The Direction of the City Gas as Clean Energy in Indonesia with the Work Force as the Moderator

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Abstract. The distribution of city gas to consumers as clean energy has expanded. Despite its expansion, the trend can run into a drop in consumer demand. This can be the case if factors that control its growth are improperly managed. Hence, regulating the variables are of critical relevance. The data movement from year to year continues to show an expanding tendency with reference to the Indonesian city gas industry. This study can further improve knowledge of Indonesia's city gas distribution industry and to paint a clearer picture of a number of latent variables that need to be taken into account in order to distribute natural gas to Indonesian cities as efficiently as possible. The Structured Equation Technique (SEM)was the methodology employed in this investigation. In a more detailed explanation, the association between indicators and latent variables is examined using path analysis, which is derived from multivariate regression, in order to assess the validity of the multiple regression model. In keeping with the research methodology, data from indicators of city gas distribution companies during the period 2010-2020 were grouped and sorted by the Indonesian Central Statistics Agency. These indicators included income, the number of employees paid, the volume of city gas distributed, and operational costs. The purpose of this research is to produce information that can be used by the government and other stakeholders to accelerate the development of Indonesia's gas distribution business. This study's novelty or worth lies in its ability to shed light on the influence of latent variables that hold the status as moderating variables. Study limitations: Because non-disclosure primary data are not readily available and secondary data are scarce, it is assumed that the information from the Indonesian Central Statistics Agency is reliable and can be used to describe the explanatory variables of the city gas distribution industry in Indonesia.

1 Introduction

Continuous and sustainable growth over the long term is an ongoing phenomenon that is closely monitored when analyzing the benchmarks that every business or industry must consistently achieve. This holds true for the natural gas city gas distribution sector in Indonesia [1]. By examining various crucial indicators such as workforce engagement, labor expenses, and the substantial volume of natural gas supplied to urban consumers, one can

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observe how the data trends year by year consistently show an upward trajectory in the Indonesian city gas sector [2]. The purpose of this study is to shed some light on a number of independent factors that have significantly influenced natural gas's distribution growth as a clean energy source in Indonesia.

The partial least squares method, commonly known as PLS, is employed to construct the structural equation model, representing a prevalent research approach often referred to as quasi-qualitative. In a more comprehensive elaboration, the relationship between indicators and latent variables is scrutinized through path analysis, a technique derived from multivariate regression, aimed at assessing the validity of the multiple regression model. Following the research methodology, data sourced from the Indonesian Central Statistics Agency is organized, encompassing information from indicators of city gas distribution companies spanning the period 2010–2020, categorized into: revenue, workforce size, salaries, volume of distributed city gas, and operational costs [3,4].

The outcome should effectively communicate to the reader the significant role of the workforce in advancing city gas as a clean energy source. To achieve a specific desired outcome, it's imperative to manage the moderating variables.

Furthermore, the findings of this study can offer insights for government and other stakeholders to optimize the expansion of Indonesia's gas distribution industry. The novelty or significance of this study lies in its capacity to elucidate the impact of latent variables serving as moderating factors [5].

2 Method

The methodology adopted for this particular study comprises two components. The first component pertains to the research approach, while the second one entails the development of a structured model. Since the research involves observing societal events and is associated with quantitative techniques, research methodologies commonly known as quasi-qualitative or naturalistic research methods are often employed worldwide [6,7]. Due to the qualitative nature of the data collected and analyzed, this method was specifically chosen for this research to elucidate social phenomena [8] (**Fig. 1**).
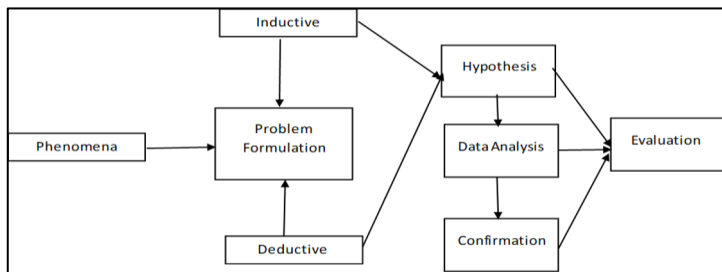

Fig. 1. Flowchart of quasi qualitative research

Furthermore, the foundation of this study is founded on events noticed in relation to Indonesia's expanding city gas industry. Several sequential flows are included in the methodology. The foundation of the research was built on a phenomenon that emerged in the energy sector, notably with respect to green energy, and in particular with regard to natural gas produced as commercially traded as city gas. The formulation of the problem was then established.

