

ANALYSING FACTOR TO IMPROVE DATA QUALITY IN INTEGRATED OPERATION SYSTEM IN OIL AND GAS INDUSTRY AT XYZ ORGANIZATION

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Abstract

Back in 2012 Integrated Operating System known as SOT (Sistem Operasi Terpadu) was started to implement in order to conduct reporting Oil and Gas Production to all stakeholders such as related Government and Ministry, House of Representatives and Supervisory Agency. The program is always being improved to have better quality on both data, infrastructure, people and process to address some problem in regards with data completeness, accuracy and timeliness. In order to address the issue arises the study has been conducted to see the problem by discussing with multi parties, study of literatures and discuss the propose framework with SME's. The well-known standard such as COBIT and DMM also support to mapping and having insight of the observed gaps. At the end this study come up with the plan of action on how the data quality is improved from many perspectives on how the policy and principle, culture and behavior, information and communication, skill of people and competencies, to management commitment and infrastructure.

Keywords: SOT, Integrated Operating System, PTK 053 and PTK 054, COBIT 5, Data Management Maturity.

Introduction

Oil and Gas (O&G) is an energy taken from fossil and one kind of natural resources in Indonesia where these resources are under protection of Undang-Undang Dasar 1945 (Constitution 1945) on article (pasal) 33 stated that natural resources are protected by the Government of Indonesia and to be utilized for all Indonesian people as much as possible for prosperity and welfare. Until these day O&G is one of accelerator for economic growth. In general, there are two part of O&G activities in Indonesia, known as upstream and downstream which the upstream activities are managed by XYZ while the downstream managed by BPH Migas.

XYZ, abbreviation from The Special Task Force for Upstream Oil and Gas Business Activities, is the institution which was established by Indonesian Government via Presidential Regulation Number 9 Year 2013 and having authority to conduct the management of upstream O&G activities based on Production Sharing Contract (PSC) with PSC Contractor (known as KKKS – Kontraktor Kontrak Kerja Sama) such as

Pertamina, BP, ExxonMobil, Chevron, ConocoPhillips, INPEX and any others PSC Contractor with the main purpose to make the exploitation of stated-owned O&G contributing maximum benefits for the state of Republik Indonesia.

In order to conduct monitoring and reporting to all stakeholders such as the Ministry of Finance (Menteri Keuangan), the House of Representatives (DPR), the Ministry of Energy & Minerals Resources (ESDM) and Badan Pemeriksa Keuangan (BPK, Financial Supervisory Agency), the Division of Information and Technology in XYZ has the strategic function as the enabler to create system to collect, exchange, analyst and to report daily reporting from all PSC Contractor (around 60 PSC contractors) where the data sources itself having various format generated from various system that implemented on each production field.

XYZ requires an adequate system to develop an information system to support the integration and management of data related to the operational activities of the KKKS. The system is also known as the Integrated Operating System or Sistem Operasi Terpadu (SOT).

SOT whose initiative was taken in 2012 by following the Norwegian Leading Position method in the implementation of Integrated Operations. SOT itself is regulated under the Work Procedure Guidelines (PTK) number 054 issued by XYZ. The basic concept of implementing SOT is an integrated system based on business processes that connects several computerized systems of application software, both physically and functionally so that they can be integrated between XYZ and KKKS. By implementing SOT, both XYZ and KKKS will benefit from, among others, data and information transparency, accuracy, process speed, and accountability. According to the 2014 SKK Migas Annual Report, the integration between XYZ and KKKS through SOT can assist XYZ in carrying out its function as supervisor and controller of the upstream O&G business.

Referred the 2020 Annual Report of XYZ, it is known that when reporting its daily report, there is a dashboard that contains information on the daily gas balance report which is divided into the composition of gas distribution data, flaring, fuel, and impurities as well as data on gas utilization for consumers, such as electricity industry consumers, use for oil lifting, city gas, export, fertilizer industry and fuel gas station.

