processes. Additionally, the findings in this study's preliminary survey indicated that ease of use would directly support users in integrating Upstream Cloud technology into their daily operational activities. Therefore, the second hypothesis is formulated as follows:

H2: Perceived Ease of Use has a positive and significant effect on the acceptance of Upstream Cloud technology at Pertamina Hulu Energi Regional 4.

Confidence Level of Users (CL) is defined as the level of trust and belief an individual has in their ability to use a particular technology. This factor becomes particularly important in upstream oil and gas companies, where technology systems are typically complex and require high accuracy in data processing. [6] argue that user confidence is directly proportional to the acceptance and adoption of new digital systems, especially in technical environments. In your thesis context, it was identified that higher user confidence in operating the Upstream Cloud platform would reduce resistance to its use and increase willingness to integrate it into operational workflows. Based on this reasoning, the following hypothesis is proposed:

H3: Confidence Level of Users has a positive and significant effect on the acceptance of Upstream Cloud technology at Pertamina Hulu Energi Regional 4.

Cost Effectiveness (CE) has been recognized as a strategic consideration in technology adoption, particularly in capital-intensive industries such as upstream oil and gas. The perception of operational and financial efficiency is a significant driver of technology acceptance decisions. A study by [3] found that cost-benefit evaluation is one of the most influential factors in determining user intention to adopt cloud computing. Their research showed that when users perceive that a cloud service offers cost advantages relative to the investment, adoption intentions increase. This finding is supported by earlier studies from [4] and [5], who confirmed that positive cost-benefit assessments significantly enhance technology adoption intentions. In Pertamina Hulu Energi Regional 4, where operational cost control is vital, the perception of cost-effectiveness from implementing Upstream Cloud technology is expected to strengthen user acceptance. Thus, the following hypothesis is proposed:

H4: Cost Effectiveness has a positive and significant effect on the acceptance of Upstream Cloud technology at Pertamina Hulu Energi Regional 4.

3. RESEARCH METHODS

3.1 *Research Design*

This study employs a quantitative research approach with a causal associative design, aimed at analyzing the influence of four independent variables Perceived Usefulness, Perceived Ease of Use, Confidence Level of Users, and Cost Effectiveness on the dependent variable, technology acceptance of Upstream Cloud at Pertamina Hulu Energi Regional 4. The causal relationship is examined through statistical analysis to determine the magnitude and significance of these effects. The research focuses on employees actively involved in the usage of Upstream Cloud technology within the organization’s operational and data management processes.

3.2 *Population and Sample*

The population in this study consists of all employees of Pertamina Hulu Energi Regional 4 who have direct experience using the Upstream Cloud platform. As of 2025, there were 75 employees involved in relevant operational divisions. Given the relatively small and accessible population, the census method was adopted, whereby the entire population was treated as the research sample. This allows for comprehensive and accurate generalizations within the organizational context. The use of total sampling also enhances the robustness of the data analysis, particularly when applying regression-based statistical techniques.

3.3 Variable Operationalization

Table 1. Operationalization Variable

No	Variable and Source	Statement Items	Scale
1	**Perceived Usefulness (PU)** [7]	1. Using Upstream Cloud helps me complete work faster.	Interval
		2. Using Upstream Cloud improves my job performance.	
		3. Using Upstream Cloud increases my productivity.	
		4. Using Upstream Cloud enhances my work effectiveness.	
		5. The cost of using Upstream Cloud is lower than local devices.	
		6. Upstream Cloud provides faster access to required information.	
		7. Upstream Cloud is beneficial for managing and organizing my work.	
		8. Upstream Cloud offers advantages over other data storage services.	
		9. Upstream Cloud provides integrated, fast, and reliable information.	
		10. Upstream Cloud is better for managing and analyzing big data.	
		11. Using Upstream Cloud enhances data backup and disaster recovery services.	
		12. Using Upstream Cloud improves automatic software updates.	
		13. Using Upstream Cloud enhances scalability and flexibility in capacity.	
2	**Perceived Ease of Use (PEOU)** [7]	1. Learning to use Upstream Cloud is easy for me.	Interval
		2. It is easy for me to get Upstream Cloud to do what I want.	
		3. Interacting with Upstream Cloud is clear and understandable.	
		4. I find Upstream Cloud flexible to interact with.	
		5. It is easy for me to become skillful and accustomed to using Upstream Cloud.	
		6. I find Upstream Cloud easy to use.	
		7. I find Upstream Cloud accessible anytime and anywhere.	
		8. Learning to operate Upstream Cloud can be done quickly.	
3	**Confidence Level of Users (CLU)** [7]	1. Upstream Cloud has sufficient security measures to make me feel comfortable and confident interacting with it.	Interval
		2. I am confident in my ability to use Upstream Cloud.	
		3. I feel safe and confident conducting activities using Upstream Cloud.	
		4. I trust the reliability of the Upstream Cloud service provider.	
		5. I believe the Upstream Cloud provider prioritizes customer interests.	
		6. I trust that Upstream Cloud has adequate features to protect my privacy.	
		7. I am confident in the services offered through Upstream Cloud.	
		8. I am confident in the connectivity to services provided by the Upstream Cloud provider.	
		9. The process of transferring data from company servers to the Upstream Cloud does not reduce data credibility.	

