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# Hack the Business Canvas Model Based on Product-Service System: Natural Language Processing (NLP) Perspective

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**Abstract**
**Purpose:** This research aims to explore the business model used for energy service companies or ESCOs.
**Research methodology:** This research uses action research based on soft systems methodology and uses business analogies to explore implementing alternative PSS business models. The question component of this research uses the canvas business model (BMC) framework. The use of Natural Language Processing (NLP) from the sub-field of artificial intelligence is used to investigate the problems and concerns of stakeholders about energy efficiency services today.
**Results:** It was found that NLP can extract issues or sentiments about positive or negative aspects when it comes to the development and role of energy service companies in Indonesia. It was also found that PSS's alternative business model can be used as a visual representation of how an energy service company creates, delivers, and adds value to its proportion of customers.
**Limitations:** This research investigated case studies conducted between June 2020 and April 2021 on ESCO company. The findings from this case study may not generalize well to other contexts. Additional case studies on different populations are often needed.
**Contribution:** Due to the increasing demand for energy and limited energy supply, companies can gain a competitive advantage by applying the PSS business model to the energy efficiency industry. Furthermore, there is a vast and untapped market potential for energy service companies in the energy efficiency industry in Indonesia.
**Keywords:** *Product Service System (PSS), Energy service company, Soft system methodology, Business Model, Business Model Analogy, Natural Language Processing.*
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## 1. Introduction

In industry energy efficiency, price competition has become the dominant aspect in creating competition that leads to hyper-competition. Therefore, the 'Price ' factor is a determining factor for the company's survival in the future. Market The current energy efficiency and industry conditions themselves are very potential and challenge many energy service companies to enter it. While many energy service companies serve existing customers, various other aspects such as growth, competition, and tough competition in the market have a lot to do with the internal development of energy service companies. The combination of market conditions, companies, products, and consumers creates hyper-competition in the energy efficiency industry (Heil and Helsen, 2001). Industry energy efficiency is complicated because many stakeholders have goals that must be met; see Figure 1 below. The figure below identifies economic interests as the underlying drivers for each stakeholder.