The data is connected to the IOC (Integrated Operating Center) from the KKKS database/system through an SOT which is gradually verified in daily basis. The integrated system can certainly improve transparency, accuracy, timeliness, and efficiency of the reporting process. In the context of digitizing the XYZ reporting process to the Ministry of Energy and Mineral Resources, XYZ has built a web service to channel several types of additional data and become a mechanism to accommodate data integration that can be accessed quickly and precisely.

However, to carry out daily operational activities related to the SOT system, both KKKS and XYZ must implement controls to mitigate disruptions to SOT operations. The problem arises from production data produced daily from thousands of

Oil and Gas wells to production facilities at onshore and offshore facilities in many locations in Indonesia.

In order for all stakeholders to remain well informed and also the daily production dashboard needs to be reported to the Ministry of Energy and Mineral Resources, ideally the production data have to be presented in full number taken from the system. The daily production report itself consists of lifting and stock which is data for one day starting from 00.00 to 24.00 on the previous day. As depicted in figure 1.1 below.

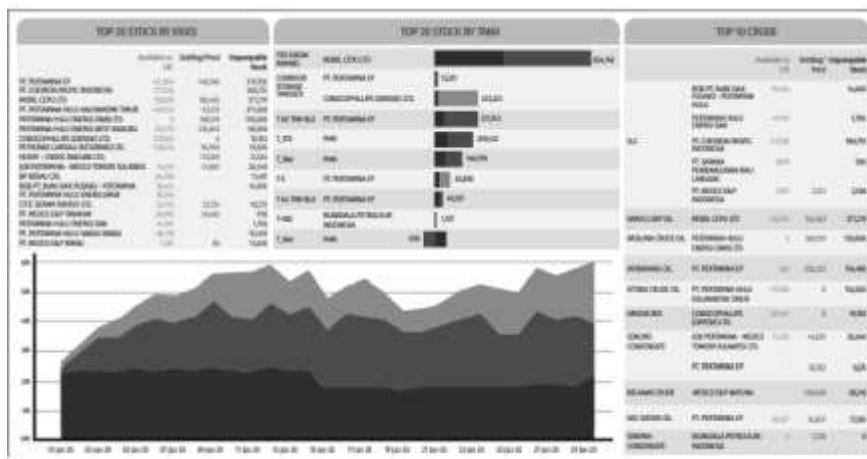


Figure 0
Dashboard display of stock conditions at the KKKS terminal
 Source: SKK Migas Annual Report 2019, (SKK Migas Annual Report 2019, 2020)

However, in reality the current SOT causes some incomplete data and there is a discrepancy between the data reported and the actual data in the KKKS. Therefore, it is necessary to analyse the improvement of problem solving resulting from daily reporting (SOT).

Based on the problem logs which is compiled by the IT service desk starting from January 2021, there are still numbers of error recorded per day with various problems related to incomplete data to send, IT infrastructure problems either network, servers and applications as depicted in figure 4.

Several previous studies have shown that the system used is the PSC contract monitoring system and the Integrated Operating System (SOT), but the SOT is widely used in the data collaboration process so that the level of caution in reporting the data needs to be increased (Kastella and Prabowo, 2020). In addition, the Integrated Operation System built by the XYZ Information System Management Division team is a form of optimizing the application of information technology and telecommunications in upstream oil and gas business activities that is able to create sustainable oil and gas management through increased efficiency, effectiveness, and a high level of calculation accuracy (Permana, 2015). System-related analysis can be explained using the SSM

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method so that it is easy for organizations to understand, implement and adopt data governance according to their needs (Prasetyo and Sureno, 2015).

