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Strategic Decision Making for Shop Optimization & Centralization at PT.CVX using SMART Method

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Abstract - **PT. CVX is a major oil producer in Indonesia and has operated Rokan block in Riau province with total oil production of more than 11.5 billion barrels since 1931. However, oil production has declined in the last few years and this condition became even worse by the plunge of oil price which began in mid-2014.With the low oil production and low oil price condition, PT.CVX is required to downsize its operation to reduce operational cost & make the organization more efficient in the future. This paper will focus on how the Company overcome this business issue through Shop optimization & centralization as part of cost leadership business strategy by developing a recommendation strategy for the optimum number & configuration for D&C Shops through selection criteria to select several alternatives and conduct decision making analysis using SMART (Simple Multi-Attribute Rating Technique) method. The recommendation consists of 4 alternatives strategy for future D&C Shop configuration and the selection criteria will be based on 4 main attributes which represent the value of the company: safety, operational reliability, asset security & ease of execution. The result from analysis using SMART method shows that 'Optimized Working Hours' alternative is the most preferred alternative. This alternative will have business implication of operational efficiency as part of cost leadership business strategy.**

Keywords – **Cost leadership strategy, drilling & completion, oil and gas industry, Simple Multi-Attribute Rating Technique (SMART), strategic decision making.**

I. INTRODUCTION

The global oil and gas industry has encountered significant challenges since 2014 where crude oil price plunged 64% in 14 months after peaking at $107/barrel in June 2014 to $38/barrel in August 2015. This oil market crash was mainly caused by US shale revolution where the new application of hydraulic fracturing technology on horizontal drilling operation could develop new sources of shale gas and led into major increases in reserves or supply of US natural gas. This condition got even worse by the COVID-19 pandemic that has disrupted oil demand due to the decline of economic activities caused by lockdown or social restriction regulation in many countries.

PT. CVX is a major oil producer in Indonesia and has operated Rokan block in Riau province with total oil production of more than 11.5 billion barrels since 1931. However, oil production has declined in the last few years and the oil block is now only producing 195.000 BOPD compared to 1.2 million BOPD in 1973.

With the low oil production and low oil price condition, PT.CVX is required to downsize its operation to reduce operational cost & make the organization more efficient in the future. This research will focus on how Drilling & Completion (D&C) team overcome the business issue through Shop optimization & centralization as part of cost leadership business strategy. The main research question is to find the best configuration alternative for future D&C shops.

II. METHODOLOGY

Research methodology in this final project will use the combination of both quantitative & qualitative research using SMART (Simple Multi-Attribute Rating Technique) decision making selection criteria. SMART method is part of Multiple Criteria Decision Making (MCDM) where judgement is made in the presence of various & usually conflicting criteria. There are 8 main stages of SMART method as below:

a) Identify decision maker(s).
b) Identify available alternatives strategy to meet business objective.
c) Identify the relevant attributes for business operation.
d) Assess & measure the performance of the alternatives on each attribute.
e) Determine a weight for each attribute to illustrate how important the attribute compared to other.
f) For each alternative, calculate the aggregate of weighted value assigned to that alternative.
g) Make a provisional decision by trading cost & benefit.
h) Perform sensitivity analysis to observe stability of solutions when level of importance for particular attributes is changed.

The overview flowchart in this study to describe the research process is shown in figure below:

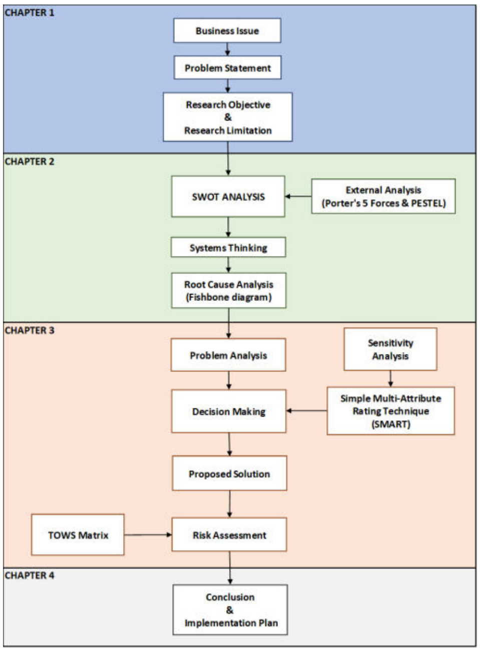

Figure 1. Research Diagram

Quantitative data in this research will be used through direct rating where a value of a criteria/ attribute will be determined directly and interpretated into a value function. This value function will be done mathematically by the decision-maker and the most widely used form of a value function method is the additive model, which can be applied using linear scale (0 to 100).

Qualitative data in this research will be determined by collecting data such as available alternatives selection, weighting criteria & provisional decision through interview or discussion with the decision maker along the process. A small group of people consists of 3 planning specialist, 1 team leader & 1 team manager under DCS team will be categorized as the decision maker.