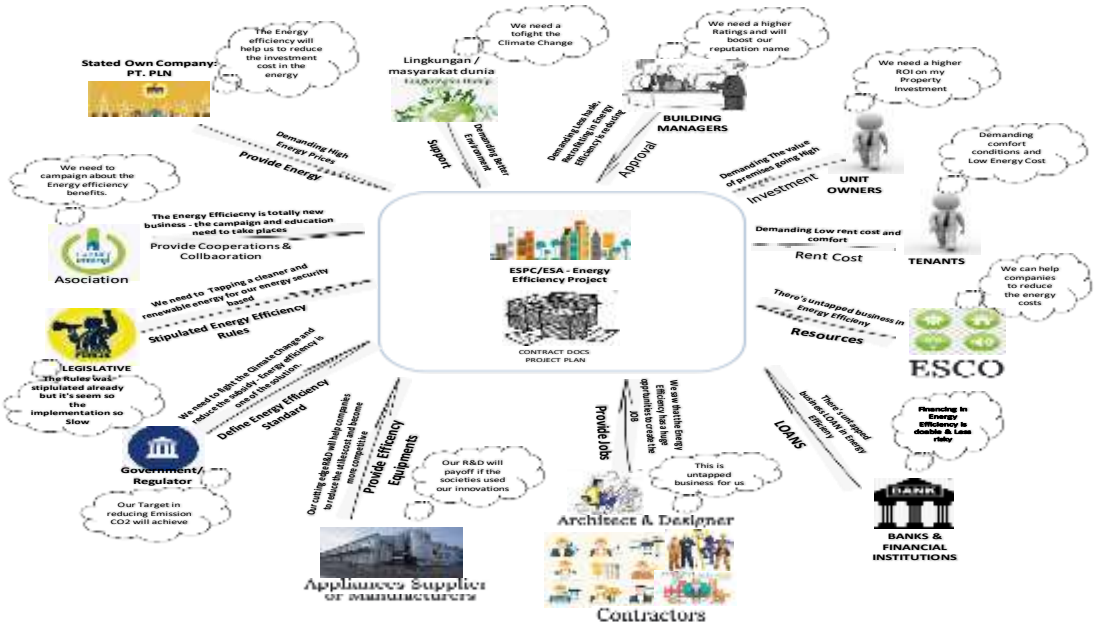


Figure 1. Stakeholder analysis

Lack of economic and financial incentives and limited financing options are the most prominent problems of Indonesia's current development of the energy efficiency industry. On the other hand, by increasing the energy efficiency industry, Indonesia will benefit from increasing competitiveness, opening up job opportunities, increasing energy security, and reducing energy demand. It can reduce the need to construct coal-fired power plants and help facilitate targeted access to electricity for people who are not yet electrified. The government has issued a policy of incentives and disincentives to spur energy efficiency for the industrial sector. Unfortunately, based on the Government of the Republic of Indonesia (2009) regulation, incentives and disincentives are only given to companies that use more than 6000 TOE (one tonne of oil equivalent) in one year. The company is deemed eligible for incentives in tax, customs, and low-cost borrowing facilities from banking institutions. Companies that do not implement energy conservation will get disincentives through warnings, media publications, fines, and decreased energy supply. Therefore, there is room to improve energy efficiency by strengthening compliance through the formation of energy service companies.

There are several factors why energy efficiency policies fail in Indonesia. First, most companies desire to maximize their energy costs. Unfortunately, they are often hindered by many obstacles caused by market imperfections or *market failures* (Cherry et al., 2017; Fisher & Rothkopf, 1989). For this reason, government policies are needed to reduce this market failure. This phenomenon is known as the 'Energy Gap Paradox.' Research on energy paradoxes or energy efficiency gaps can be found in articles Blumstein and Taylor (2013), MA Brown (2001), Gerarden, Newell, and Stavins (2015), Golove and Eto (1996), O'Malley, Scott, and Sorrell (2003), Schleich and Gruber (2008) Energy This paradox or efficiency gap arises when consumers and businesses do not take advantage of cost-effective energy efficiency savings (engineering innovation). Meanwhile, engineering-based calculations to identify energy efficiency are not sufficient to explain and ignore the economic behavior of companies. This phenomenon is referred to as market failure theory in neoclassical theory.

There is a vast and significant market failure in implementing energy efficiency projects in Indonesia. One of the obstacles is that no financial schemes support and accelerate energy efficiency savings. MH Brown and Conover (2009) stated that the financing contract Energy efficiency through retrofitting deserves to be considered and implemented primarily in the public and private sectors. However, this retrofit financing program seems less acceptable to the market because it looks more complicated, while banks and financial institutions are unfamiliar with this energy efficiency industry. On the other hand, this retrofit financing contract requires a long-term commitment, financial resources, and human resources of energy service companies. For this reason, the government needs to help new energy

service companies enter the energy efficiency industrial sector. In particular, incentive policies are very useful in overcoming the efficiency gap and increasing the growth of energy efficiency projects and energy service companies introducing retrofit programs. On the other hand, it is necessary to change the current business model of energy service companies to take advantage of opportunities in the energy efficiency business sector. Therefore, the business model of energy service companies needs to change and focus on services (service enablers). However, not all companies can build their business through a product-service model or product-service system (PSS) business model because this model may not be suitable for all companies. The process of changing the business model requires fundamental changes in the company's structure, culture, competencies, operations, and partnerships. The difference between products and services, tangible and intangible, in the PSS business model is very biased, especially regarding the company's strategy adopted to be more customer service oriented. The PSS business model concept can eliminate the boundaries between products and services. This business model can be used as a general framework that enables organizational change from selling products to providing unique and positive customer experiences with customized and *result-oriented solutions*.

Indonesian energy services companies must drastically change operations, expand product service model capacity, and foster new knowledge, standards, measures, and incentives to retrofit services effectively. A business model is a coherent depiction of how an organization directs its business with its products and services. It provides the basis for implementing strategies to help business managers change their business models and create customer value propositions. Throughout the literature of the last decade, it is possible to find several processes for creating new business models and reference business models. One of them is using the Business Model Canvas (BMC) proposed by (Osterwalder and Pigneur, 2010). Changes or adaptations of business models occur due to new technologies, innovative services, supply chain management, optimized cost structures, and unique resources. To that end, two newly implemented aspects that companies must implement are business model transformation and periodic evaluation of the business model for the company. The creation of a PSS -based business model represents the best scenario for an energy service company today. . Therefore, along with the arguments above, the author will break down into two research questions, as follows: 1)What is the best PSS -based business model that the energy sarvice company can adopt? Furthermore, 2) How big are the risks and barriers that prevent the shift to a PSS -based business model in energy services companies?