Research Methodology

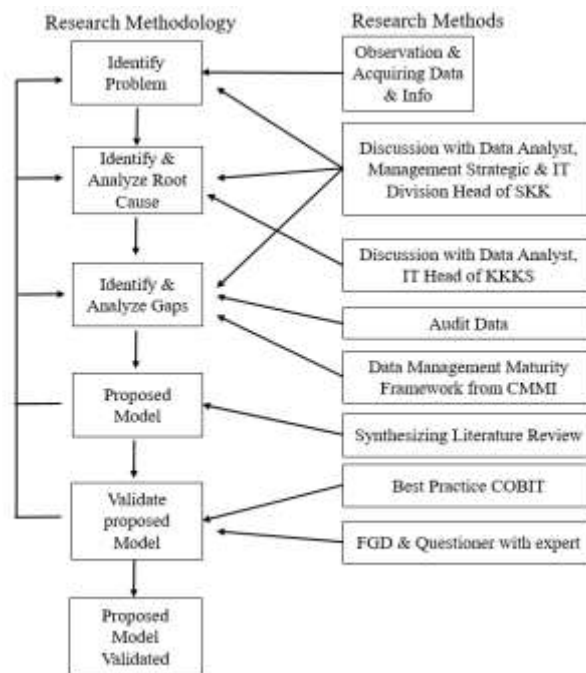


Figure 2
Research Methodology

Research Framework

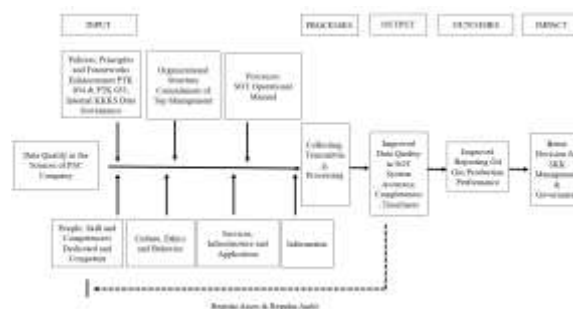


Figure 3
Proposed Research Framework

As depicted at the above framework we divided the component of framework into five parts as they are input, processes, output, outcomes and impact. As stated earlier that we believe that the quality of data in the source of data which stored in KKKS's repository will be affected also to the quality data (completeness, timeliness and accuracy) that ready to be processed to XYZ and in order to support that, along the

way, there are some enablers as inputs that explained as following below. The seven enablers put as input of the process, as an improvement process requires iterative activity from output back to input and as well as conducting regular audit in both internal and external and also the self-assessment on how effective is the processes.

Evaluation of Framework

The Evaluation of the framework will be conducted by interviewing seven subject expert matters from various working experience, position and also take outside organization expert to give opinion. The area that will be discussed is as following below; Policies, Principles and Framework, As already stated earlier in Chapter 2. Literature Review, many authors proved that the regulation or governance have significant impact to the data quality, therefore in this stage there will be some activities to conduct evaluation whether the current regulation is still adequate to address any issues arises in data quality, by first of all to conduct a mapping between current regulation PTK054 and PTK053 against COBIT 5 Processes the continue mapping to Data Management Maturity to observe more clearer gaps in correlation with Data Quality. This is will also discuss the importance of PPDM and PRODML to be considered in the component of the framework. The result then to be presented to the SME's as evaluators to discuss the importance and relation to the success factor.

Organizational Structure Commitment of Top Management

As stated earlier in Chapter 2, many authors argue the commitment of top level of management will effect positively to data/information quality, also base on previous conversation with many KKKS that it obviously needs commitment, awareness and their priority to data governance and data quality, therefore in this research we will evaluate by compiling SMEs opinion in the importance of making awareness and commitment from top management in each KKKS by gathering opinion from SME's.

People, Skill and Competencies, Dedicated Personnel and Competency

From the results of the literature study and also from interviews with KKKS regarding people, skills and competencies, it will then be tested whether these are things that can be a success factor to be implemented based on expert opinion.

Culture, Ethics and Behaviour

This section is to asses if organizations need to apply a focus on Value of Information / Data and need to apply motivation, concern and understanding of the importance of data / information quality.

Services, Infrastructure and Application

In this section will also be tested if the services in IT, supporting infrastructure, or supporting application will also need to improve as success factor of data quality.