The next stage in this study is the use of structural equation modeling (SEM), a hybrid technique that combines path analysis with factor analysis (**Fig. 2**) [9,10]. Regression, factor analysis, and path analysis confirmatory features are all included in this analysis. Because

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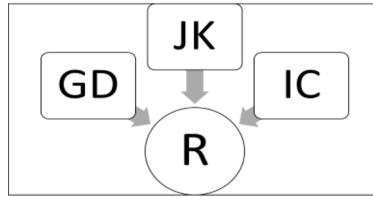

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The Partial Least Square (PLS) approach was utilized in this particular work to evaluate and examine hypothetical hypotheses. PLS is an alternate analysis technique that uses structural equation modeling (SEM) and is based mathematically on variance. The benefit of this frequently relied-upon algorithm method is that it may be estimated with only a small number of samples and might not require assumptions.

Fig. 3 illustrates the pathway following the execution of the application and inputting the datasets. The quantity of natural gas distributed through pipeline systems to cater to end-users (GD) is quantified by the GKD, while the internal corporate cost (IC) is gauged by an indicator set designated as BI.
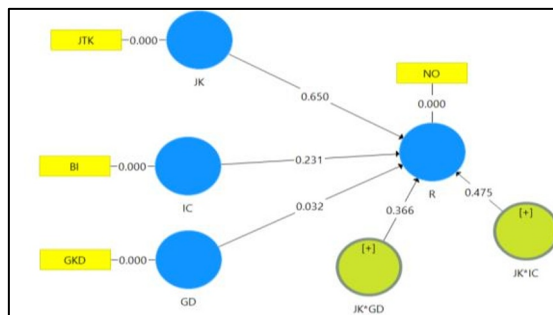

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Furthermore, the picture demonstrates that a JTK indication is used to calculate the size of the work force (JK). JK, however, also serves as the discernible moderating factor. As a result, the latent variable R (acting as the endogenous variable) has two moderating functions, JK*GD and JK*IC, in addition to the indicator NO.

The quality criterion should be looked at first. As mentioned, and shown in **Table 1**, R square is a measure of how significant an exogenous, independent variable's value is in influencing an endogenous, dependent variable (endogenous). R squared is frequently used

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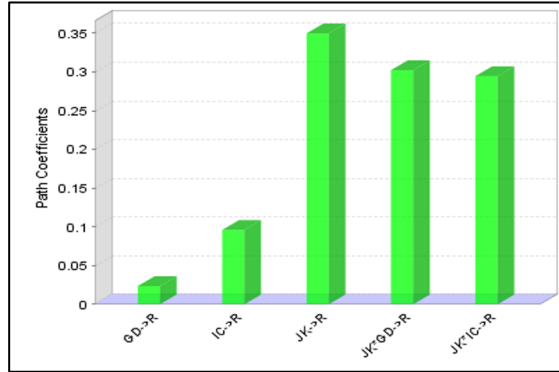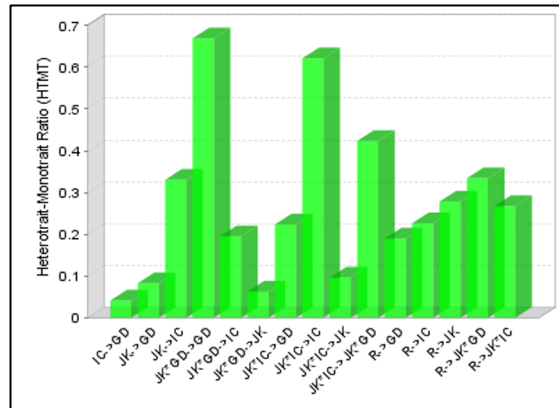

Fig. 4. The path coefficients

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This paper demonstrates that the R Square has a value of 23%. Such a percentage goes further to show that the dependent value, or company revenue, is only slightly impacted by the independent variables JK, IC, and GD (R). The path coefficient has to be examined next. Considering the moderating function, interpretive decisions should be made in light of the outcomes (**Fig. 4).**

Table 1. R square

Depth (ft)	R Square
R	0.232

Interestingly, the output delivers several key insights to the reader. Initially, it's noteworthy that an increase of one unit in the moderating variables leads to a 30.2% rise in Revenue, as indicated by the direct impact of labor forces multiplied by distributed gas on Revenue (R) being 0.302. This effect is thus deemed significant and beneficial. Similarly, the impact of labor forces multiplied by internal corporate costs as moderating variables on Revenue (R) is 0.295, suggesting that a one-unit increase in moderating variables corresponds to a 29.5% increase in Revenue. Consequently, the moderating variables significantly influence the revenue of the corporation distributing city gas to households across various areas.

Furthermore, the Heterotrait-Monotrait Ratio of Correlations (HTMT) should be taken into consideration (**Fig. 5**). HTMT serves as a useful initial step in assessing discriminant validity; however, it is most effective when comparing features that are relatively similar, as disparate features may yield insignificant results. Graphically, the distributions of individuals follow typical patterns. In this particular study, the HTMT criterion has a value below 0.90, indicating that discriminant validity has been established. Consequently, the model developed in this study can draw conclusions based on both the indicators and the latent variables.