## 2. Literature reviu

So what is the business model transformation that must occur in the Energy Efficiency business? The transformation process will involve constructs such as organizational learning. As such, transformation may become an integral part of standard business practice. The focus is no longer on the product but on the solutions and utilities that result from using the product. It is assumed, of course, that PSS consumers are more interested in the service than the product itself. However, it should be noted that there are instances where ownership of a product also connotes social status, which is an essential social factor in Indonesian society (Wahyudi & Sumahir, 2022).

The transformation from a 'Product (P)' or 'Service (S) domain to a PSS business model requires changes in the company structure, organization, marketing strategy, and stakeholder relationships, see figure 2 below. Furthermore, the development and implementation of PSS not only results in slight changes or innovations but also requires a different way of thinking on top management (Zillah et al., 2022). The PSS business model may allow companies to create different goals (e.g., new market opportunities, sustainable lifestyles, new jobs, etc.). It is not a trivial task to achieve the above goals because they influence each other in different ways that can have positive or adverse effects. Decisions about swapping between corporate objectives may be necessary given the many barriers that result from the organization's current state. The change in mindset needed to achieve this transformation must be supported by methods and techniques that focus on adding value. The business model development must be investigated to make the company transformation successful (Gaiardelli, 2021; Rapaccini, 2022).

Energy efficiency products used in the transformation of the PSS business model require recognition of shared value creation by suppliers, customers, and prospects. It is a significant change in mindset, which implies the need for companies to embrace different management and decision-making approaches in different leadership styles. Top managers must choose the appropriate method and model to carry out the transformation. In addition, mindset change must be ubiquitous across the organization, so a constructive approach towards fully transforming the PSS business model is required. This study uses the soft systems ( SSM ) as one of system thinking methodology (Hanifah et al., 2023) to contribute to understanding the current problem situation. It analyzes the situation using root definition techniques and conceptual models to identify the necessary activities required to transform the PSS business model.

The business model of an energy service company should focus on customer service (service enabler) rather than product sales. Nevertheless, as mentioned earlier, not all companies successfully build their business with a product service model or product-service system ( PSS ) because this business model may not suit all companies. The PSS business model was first defined by Goedkoop, van Halen, te Riele, and Rommens (1999). Meanwhile, there are several other definitions of the PSS concept found in previous literature studies, Servitization; functional economy; Functional Sales; The logic that dominates the service; Product bundling; Industrial Product-Service System (IPSS); Sustainable Product-Service Systems (SPSS), environmental-saving services (Johnson, 2021), user-oriented PSS, results-oriented PSS, and service-oriented PSS. However, after 2009, only IPSS and PSS definitions emerged. According to empirical research, Goedkoop et al. used the term PSS without precedent in 1999. However, the first study to introduce PSS was Servitization (Vandermerwe and Rada 1988).

PSS's business model promotes increased efficiency and consistency using advanced technology, customer focus, and special offers. The sustainability of the PSS business model is consistent with the results of empirical research. The PSS model contributes to the growth of the energy efficiency market by increasing the added value perceived by customers. Companies that use the PSS business model receive increased revenue and profit margins and get more stable revenue than products. On the other hand, customer loyalty and brand image also increase where companies focus on developing customer relationships more intensely and exploring new sources of sales and connections.

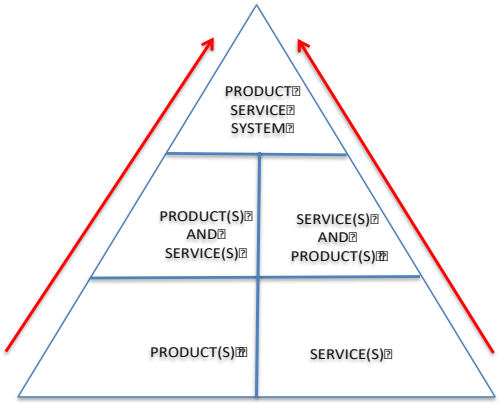


Figure 2. PSS business model – from product domain (P) and service domain (S)
*Modification from source*: Haase et al. ( 2017)

## 3. Methodology

To overcome this situation, the authors investigate the application of the PSS business model for energy service companies to the private sector. To prove the proposed theoretical framework, the author uses *an Action Research* (AR) *-based system methodology (* SSM *)* (Checkland, 2000; Checkland and Holwell, 2007); see Figure 3 below. With the Checkland soft system methodology, the authors can describe the current practice, analyze problems, and identify stakeholders and their relationships (stakeholder analysis). This study explores the application of a new business model by considering the characteristics of PSS. According to empirical data, many companies have succeeded in changing the structure of the energy efficiency market by introducing innovative new business models based on PSS

( Remane, Hanelt, Tesch, and Kolbe, 2017). The success of this business model is due to changing technologies, innovative services, supply chain management, optimized cost structures, and unique resources.