No	Variable and Source	Statement Items	Scale
		10. I believe Upstream Cloud has sufficient data storage capacity.	
		11. I am confident in the service continuity and consistency of Upstream Cloud.	
		12. I believe my data confidentiality is safeguarded from theft, selling, or unauthorized access by the provider.	
		13. I trust the provider's sincere policies and procedures.	
		14. I believe the Upstream Cloud provider is responsive to user inquiries and capable of adapting applications quickly as needed.	
4	**Cost Effectiveness (CE)** [3]	1. Upstream Cloud is more effective than other IT/ICT service methods (standalone workstation).	Interval
		2. Upstream Cloud shortens time and effort.	
		3. I can avoid unnecessary costs and wasted time using Upstream Cloud.	
		4. The maintenance cost of Upstream Cloud is cheaper.	
5	**Cloud Computing Technology Adoption** [2], [7]	1. I intend to start using Upstream Cloud.	Interval
		2. I will recommend using Upstream Cloud to others.	
		3. I intend to continue using Upstream Cloud in the future.	
		4. I will increase the use of Upstream Cloud for all possible applications and data.	
		5. I prefer an Upstream Cloud environment over a conventional IT environment (standalone workstation).	
		6. I believe using the Upstream Cloud platform is necessary.	
		7. Using Upstream Cloud is a pleasant experience.	
		8. I have the resources necessary to use Upstream Cloud.	
		9. Upstream Cloud technology is compatible with other technologies I use.	
		10. I intend to invest my time and effort to learn how to use Upstream Cloud and benefit from it.	

Source: Adaptation from prior studies (2025)

Each variable was measured using multiple items on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

3.4 *Data Collection Techniques*

Primary data were collected using a structured questionnaire distributed to all 75 employees of Pertamina Hulu Energi Regional 4. The questionnaire was divided into five sections: demographic profile, Perceived Usefulness scale, Perceived Ease of Use scale, Confidence Level of Users scale, Cost Effectiveness scale, and Technology Acceptance scale.

3.5 *Validity and Reliability Testing*

To ensure the quality of the measurement instruments, construct validity was tested using Pearson product-moment correlation, while reliability was assessed using Cronbach's Alpha. A validity coefficient above r = 0.30 and a reliability score above $\alpha = 0.70$ were considered acceptable thresholds. The testing confirmed that all items for each variable were both valid and reliable for subsequent analysis.

3.6 *Data Analysis Techniques*

The data were analyzed using **SPSS** through several sequential steps. Descriptive statistics were used to summarize respondent profiles and variable distributions. **Classical assumption tests** included normality, multicollinearity, and heteroscedasticity tests. **Multiple linear regression analysis** was conducted to evaluate both the simultaneous and partial effects of the four independent variables on technology acceptance. The **coefficient of determination (R^2)** assessed the proportion of variance in technology acceptance explained by the predictors. Finally, **t-tests** and **F-tests** were employed to examine the statistical significance of individual and combined effects of the independent variables.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The profile of respondents in this study includes gender, age, education, expertise background, current position, and two items related to the theme of the study. A total of 75 respondents from Pertamina Hulu Energi Regional 4 participated.