III. RESULTS

Currently, the Company has a total of 7 D&C Shops: Tactical 125 Shop, Warehouse Baung, Downhole Tool (DHT), Rig Maintenance (RMTC) Shop, Bangko Shop, Minas Shop & Petapahan Shop. The responsibility of each Shop is to support the operation of oil Rig in the area.

According to SMART decision-making selection criteria, there are 8 main stages as below:

A. *Stage 1: Identify Decision Makers*

The decision maker consists of 5 people from internal team as below:

- 1 Manager
- 1 Team Leader
- 3 Planning Specialist

B. *Stage 2: Identify Available Alternatives*

There are 4 available alternatives as below:

- **As Is (7 Shops)**: this alternative will be implemented as per current operational condition and no change will be applied to the shop configuration.
- **Three (3) Shops Configuration**: this alternative will accommodate only the operational of 3 shops: Bangko, Tactical 125 & Minas Shop.
- **Centralized at Duri (1 Shop)**: this alternative will accommodate only the operational of Tactical 125 which is located in Duri area to support all Rig operation in Sumatera.
- **Optimized Working Hours (7 Shops with 12 working hours)**: this alternative would maintain the presence of all 7 D&C Shops but the facility will be open for only 12 hours except for Tactical 125.

The development of the 4 alternatives for shop optimization and centralization above is primarily based on the similarities of location and main responsibility for each shop to support Rig operation in Sumatra.

C. *Stage 3: Identify Relevant Attributes*

The identification of relevant attributes was done during regular meeting in June 2020 with the project team. There are 5 attributes which reflect the value of the company:

- Operational cost: labor cost to operate each Shop.
- Safety: number of people involved in the operation.
- Ease of execution: to conduct transformation or implement strategy.
- Operational reliability: ability to support oil Rig operation without failure (Rig downtime).
- Asset security: ability to secure or prevent Company's assets from missing or being stolen due to poor asset management.

D. *Stage 4:Measure Performance of the Alternatives on each Attribute*

Performance measurement will be conducted using direct rating method with linear scale of value function (0 to 100). The performance measurement summary result is shown in table below:

TABLE 1. PERFORMANCE MEASUREMENT RESULT

Performance Measurement Summary Result						
No	**Alternatives**	**Operational Cost**	**Safety**	**Ease of Execution**	**Operational Reliability**	**Asset Security**
1	As Is (7 Shops)	0	0	100	100	0
2	Three (3) Shops Configuration	53	50	27	81	92
3	Centralized at Duri	87	85	0	0	100
4	Optimized Working Hours	100	100	51	83	0

From table above, zero (0) would represent the worst alternative and 100 would represent the best or the most preferred alternative.

E. *Stage 5: Determine a Weight for each Attribute*

The weight determination for each attribute will be generated through questionnaire distributed to the decision makers. There are 7 questions and these questions will analyze the level of importance of each attribute from the perspective of the decision makers.

The decision maker or the respondents in this research is shown in table below:

TABLE 2. DECISION MAKERS

No	Name (Initial)	Position
1	AR	DCS Manager
2	WS	Team Leader
3	ABM	Planning Specialist
4	TD	Planning Specialist
5	LA	Planning Specialist

The result number from the questionnaire will be normalized to calculate the final weight determination for each attribute as below:

TABLE 3. WEIGHT DETERMINATION FOR EACH ATTRIBUTE

No	Benefit Attributes	Original Weight	Normalized Weight
1	Safety	90	0.30
2	Operational Reliability	80	0.27
3	Asset Security	66	0.22
4	Ease of Execution	62	0.21
	Total	298	1

From table above, safety attribute has the highest weight or level of importance whereas ease of execution attribute has the lowest level of importance.

F. *Stage 6: Calculate the Aggregate of Weighted Value for each Alternative*

According to SMART method, the weighted value from Table 2 will be used to calculate the cumulative aggregate or total benefit value assigned to the alternatives. The aggregate of weighted value for each alternative is shown in table below:

TABLE 4. TOTAL BENEFIT VALUE FOR THE ALTERNATIVES

No	Alternatives	Benefit Attributes & Weight Value				Total Benefit
		Safety	Operational Reliability	Asset Security	Ease of Execution	
		0.30	0.27	0.22	0.21	
1	As Is	0	100	0	100	47.7
2	Three (3) Shops	50	81	92	27	62.8
3	Centralized at Duri	85	0	100	0	47.8
4	Optimized Working Hours	100	83	0	51	**63.1**

From table above, 'Optimized Working Hours' alternative has the highest total benefit value with 63.1. The combination of high safety performance and moderate operational reliability have made this alternative to be the most preferred alternative.