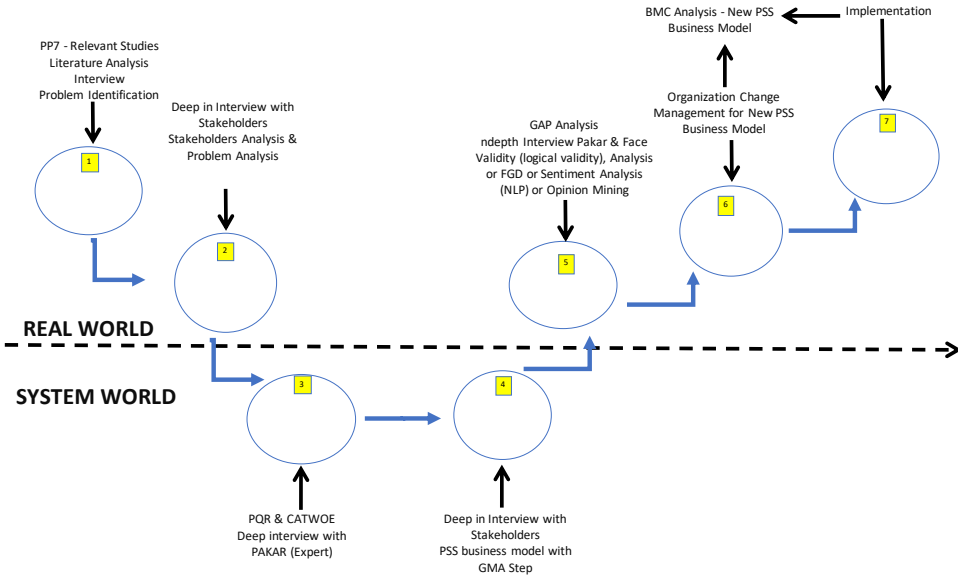


Figure 3. SSM based on Action Research ( AR) - Modified from Checkland and Scholes (1990),

The study examines the current strategy of energy service companies to seize opportunities and open new markets by implementing a customer-focused PSS business model. There are many new opportunities that service companies can do for energy, namely by offering the PSS business model in the form of an energy-saving service contract or *Energy Saving Agreement* (ESA), or an *Energy Saving Performance Contract* (ESPC), known as a "retrofit" contract agreement. Therefore, the objectives of this study are as follows: 1) To investigate the ability of energy service companies to exploit the business potential in the energy efficiency industry under the PSS -based business model, and 2) To explore the minimum risks that may exist in energy service companies. When implementing a new PSS-based business model. For this post, the author takes a case study on the energy services company PT. MWS or 'MWS,' which is only called a pseudonym in this study. The MWS business vision aims to become Indonesia's most significant energy service company. To achieve this goal, MWS has implemented several steps to improve its business model. This study investigates business phenomena in the real business world. The author does not have the formula to explore this case study but relies on exploring the interview questions created. The question component of this study uses the components of the Magic Triangle concept (Gassman et al., 2015); see Figure 4 below. The questions using 'who is, 'what,' 'how' and 'how much ' was used to provide important clues for the business canvas model built by (Osterwalder and Pigneur, 2010) and information that requires an additional and in-depth description of business phenomena.

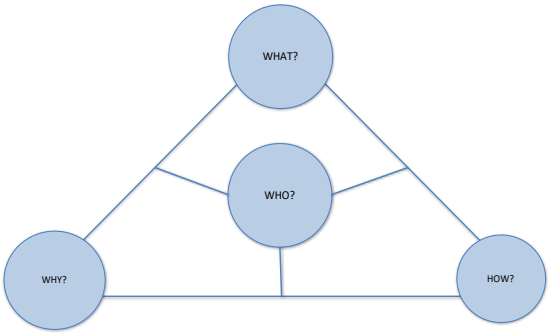


Figure 4 . Gassman' magic triangle
Source: Gassman, Frankenbeger, Csik (2015)

This component of the Magic Triangle concept relates to a person or part of an organization involved in the organization's operations. In this study, the question was designed to be answered by those who understand the overall condition. The unit of analysis used in this research is the owner of the company and the part that directly handles business functions. Measurement of case study quality includes identifying case study designs and conducting trials into four criteria to maintain case study quality. The four criteria are construct validity, internal validity, external validity, and reliability.