Table 2. Demographic Profile of Respondents

Characteristic	**Category**	**Frequency (n)**	**Percentage (%)**
Gender	Male	62	82.7%
	Female	13	17.3%
Age	21 – 30 years	13	17.3%
	31 – 40 years	33	44.0%
	41 – 50 years	25	33.3%
	≥ 51 years	4	5.3%
Education Level	Bachelor	44	58.7%
	Master	313	41.3%
Expertise Background	G&G	39	52.0%
	Reservoir/Production	16	21.3%
	Drilling	10	13.3%
	Facility	2	2.7%
	Others	8	10.7%
SODA–WOPDM Consultation	Pernah	60	80.0%
	Tidak	15	20.0%
Understanding and Skills in Upstream Cloud	None	5	6.7%
	Beginner User	29	38.7%
	Moderate User	26	34.7%
	Advanced User	15	20.0%

Source: Results analysis data (2025)

The demographic data indicates that the majority of respondents were male, totaling 62 individuals or 82.7%, while female respondents amounted to 13 individuals or 17.3%. Regarding age distribution, most respondents were in the 31–40 years age group, accounting for 33 individuals or 44.0%. This was followed by respondents aged 41–50 years (25 individuals or 33.3%), those aged 21–30 years (13 individuals or 17.3%), and finally respondents aged 51 years and above (4 individuals or 5.3%).

In terms of education level, respondents were predominantly bachelor's degree holders, totaling 44 individuals or 58.7%, while 31 respondents or 41.3% held a master's degree. When viewed from their expertise background, the majority came from Geology & Geophysics (G&G), comprising 39 individuals or 52.0%. This was followed by Reservoir/Production at 16 individuals or 21.3%, Drilling at 10 individuals or 13.3%, Facility at 2 individuals or 2.7%, and other fields at 8 individuals or 10.7%. Regarding prior consultation with the SODA–WOPDM function within the last three years, 60 respondents or 80.0% reported having consulted, while 15 respondents or 20.0% had not.

Finally, related to understanding and skills in using Upstream Cloud, most respondents identified themselves as beginner users, totaling 29 individuals or 38.7%. This was followed by moderate users at 26 individuals or 34.7%, advanced users at 15 individuals or 20.0%, and a small proportion, 5 respondents or 6.7%, indicated that they did not have any understanding or skills related to Upstream Cloud technology.

Descriptive analysis techniques were used to interpret the data and information obtained from respondents by collecting, organizing, and classifying these data. In this study, the researcher used a questionnaire in which each research question was accompanied by five possible response options that respondents were required to choose from. Each response carried a score: 1 for "Strongly Disagree" (SD), 2 for "Disagree" (D), 3 for "Neutral" (N), 4 for "Agree" (A), and 5 for "Strongly Agree" (SA).

These responses were then calculated as percentages and compared with criteria based on the highest and lowest possible scores from the questionnaire results, with the following calculations for a total of 75 respondents:

1. Minimum Percentage Value = $\left(\frac{1\,x\,75}{5\,x\,75}\right) x\ 100\% = 20.0\%$
2. Maximum Index Value = $\left(\frac{5\,x\,75}{5\,x\,75}\right) x\ 100\% = 100.0\%$
3. Interval Value per Class = Maximum percentage value – Minimum percentage value = 100.0% - 20.0% = 80.0%
4. Interval Value per Class = range value: 5 = 80.0%: 5 = 16.0%

Based on these calculations, the score interpretation criteria can be determined as shown in the table below.

Table 3. Score Interpretation Criteria

No	Interval	Category
1	20.00% - 36.00%	Very Poor/Very Low
2	36.10% - 52.00%	Poor/Low
3	52.10% - 68.00%	Fair/Moderate
4	68.10% - 84.00%	Good/High
5	84.10% - 100.00%	Very Good/Very High

Source: Processed Data Results, 2025

To visualize the score interpretation criteria for the variable values, it can be illustrated in the continuum line below:

Very Poor/Very Low	Poor/Low	Fair/Moderate	Good/High	Very Good/Very High

20.0% 36.0% 52.0% 68.0% 84.0% 100.0%

Source: Results analysis data (2025)

The results indicate that respondents at Pertamina Hulu Energi Regional 4 reported a very high level of Perceived Usefulness (PU), with a mean score of 4.33, suggesting strong confidence in the operational advantages and benefits of using Upstream Cloud technology. The Perceived Ease of Use (PEOU) variable also obtained a high mean score of 4.22, reflecting that respondent generally found the system user-friendly and easy to adopt in their daily activities. Similarly, the Confidence Level of Users (CL) variable recorded a very high mean score of 4.40, indicating that employees felt secure, trusted the technology, and believed in the system's reliability and data protection capabilities. The Cost Effectiveness (CE) variable demonstrated a high mean score of 4.18, illustrating that respondents perceived Upstream Cloud technology as providing significant cost and time efficiencies compared to traditional systems. Lastly, the Cloud Computing Technology Adoption (CCTA) variable achieved the highest mean score of 4.41, indicating that respondents had strong intentions to continue using, recommending, and integrating the technology into broader operational processes. This confirms an overall positive acceptance level toward Upstream Cloud within the organization.