Information

This section will evaluate if the communication forum between KKKS and XYZ in order to improve the quality of SOT Infrastructure, Data Management, discussion of SOT issues, brainstorming and sharing knowledge as well as support sharing will affect to data quality.

It has also a moderator factors as COBIT Enabler mentioned it as Principle, Policies and Framework which in this case we will be focusing on investigating the Pedoman Tata Kerja (Working Guidelines) PTK 053 as supporting to PTK 054. In this area those PTK will be mapping to the COBIT 5 Enablers and due to COBIT 5 Enablers don't specifically have detail on how it correlated with Data Quality then mapping them to Data Management Maturity (DMM) provided by CMMI is required as see in figure 4.

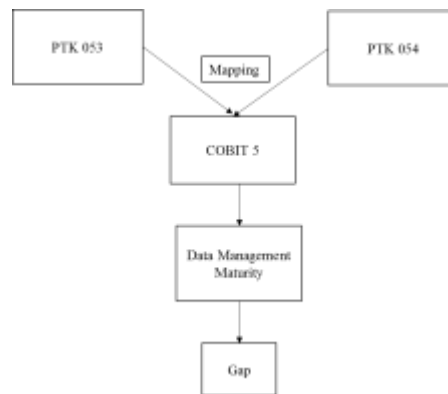


Figure 4

Mapping Methods utilizing COBIT 5 and Data Management Maturity (CMMI)

Validation of the Framework

After conducting several activities in order to obtain evaluation and opinion by the SME's, the result and framework than need to be validated via Forum Group Discussion with other expert which in this case obtaining validation from the Division Head, ITIL Expert, Department Head and Vice President. Focus group discussion is a common qualitative method for gaining a deeper understanding of social issues. Rather than a statistically representative sample of a larger population, the approach tries to acquire data from a purposively selected group of individuals (O.Nyumba *et al.*, 2018).

Results And Discussions

Based on the results of descriptive analysis using SPSS, it is known that question A1 is related to the statement that SOT has implemented the Data Exchange Standard (PRODML) and the data storage/repository standard (PPDM), which the PTK does not include the two standards. The majority of respondents stated that it is essential for SOT to continue to apply these standards. Where even though based on the results of mapping PTK 054 it has not touched the points of Data Management Maturity (CMMI), but with the implementation of data-policy standards that are easy to follow, these standards will have a fundamental role as a success factor in the data.

In question A2, it is known that the majority of respondents answered that it is essential for XYZ to adopt several processes in COBIT to enrich PTK053 especially in relation to data. This is because PTK053 has been released for a long time so it is necessary to make adjustments to current conditions, especially in relation to IT Governance

standards such as COBIT. In question A3, it is known that the majority of respondents stated that it is essential for XYZ to include data exchange standards (PRODML) and data storage/repository standards (PPDM).

Table 1
Percentage of Descriptive Analysis

Question	Rating percentage						Modus
	Critical	Essential	Useful	Nice to have	Irrelevant	Don't Know	
A1	20%	80%	0	0	0	0	Essential
A2	20%	80%	0	0	0	0	Essential
A3	0	60%	20%	0	0	0	Essential

For questions A4-A9, a two top box analysis (percentage of essential and critical answers) is used to show how much respondents agree whether the program is feasible to run. Figure 4.2 and Table 4.25, The total percentage of essential and critical answers shows "PRIORITY" while the total percentage of nice to have, irrelevant, and don't know answers shows "NOT PRIORITY". Based on the results of the two top box analysis, it is known that the priority program that must be carried out is the commitment of the KKKS top management (A4) this is because the top management of the KKKS has an effect on increasing Data Quality, people skill competencies (A6) both for increasing dedicated personal specifically handling SOT both in the field as well as in the office (A6a) as well as improving skills and competencies related to understanding the technology used in every application development and operation used for SOT (A6b), organizations need to apply a focus on Value of Information / Data and need to apply motivation, care and understanding of the importance of data / information quality as a form of improving culture, ethics and behavior (A7), as well as improving services infrastructure and application (A8).