Construct validity - Primary data were taken from Focus Group Discussion (FGD) and questionnaires. Questionnaires were distributed directly to business actors at random. The research population is the LED distributor company listed in 'Philips Manufacturing Length Arms.' The author explores PSS Business Model Innovation and Energy Efficiency Industry Development in Indonesia and ESCO Development in Indonesia. Internal validity - SSM Checkland explores and assesses current and actual business practices in the energy efficiency industry; BMC is used for alternative business model innovations. In the business concept and sense of innovation, BMC is used for mapping the competitive arena (Yuliana, 2022). BMC template for generating various alternative business models. It consists of a database of empirical business patterns that show certain general aspects of developing a business model. The prototype consists of nine blocks collected and tested through a systematic review of real-world business model cases and related literature.

External validity - Creation of an alternative business model based on BMC, we developed a conceptual system to support the creation of a new PSS business model based on a single business case. The creation of this alternative conceptual-based PSS business model examines how PSS differs from the actual business case-based model. For reliability - the interview process was conducted from June 2020 to April 2021, with *purposively* selected stakeholders at random. Then, the results of the interviews were used to identify MSW's business functions and the types of PSS -based services used. After identification is made, the identification results are validated back to the relevant types of PSS -based services found in previous empirical research. The following is a panel of experts interviewed to collect data in this study, Table 1.

Table 1. Case study – Expert Panel

| No | Institution | Occupational |
|---|---|---|
| 1 | PT. Aditya Sriwijaya (ASW), Bekasi | Operations Director |
| 2 | PT. Mantra Wira Sriwijaya (MWS), Bekasi | Director |
| 3 | PT. Aditya Sriwijaya, (ASW), North Jakarta | Online Selling Manager |
| 4 | SNC-Lavalin' Atkins Co. Ltd, London | Building Physics Consultant – Chartered Engineering |
| 5 | PT. Signify Commercial Indonesia (DH PT. Philips Lighting), South Jakarta | Sales Manager - LED manufacturer |
| 6 | PT. Signify Commercial Indonesia (DH PT. Philips Lighting), South Jakarta | Area Sales Manager – VIP |
| 7 | British School Foundation, Jakarta | Building Manager |

To help study this phenomenon, the authors used machine-learning (AI) artificial intelligence with natural language processing (NLP) (Chiu, 2021). According to Sun, Luo, and Chen ( 2016), personal interviews are a gold mine of information. However, such an analysis is subjective and highly dependent on the subconscious bias of the writer or researcher (Suyudi et al. 2023). As a result, the authors decided to use sentiment analysis from the natural language processing (NLP) domain to provide objectivity to the interpretation of personal interviews and gain significant insights (Parmar et al., 2018). Personal interviews are much more challenging to analyze, but with NLP, sentiment analysis can be divided into neutral, positive, and negative categories, providing additional insight. On the other hand, NLP converts unstructured text into data that can be measured to understand sentiments, such as emotions and opinions (Moreno and Redondo 2016).

Therefore, the authors can track sentiment to understand better how individual aspects may play the essential role of an organization that will adapt. It is referred to as the interactivity characteristic. 'Emotional' visualization can help writers gain new insights and serve as a tool for capturing new ideas that may arise. To get the final sentiment of the interview, we used the IBM Watson application to analyze the sentiment on the interview answers given by the MWS board of directors. We pre-accurate the interview dataset and run an exploratory analysis to improve understanding. With this analysis, we can understand the sentiment pattern towards ESCO's new business model.

This study examines the internal changes required if MWS implements a PSS -based business model in its operations. Therefore, this research needs to reaffirm and answer all the research questions above; then the author has the following proposition:

Proposition 1: PSS -based business models can be aligned with MWS operations. Moreover, MWS will benefit by implementing a PSS -based business model because of MWS' capabilities and competencies in the energy efficiency industry.

Proposition 2: There are minimal risks and small barriers to MWS that prevent switching to a PSS -based business model.