G. *Stage 7: Make a Provisional Decision by Trading Cost & Benefit*

Provisional decision and the recommendation strategy for the business issue will be made by trading cost & benefit calculated previously. The summary of monthly operational cost & total benefit for D&C Shop alternatives strategy will be shown in table below:

TABLE 5. TOTAL COST & BENEFIT SUMMARY

No	Alternatives	Monthly Operational Cost	Total Benefit
1	As Is	$142,046	47.7
2	Three (3) Shops	$108,349	62.8
3	Centralized at Duri	$86,851	47.8
4	Optimized Working Hours	$81,086	63.1

From table above, 'Optimized Working Hours' alternative has the lowest monthly operational cost of $81,086 and with the highest total benefit score of 63.1. On the other hand, 'As Is' alternative has the highest monthly operational cost of $142,046 and the lowest total benefit score of 47.7.

With this result, 'Optimized Working Hours' alternative is the absolute solution or recommendation using SMART decision-making selection criteria.

H. *Stage 8: Perform Sensitivity Analysis*

Sensitivity analysis is used to observe the stability of business solution when level of importance for particular attributes is changed. There are 4 attributes that will be changed in the level of importance consists of safety, operational reliability, asset security and ease of execution. The summary result of sensitivity analysis will be shown in table below:

TABLE 6. SENSITIVITY ANALYSIS SUMMARY

No	Alternatives	Total Benefit				
		Safety = 0	**Operational Reliability = 0**	**Asset Security = 0**	**Ease of Execution = 0**	**Original**
1	As Is	68.3	28.4	61.2	33.9	47.7
2	Three (3) Shops	**68.4**	56.2	54.5	**72.3**	62.8
3	Centralized at Duri	31.7	**65.4**	33.0	60.4	47.8
4	Optimized Working Hours	47.1	55.8	**81.0**	66.3	**63.1**

From table above, sensitivity analysis would give the same result of the highest total benefit with the solution when level of importance or weight value for asset security is changed. This means that when the asset security level of importance is changed or being ignored by the decision maker, 'Optimized Working Hours' would still be the most preferred alternative solution for the business issue.

IV. DISCUSSION

Although the recommended business solution of 'Optimized Working Hours' strategy would give the best benefit with the lowest cost possible, there are several potential problems with possible causes that should be taken into consideration by the management as shown in table below:

TABLE 7. POTENTIAL PROBLEM & POSSIBLE CAUSE

Potential Problem	Possible Cause
Labor strike	Reduced or layoff half manpower required to operate each D&C Shop
Lower quality of service	D&C Shop would be open for only 12 hours while Rig operation operates for 24x7 nonstop
Limited innovation	Limited workforce within the shop operation
Increased risk for asset security	Assets or material will be monitored closely for only 12 working hours

Labor strike might occur during the optimization process since from the analysis there are 74 workers will be laid off to meet the final configuration of 'Optimized Working Hours' alternative strategy. Lower quality of service could also become a problem in the future since the 12-hours working Shops are required to support 24-hours Rig operation. Limited innovation within the operation will also impact the future performance of the D&C Shop since there are only limited workforce working together to form learning organization. Increased risk for asset security could also become an issue for 'Optimized Working Hours' configuration in the future since the assets will be monitored closely for only 12 working hours instead of 24 thus increase the risk of missing or being stolen.

Potential problem as explained above could impact the future operation of D&C Shop therefore there are several preventive actions that should be done by the management as shown in table below:

TABLE 8. POTENTIAL PROBLEM & PREVENTIVE ACTION

Potential Problem	Preventive Action
Labor strike	- Open discussion for workforce engagement - Distribute potential layoff workforce to other operation to eliminate unemployment - Take proper legal concern before workforce layoffs
Lower quality of service	- Training & certification to improve workforce skill & competency - Closely monitor for upcoming Rig operation - Increase technology usage such as digital planning, etc. - Strengthen integrated operation to support Rig operation
Limited innovation	- Initiate & strengthen Knowledge Management (KM) strategy
Increased risk for asset security	- Reinforced main gate security system - Utilized advanced CCTV monitoring system

V. CONCLUSION

The conclusion in this research to answer research questions are:

a) The reasons of high operational cost for D&C Shops are mainly caused by poor asset management and high labor cost to operate all 7 Shops. Poor asset management is driven by the nature of high-risk and complex oil & gas industry environment whereas high labor cost is driven by the number of manpower required to operate and perform a certain job or services in each facility.

b) There are 4 available alternatives of strategy to meet business objective of operational efficiency through Shop optimization and centralization:
   - As Is
   - Three (3) Shops Configuration
   - Centralized at Duri
   - Optimized Working Hours

c) 'Optimized Working Hours' alternative is the best configuration for future D&C Shop organization to achieve business objective of operational efficiency. This recommendation strategy & proposed solution is made through SMART decision-making analysis.

d) Potential problems or business implication that might occur from the proposed recommendation of 'Optimized Working Hours' strategy above includes labor strike, lower quality of service, limited innovation and increased risk for asset security.

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