The above programs need to be prioritized because they have a two top box value that reaches 100%. However, the majority of respondents stated that all of these programs are essential to be carried out so that the quality of data in KKKS can be further improved.

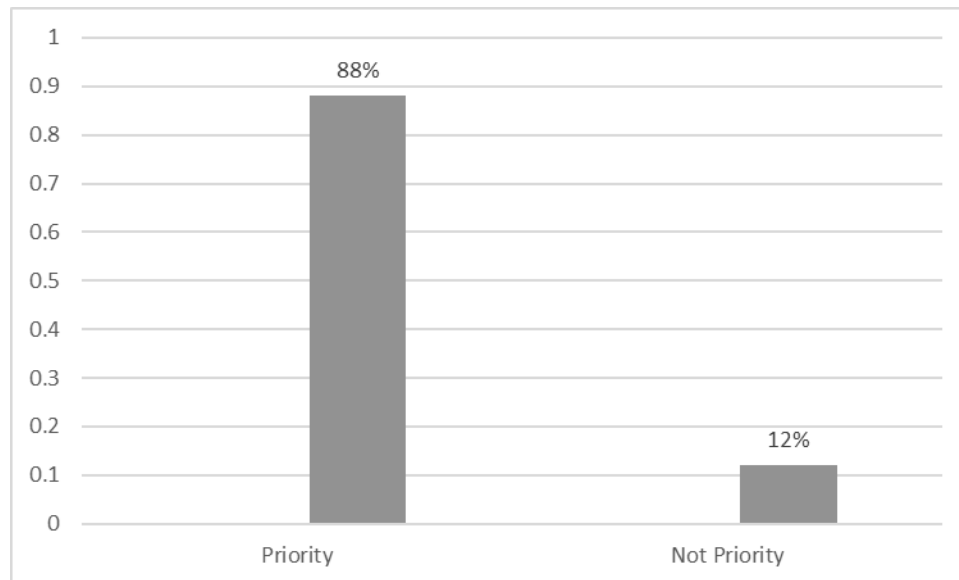


Figure 5
Program priority based on two top box analysis

Table 2
Percentage rating two top box

Question	Rating percentage						Two top box	Not Priority	Modus
	Critical	Essential	Useful	Nice to have	Irrelevant	Don't Know			
A4	20%	80%	0	0	0	0	100%	0	Essential
A5	20%	40%	40%	0	0	0	60%	40%	Essential and Useful
A6a	40%	60%	0	0	0	0	100%	0	Essential
A6b	40%	60%	0	0	0	0	100%	0	Essential
A7	20%	80%	0	0	0	0	100%	0	Critical
A8	60%	40%	0	0	0	0	100%	0	Essential and Useful
A9	20%	40%	40%	0	0	0	60%	40%	Essential and Useful
Rata-rata Prioritas	31.43%	57.14%	11.43%	0	0	0	88.57%	11.43%	

Conclusions

The quality of the data is very dependent on the role of Data Management which is mentioned a lot in the literature review related to this. After being compared using the DMM Maturity Model and COBIT between the currently available governance guidelines, namely PTK 053 and PTK 054, it turns out that there is still a large gap, where there are a lot of process points that are not covered by the two PTKs. This was happening because during the preparation of the PTK was not considered about aspects of data governance or data management.

This situation also resulted in how the KKKS manage data in their system, it was identified during interviews that they did not yet have a policy regarding data management and some were in the stage of making standard policies related to data management.

The proposed framework model is acceptable to be applied for improvement in order to improve data quality based on the validation of Department Head of Data Management and Division Head of IT as well as the results of the questionnaire submitted to 7 (seven) subject experts who handle Data Management at XYZ every day that every detail of the components in the proposed framework can be implemented with a tendency of opinion stating important, and partially important and useful on average.

Beside rearrangement of PTK it comes also to the attention that standard data exchange (PRODML) and standard repository (PPDM), emphasizing commitment from top management of KKKS and top management level of XYZ as the supervisory body for the upstream oil and gas industry.