4.2 Validity and Reliability

a. Testing

1. Validity Test

The validity of the questionnaire items was tested using the Pearson Product-Moment Correlation method. Items with a correlation coefficient (r) > 0.30 and p-value < 0.05 were considered valid. The results showed that all items measuring Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Confidence Level of Users (CL), Cost Effectiveness (CE), and Cloud Computing Technology Adoption (CCTA) met these criteria, with r values ranging from 0.602 to 0.891, thereby confirming strong construct validity across all variables.

2. Reliability Test

Reliability was measured using Cronbach's Alpha, which evaluates the internal consistency of items within each variable. A Cronbach's Alpha value greater than 0.70 indicates acceptable reliability.

Table 4. Reliability Test

Variable	Number of Items	Cronbach's Alpha (α)	Interpretation
Perceived Usefulness (PU)	13	0.940	Reliable (Very High)
Perceived Ease of Use (PEOU)	8	0.912	Reliable (Very High)
Confidence Level of Users (CL)	14	0.965	Reliable (Very High)
Cost Effectiveness (CE)	4	0.851	Reliable (High)
Cloud Computing Tech Adoption	10	0.953	Reliable (Very High)

Source: Results analysis data (2025)

All variables exceeded the minimum reliability threshold, with alpha values ranging from 0.851 to 0.965, indicating that the items within each scale were internally consistent and could be considered statistically reliable for further analysis.

b. Classical Assumption Testing

1. Normality Test

Residual normality was assessed through visual and statistical methods. The P-P Plot of standardized residuals showed a linear trend, indicating normal distribution. Furthermore, the Kolmogorov-Smirnov test yielded a significance value of 0.200 ($p > 0.05$), confirming the normality of error terms and the suitability of the regression model for further analysis.

2. Multicollinearity Test

Multicollinearity was assessed using Variance Inflation Factor (VIF) and Tolerance values, with VIF < 10 and Tolerance > 0.10 confirming its absence.

Table 5. Multicollinearity Test Results

Independent Variable	Tolerance	VIF
Perceived Usefulness (PU)	0.186	5.383
Perceived Ease of Use (PEOU)	0.445	2.247
Confidence Level of Users (CL)	0.266	3.764
Cost Effectiveness (CE)	0.284	3.519

Source: Results analysis data (2025)

The independent variables showed VIF values significantly below 10 and Tolerance values exceeding 0.10, confirming the absence of multicollinearity. This indicates that each variable contributes uniquely to the model.

3. **Heteroscedasticity Test**

Heteroscedasticity was evaluated using a scatterplot analysis of standardized residuals. The distribution of points did not form a clear pattern, indicating that heteroscedasticity is not present. This confirms that the regression model meets the assumption of homoscedasticity.

4. **ANOVA Test**

The ANOVA (F-test) was used to assess the simultaneous effect of Perceived Usefulness, Perceived Ease of Use, Confidence Level of Users, and Cost Effectiveness on technology acceptance. The significance value of 0.000 ($p < 0.05$) indicates that these independent variables together have a significant effect on the dependent variable.

Table 6. Heteroscedasticity Test

Model	Sum of Squares	df	Mean Square	F
Regression	34.467	4	8.617	438.935
Residual	1.256	64	.020	
Total	35.724	68		

Source: Results analysis data (2025)

Since both variables have p-values exceeding 0.05, the regression model is free from heteroscedasticity. Combined with the results of the normality and multicollinearity tests, the model satisfies all classical assumptions, confirming the data's suitability for accurate and valid multiple linear regression analysis.

5. **Determination Coefficient Analysis**

The determination coefficient (R^2) is used to measure the magnitude of the influence of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Confidence Level of Users (CL), and Cost Effectiveness (CE) on the acceptance of upstream cloud technology at Pertamina. The following table presents the calculation results of the determination coefficient based on SPSS output.