## 4. Results And Discussion

MWS is a B-to-B company. Through the concept of energy services and retrofit financing, the company provides functional capabilities of energy-efficient equipment through the PSS concept to its customers. MWS seeks to improve the marketing/customer acquisition process by actively attending technical conferences and exhibitions to promote the company's new value proposition in the energy efficiency industry through retrofit financing. This effort is considered to achieve a sustainable competitive advantage for the company in the long term. Teamwork is customer-focused or customer-centric. The company is actively seeking new collaborations with both opening channels for technology equipment, electrical manufacturing companies, SME companies in electricity, architectural services, and professional designers. This open collaboration accelerates the innovation carried out by MWS, which is currently still on an SME scale (Sudarmaji, 2017). To understand how SSM should help the PSS business model solve the problem of implementing the product-service integration business model or the PSS business model, the authors present a real case to validate the proposed methodology (see Table 1 ).

In order to better track sentiment and understand how certain aspects of the business may have changed, the authors used **the IBM Watson application** to track sentiment analysis on the answers to the questionnaires provided by respondents. The author has accurate the interview dataset and carried out an exploratory analysis of the answers to the questionnaire to better understand. Through NLP, the author can understand the sentiment pattern towards Indonesia's efficient energy policy model using this NLP analysis. After the interview dataset was translated into English, the interview dataset was tracked using NLP. The results of this NLP analysis show that the opinion mining hierarchy of interview datasets about energy efficiency policies is in line with the authors' expectations. NLP shows that a dataset of interviews on energy, electricity, green solutions, business processes, finance, renewable energy, and investment topics shows scores between 0.935 and 0.605 (see Table 2 ) where the topic of energy, electrical energy, and green solutions has the highest score among other topics.

Table 2. Data collection, data analysis, and output – stages of action research-based SSM

| Step | SSM | Description | Tools | Explanation | Methods | OUTPUT |
|---|---|---|---|---|---|---|
| 1 | Problem Situation (Unstructured) | Analyze the problem and Identify Stakeholders and their relationships (stakeholder analysis) | SLR - PP7 – Relevant empirical research | Companies are experiencing hyper-competition. Managers explore other business models to get out of competitive situations. | Questionaire and Question and Answer ( Interview ) with Stakeholders | Stakeholders analysis and problem analysis |
| 2 | Problem Situation (Disclosed) | | | Rich pictures consist of structures, processes, issues, information, flows, and communication channels to solve company problems. | | |
| 3 | Relevant system (Rich Picture) and root definition | Issue root definitions based on SSM structure and CATWOE Analysis | NA | Framework ' A rich picture ' for corporate problems ( wicked problems ) | Expert Q& A | CATWOE Analysis and RICH Picture analysis |
| | | | | A system for doing "energy efficiency (What-P)" where the company ESCO provides retrofit financing (How-Q)' to save energy costs and achieve sustainability (Why-R). The 'What-How-Why' formula 'QPR' is meant to do P by Q to reach R | | |
| 4 | Conceptual Model | NA | Identify alternative components of BMC and then present the final BMC model. | BMC provides a complete method for constructing a conceptual model. | Questionnaire and Q&A with stakeholders. SLR and GMA: Alternative BMC PSS vs. Model Conceptual | Rich Pictures Analysis & BMC Analysis |
| | | | | A conceptual model is a human activity model that represents the minimum required set of activities. | | |
| | | | | Performance Measure: 1) Efficacy - through retrofit LED lighting - 75 % energy cost savings, 2) efficiency - with a retrofit financing model ) and, 3) effectiveness - the goal to meet customer demands. | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | BMC is demonstrated at all stages of the modeling process; PSS's conceptual model offers a holistic view of the problem. | BMC PSS vs. Real BMC | |
| 5 | Difference | We are describing reality based on epistemological terms. Furthermore, use the conceptual model as the basis for answering the company. | NA | Comparison: 1) using the BMC PSS model as the basis, 2) comparing the process with target predictions, 3) overall general comparison, and 4) comparison model. | Expert Q& A and analysis Validit as with sensitivity analysis as or FGD or Analysis Ku literati f (NLP) or Opinion Mining | Benefit analysis vs. BMC analysis |
| | | | | Feasibility of changes due to ' Retrofit Financing ' (Reality vs. Conceptual). There are three types of change 1) organizational structure, 2) business processes/procedures, 3) attitude change. | | |
| 6 | Discuss Differences | | | The combined research methodology means that the system assigns value to the structure. | | |
| | | | | Develop an action plan to implement change and make it happen | | |
| 7 | Repair Action | NA | Develop new Business Process Reengineering - Establish cause-and-effect relationships | SSM measures future system improvements. BMC, on the other hand, is used for the implementation phase because it can monitor and analyze system improvements over time. | Changes in Organizational structure – BMC analysis | BMC Analysis |