Also need for improvement of organization structure on each KKKS that builds roles, responsibilities, duties, accountability, decision rights, rules of engagement and communication, human factor related to dedicated personnel and well trained personnel also need to address as well as the knowledge to the technology used for SOT, focus on value on information and data also having high attention from the responder as well as conducting regular audit and communication forum. Beside the conclusion above the gap analysis is also provided as shown in table 3 below.

Table 3
Findings and Recommendation

Findings	Gap Analysis	Recommendation
PTK 054 Based on mapping using COBIT and CMMI it is found that there are not clausal related to the EDM domain,	The PTK it itself will lose control of Evaluate Direct & Monitor as in this case resulting in a lack of role from top management in KKKS due to the absence of direction in the EDM domain	It is recommend that PTK 054 also elaborate the EDM process to address the issues, the importance of EDM will direct KKKS in term of developing their own SOT governance which referring to PTK 054 and PTK 053, as well as the importance of resource optimization and stakeholder transparency
PTK 054 Only 2 clausal found related to the APO (align, plan and organize) related to Manage Security	For KKKS which do not refer to another PTK 053 this will causing lack of alignment, planning and organizing phase, in particular based on last audit found it is stated the security issue with high vulnerability	PTK 045 should also addressing more to the APO domain, especially to domain related to Manage Human Resources, manage Service Agreement and in particular Manage Quality which is even not stated on both PTK 054 and PTK 053 as described in table 4.10
In both PTK 054 and PTK 053 are not addressing	Manage knowledge will be more importance to be	KKKS should be more aware on how they record the problem &

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Findings	Gap Analysis	Recommendation
Manage Change Acceptance and Transitioning and mana Knowledge and Manage Requirement Definition	utilized by either XYZ and KKKS as to solve the day to day SOT problems or accident, as also stated on audit findings that KKKS don't have good problem recording related to SOT, this is also related to Manage Configuration which is not stated in PTK 054.	accident. Using on the shelf application or tools would be also beneficial. It is also beneficial if the system is integrated between KKKS and XYZ.
Comparing with Data Management Maturity – CMMI as stated on Table 4.11 DMM Mapping to PTK 054 it clearly observed that in Data Management Strategy in detail on Communication and Program Funding are not address on PTK 054	The clear communication is an importance in order to ensure data quality, during interview with KKKS it is also discussed that some are lack of internal communication in handling SOT	On PTK should address the Communication process area and also program funding even actually it already covers on annual Work Program and Budget (WP&B). However it still necessary to put on PTK to prevent it uncovered anywhere.
Referred to PTK 054 mapping to DMM, there are found that PTK 054 are not addressing any Process Area in Data Quality	It should address Data Quality Strategy and data profiling as this will be importance for KKKS in changing the way they manage Data Governance and data Quality that will also affected to Behavior and Culture. It is also lack of clausal in regards with data quality assessment and data cleansing. This will be more in	Data Quality Strategy, Profiling, Assessment and Cleansing should be addressed on next PTK revision
Refer to mapping result between PTK054 to DMM – Platform and Architecture – Approach and Standard – as has been discussed in interview with one of big KKKS stated that they operation area are too long so that not easy as another KKKS to manage source of data.	This condition might be affected by lack of Architectural Approach and Standard as if the two processes are stated in PTK will then be useful guide for KKKS to address this issues	In the next PTK revision will need to elaborate the architectural approach and standard to assist KKKS on how they manage the infrastructure and data in the wide operational area.

As the overall study and conclusion provided in this thesis, it is confident enough to say that implementing this study will affect to improvement of data quality in SOT, and not SOT Production in particular but will be affecting to better future data

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quality on SOT Drilling, Financial Quarterly Report and others SOT which still in the development process. This is also will impact to better Data Governance that will be adopted by KKKS so that at least around sixty-five production KKKS have a benefit for better Data Governance and Data Quality as this also supporting Oil and Gas IOG 4.0.

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