4 Conclusion

The study concludes with several noteworthy findings. The R Square value stands at 23%, indicating that the independent variables JK, IC, and GD moderately influence the company revenue (R). Moreover, regarding direct effects, the interaction between workforce and distributed gas as moderating variables on revenue (R) yields a coefficient of 0.302. This suggests that a one-unit increase in moderating variables should lead to a 30.2% increase in revenue. Similarly, the interaction between workforce and internal corporate cost as moderating variables on revenue (R) yields a coefficient of 0.295, indicating that a one-unit increase in moderating variables should result in a 29.5% increase in revenue. Lastly, the HTMT criterion, assessed in this study, is below 0.90, indicating that discriminant validity has been established. Therefore, the model developed in this study can draw conclusions based on the indicators and latent variables. Recommendations for future research can be provided following the conclusions. It is expected that data from the Indonesian Central Statistical Agency will increase in the coming years, potentially including more indicators in future studies. This could enrich the dataset population at this time.

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MPK02

by Wiwik Dahani

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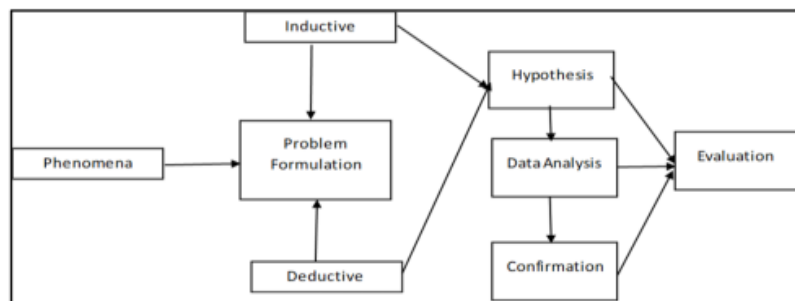

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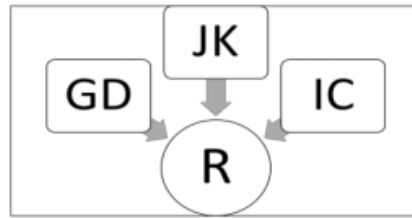

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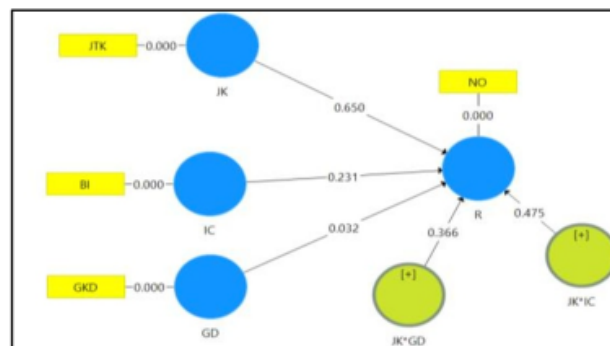

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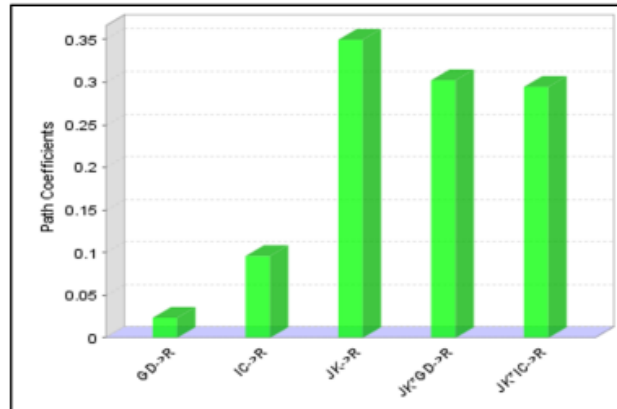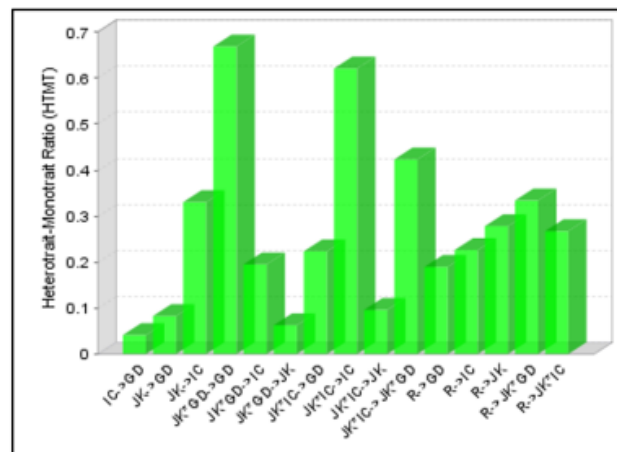

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