Table 3. *Opinion mining* hierarchy

| **Hi hierarchy** | **S k or** |
|---|---|
| /b business and industry/energy i | 0.935927 |
| /b business and industry/energy i / Electricity | 0.895224 |
| /b business and industry / green solutions | 0.892964 |
| /b business and industry / operational business / management / process business _ | 0.819675 |
| / finance / financial news | 0.724753 |
| /b business and industry/energy i /renewable energy | 0.697347 |
| /b business and the operational / planning business / operations industry business | 0.639728 |
| /b business and the business / software industry | 0.613137 |
| / education / classroom learning resources | 0.608393 |
| / finance / invest asi | 0.605979 |

A keyword analysis is a text analysis technique that extracts the most frequently used essential words and expressions from an interview. It helps in summarizing the textual content and identifying the main topics covered. It is used to extract keywords from different types of interviews. What percentage of customer reviews mention the word "Price"? What skills and competencies does MWS need to implement the new ESCO business model? These insights can assist authors in shaping business strategy by identifying what MWS deems essential, aspects of MWS products that need improvement, and what customers are saying about MWS competition. Keywords in the interview are known as concept extraction, and sentiment analysis can determine the terms associated with the concept. The author uses interview data and NLP to see if concept extraction and sentiment analysis can be validated. Table 3 below shows the main keywords that came from the interviews. Each interview was first analyzed separately, and the findings were entered into an excel sheet.

Table 4. Keywords of text analysis

| Keywords | Relevance |
|---|---|
| Ma majority subscriber _ | 0.779 |
| Head of building management | 0.621 |
| Use of energy | 0.599 |
| Unlucky potential customer | 0.592 |
| Great attention | 0.586 |
| Conventional lamp _ | 0.569 |
| Energy efficiency equipment prices | 0.566 |
| Where is the building? | 0.563 |
| K on s ep green building | 0.560 |
| Product purchase | 0.557 |
| Retrofit Program | 0.556 |
| Saver tan energy | 0.555 |
| Conventional equipment _ _ | 0.540 |
| Persepsi savings | 0.539 |
| P customer prospective | 0.537 |
| Big savings | 0.537 |
| Strong corporate team | 0.537 |
| Allotted time | 0.536 |
| al k ula si . procedure | 0.534 |
| Bidding time | 0.533 |

Emotional visualization in NLP can help writers formulate energy efficiency policies in Indonesia in the eyes of stakeholders. NLP also shows the percentage of emotional visualization as an interactivity feature in the interview dataset, shown in Table 4. The following are the results of sentiment analysis in in-depth interviews. Through the sentiment analysis collected, the NLP results for all interview dataset documents showed positive sentiment with a score of 0.550. At the same time, the other emotion scores show the numbers 12.55%, 50.67 %, 13.28%, 10.00%, and 9.66% for sadness, joy, fear, disgust, and anger emotions.

Table 5. Keywords, suspension of sentiment and emotion for regulations in UK and Indonesia

| Keywords | Sentiment | | Sad (%) | Happy (%) | Fear (%) | Fed up (%) | Angry (%) |
|---|---|---|---|---|---|---|---|
| **Document** | positive f | 0.550 | 12.55 | 50.67 | 13.28 | 10.00 | 9.66 |
| **Entity Sentiment Scores** | | | | | | | |
| UK | positive f | 0.620 | 12.37 | 13.01 | 20.09 | 9.03 | 4.96 |
| 100% | Neutral | 0.000 | 23.14 | 24.02 | 11.15 | 37.17 | 3.47 |
| Green building council | Nef trial _ | 0.000 | 23.14 | 24.02 | 11.15 | 37.17 | 3.47 |
| Indonesia | positive f | 0.230 | 13.59 | 7.54 | 37.87 | 11.67 | 13.22 |
| London | positive f | 0.730 | 2.76 | 61.12 | 4.92 | 14.64 | 3.30 |
| Government | positive f | 0.770 | 6.88 | 8.33 | 23.50 | 2.61 | 1.60 |
| US | positive f | 0.750 | 11.85 | 16.20 | 11.45 | 11.98 | 20.74 |