Table 6. R^2 Coefficient

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.982	0.965	0.963	0.14011

Source: Results analysis data (2025)

Based on the table above, the simultaneous correlation coefficient value is 0.982, and the determination coefficient (R^2) is 0.965. This means that the total influence of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Confidence Level of Users (CL), and Cost Effectiveness (CE) on the acceptance of upstream cloud technology at Pertamina is 96.5%, while the remaining 3.5% is explained by other variables not included in this study.

Furthermore, to determine the partial influence of each independent variable on the acceptance of upstream cloud technology at Pertamina, the following partial effect calculations were performed.

Table 7. Partial Effects

Variable	Standardized Coefficients (Beta)	Correlations (Zero-order)	Partial Effect	Percentage
Perceived Usefulness (PU)	0.355	0.938	0.333	33.3%
Perceived Ease of Use (PEOU)	0.119	0.769	0.092	9.2%
Confidence Level of Users (CL)	0.420	0.932	0.391	39.1%
Cost Effectiveness (CE)	0.172	0.871	0.149	14.9%
Total Influence			0.965	96.5%

Source: Results analysis data (2025)

The simultaneous influence of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Confidence Level of Users (CL), and Cost Effectiveness (CE) on the acceptance of upstream cloud technology at Pertamina is 96.5%. Partially, the influence of Perceived Usefulness (PU) on the acceptance of upstream cloud technology at Pertamina is 33.3%. The influence of Perceived Ease of Use (PEOU) is 9.2%, the influence of Confidence Level of Users (CL) is 39.1%, and the influence of Cost Effectiveness (CE) is 14.9%.

Based on the above explanation, the conclusions of the hypothesis testing can be summarized as follows:

H1: The first hypothesis is accepted because Perceived Usefulness (PU) has a significant effect on the acceptance of upstream cloud technology at Pertamina Hulu Energi Regional 4.

H2: The second hypothesis is accepted because Perceived Ease of Use (PEOU) has a significant effect on the acceptance of upstream cloud technology at Pertamina Hulu Energi Regional 4.

H3: The third hypothesis is accepted because Confidence Level of Users (CL) has a significant effect on the acceptance of upstream cloud technology at Pertamina Hulu Energi Regional 4.

H4: The fourth hypothesis is accepted because Cost Effectiveness (CE) has a significant effect on the acceptance of upstream cloud technology at Pertamina Hulu Energi Regional 4.

H5: The fifth hypothesis is accepted because Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Confidence Level of Users (CL), and Cost Effectiveness (CE) have a significant simultaneous effect on the acceptance of upstream cloud technology at Pertamina Hulu Energi Regional 4.

4.3 *Discussion*

Based on the regression analysis results presented in the previous section, it can be concluded that all tested variables significantly influence the acceptance of upstream cloud technology at Pertamina Hulu Energi Regional 4.

The Perceived Usefulness (PU) factor has been shown to make a substantial contribution to users' decisions to adopt and utilize the technology. This suggests that when a technological system is perceived as providing tangible benefits in supporting work efficiency and effectiveness, the tendency to adopt it becomes stronger. The regression coefficient for PU is 0.370 with a t-value of 6.527 (greater than the t-table value of 1.998), indicating that each unit increase in perceived usefulness results in a 0.370 unit increase in technology acceptance.

In practice, employees at Pertamina Hulu Energi Regional 4 use the upstream cloud to accelerate access to well data, seismic data, drilling reports, and real-time production monitoring. The cloud enables faster data analysis without relying on limited local storage or workstations. Features such as multi-user data integration and seamless cross-location collaboration directly enhance work effectiveness and productivity. This aligns with the high and significant value of PU found in this study.

These findings are consistent with [7], who identified perceived usefulness as the primary factor motivating cloud computing adoption in Bahrain's oil and gas industry, driven by its direct benefits in accelerating data analysis and supporting operational decision-making. Similarly, [3] also highlighted PU as a dominant driver of cloud adoption in both organizational and individual contexts. In this study, PU contributed 33.3% to upstream cloud technology acceptance, indicating that users highly value the technology's ability to improve performance, accelerate work processes, and support data-driven decision-making.

The Confidence Level of Users (CL) variable exhibited the strongest influence, with a regression coefficient of 0.441 and a t-value of 9.226. In Pertamina Hulu Energi Regional 4, user confidence is closely linked to data security and cloud service reliability. Employees become more confident in using cloud technology when the company ensures robust data encryption, automatic backups, and disaster recovery systems. Additionally, user training and cloud policy socialization help strengthen their belief that the cloud is safe for storing critical oil and gas data, such as drilling data, geological and geophysical reports, and production records.

This underscores that technology acceptance is not only dependent on technical aspects but also on users' psychological readiness. When users feel confident and capable of operating the new system, technology adoption progresses more smoothly. Therefore, enhancing user confidence and competence is crucial and cannot be overlooked. This aligns with [7], who emphasized the importance of trust in cloud adoption in Bahrain's oil and gas industry due to concerns about data privacy and security. Furthermore, [3] noted that trust and perceived security had even greater impacts than PEOU in cloud adoption. In Pertamina Hulu Energi, confidence in encryption systems, data integrity, and disaster recovery is a prerequisite before large-scale cloud adoption. In this study, CL contributed 39.1% to technology acceptance, highlighting that trust in security, reliability, and system integrity is critical. To address this, companies must ensure strong cybersecurity measures and conduct continuous user engagement to build user confidence.

Meanwhile, Perceived Ease of Use (PEOU) also has a significant influence, albeit lower than other factors, with a regression coefficient of 0.124 and a t-value of 3.390. This suggests that although ease of use is important, users prioritize perceived benefits and personal readiness when deciding to adopt technology. In practice, at Pertamina Hulu Energi Regional 4, the user interface simplicity of the upstream cloud platform significantly influences employees' intention to use it. Features such as file transfer capabilities, drag-and-drop geological-geophysical files, intuitive production monitoring dashboards, and mobile access options all improve usability.

Although PEOU's impact is smaller compared to PU and CL, it remains essential to ensure users quickly adapt to the new system, especially field operators and non-IT users. This finding supports Zorah & Buthiana (2021), who also found PEOU to be significant but less influential than PU among engineers and geoscientists in the oil and gas sector. Vafaei-Zadeh et al. (2020) similarly reported that while PEOU is important in cloud adoption in the energy sector, its influence ranks below PU and trust-related factors. In this study, PEOU contributed 9.2% to technology acceptance, confirming that a user-friendly interface and adequate training support remain vital to facilitate adoption.

Lastly, the Cost Effectiveness (CE) factor also significantly contributes to technology acceptance, with a regression coefficient of 0.162 and a t-value of 3.903. In Pertamina's upstream operations, cloud services are considered more economical compared to maintaining on-premises servers, especially in remote site areas. Costs associated with hardware maintenance, storage procurement, and software upgrades can be minimized through cloud adoption. Additionally, faster information access and reduced server downtime further improve operational efficiency.

This aligns with [8], who reported that in the oil and gas industry, cost effectiveness is a strong driver of cloud adoption, with EPC companies achieving operational cost reductions of up to 20–30% and improvements in maintenance and monitoring efficiency. In this study, CE contributed 14.9% to technology acceptance, indicating that economic considerations, such as operational cost savings, time efficiency, and reduced physical infrastructure needs, remain important supporting factors.

Overall, the combination of these four factors forms a robust model for explaining technology acceptance phenomena. This implies that technology adoption strategies must balance functional benefits, ease of use, user readiness, and cost efficiency considerations to effectively drive adoption within the organization.

5. CONCLUSION

This study concludes that Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Confidence Level of Users (CL), and Cost Effectiveness (CE) all have significant and positive influences on the acceptance of upstream cloud technology at Pertamina Hulu Energi Regional 4. Among these variables, Confidence Level of Users (CL) emerged as the most dominant factor, highlighting the critical role of user trust in ensuring successful technology adoption, especially in high-risk, data-intensive industries such as oil and gas.

Perceived Usefulness (PU) was also found to play a major role, reflecting the importance of tangible operational benefits in driving user acceptance. Although Perceived Ease of Use (PEOU) and Cost Effectiveness (CE) showed smaller effects, they remain relevant supporting factors that help create a more holistic and seamless adoption process. Collectively, these four factors explained 96.5% of the variance in technology acceptance, indicating a robust model.

From a managerial perspective, it is recommended that organizations focus on strengthening user confidence through enhanced cybersecurity measures, continuous training, and transparent communication of system benefits. Furthermore, simplifying the user interface, highlighting cost efficiency, and conducting regular evaluations will further reinforce user adoption and maximize the long-term value of cloud technology implementations. Future research could explore additional factors such as organizational culture, leadership support, or technological readiness to provide a more comprehensive understanding of technology adoption dynamics within the energy sector.

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