Positive. The author explores the interview dataset to see the standard regulations that apply to the energy efficiency industry that stakeholders understand so far NLP Analysis found that 'building regulations,' 'energy hierarchy,' 'long-term savings,' 'the Indonesian government, ' 'radical approach,' 'net-zero building,' ' UK building regulations,' and 'pragmatic approach,' have a positive sentiment. The score for 'building regulations' was 0.230, followed by 0.730 and 0.230, for the 'energy hierarchy,' and 'government of Indonesia', respectively, with a relevance score between 0.647 and 0.584. In the emotion keyword analysis, 25.64% and 8.40 % were the highest fears to develop Indonesian government regulations and policies (see Table 5 ). Meanwhile, 32.64% is the highest emotion of Joy when we talk about 'energy hierarchy.' These results are in line with how complex the regulations for building energy efficiency or energy efficiency are in Indonesia. These results align with statements from the MWS board of directors who shared their current views on the difficulty of promoting retrofit financing contracts in Indonesia.

Table 6. Keywords, sentiment, and emotional analysis on retrofit practices in Indonesia

| **Keywords** | **Relevant** | **Sentiment** | | **Sad (%)** | **Happy (%)** | **Fear (%)** | **Fed up (%)** | **Angry (%)** |
|---|---|---|---|---|---|---|---|---|
| building clock | 0.7306 | Neutral | 0.000 | 22.03 | 2.81 | 2.06 | 3.83 | 6.93 |
| building regulations | 0.6473 | **positive** | 0.230 | 8.18 | 12.79 | **25.64** | 3.35 | 2.34 |

| Keywords | Relevant | Sentiment | | Sad (%) | Happy (%) | Fear (%) | Fed up (%) | Angry (%) |
|---|---|---|---|---|---|---|---|---|
| Hierarchy of e nerg i | 0.6280 | **positive** | 0.730 | 0.63 | **32.64** | 10.74 | 6.22 | 1.22 |
| Energy aspect | 0.6109 | Neutral | 0.000 | 1.12 | 13.87 | 21.67 | 3.76 | 1.78 |
| Long term savings | 0.5931 | **positive** | 0.410 | **43.69** | 13.95 | 11.83 | 11.28 | 16.31 |
| Green building council | 0.5853 | Neutral | 0.000 | 23.14 | 24.02 | 11.15 | 37.17 | 3.47 |
| Minimum m requirements | 0.5848 | Neutral | 0.000 | **22.03** | 2.81 | 2.06 | 3.83 | 6.93 |
| Indonesian Government | 0.5840 | **positive** | 0.230 | 13.11 | 22.31 | **28.40** | 7.20 | 5.61 |
| Radi k al . approach | 0.5835 | **positive** | 0.230 | 13.11 | 22.31 | **28.40** | 7.20 | 5.61 |
| Retrofit Rules | 0.5664 | Neutral | 0.000 | 10.16 | 15.84 | 7.67 | 27.04 | **20.29** |
| UK construction industry | 0.5661 | Neutral | 0.000 | 10.10 | 7.89 | 21.40 | 2.46 | 11.78 |
| Net Zero Building | 0.5618 | **positive** | 0.770 | 10.10 | 7.89 | 21.40 | 2.46 | 11.78 |
| UK building regulations | 0.5537 | **positive** | 0.770 | 6.88 | 8.33 | 23.50 | 2.61 | 1.6 |
| Local council | 0.5536 | Neutral | 0.000 | 3.33 | 45.77 | 6.42 | 12.14 | 5.98 |
| Pragmatic. approach | 0.5488 | **positive** | 0.770 | 6.88 | 8.33 | **23.50** | 2.61 | 1.60 |
| green building | 0.5482 | Neutral | 0.000 | 10.62 | 37.39 | 9.19 | 7.90 | 3.92 |
| green room | 0.5452 | Neutral | 0.000 | 9.76 | 68.87 | 6.55 | 8.20 | 12.27 |
| Surrounding people's well-being | 0.5407 | negative | -0.640 | 9.76 | 68.87 | 6.55 | 8.20 | 12.27 |
| Planning stage | 0.5405 | Neutral | 0.000 | 10.16 | 15.84 | 7.67 | 27.04 | 20.29 |
| Commercial building | 0.5394 | Neutral | 0.000 | 8.47 | 17.08 | 18.9 | 10.85 | 6.39 |

The author tries to explore the keywords, suspension sentiments, and suspension emotions regarding *stakeholder* opinions when asked - '**if there is direct financial assistance on energy efficiency industry practices so far. '** NLP analysis found that ' long-term savings ' is a positive sentiment through sentiment analysis; see table 5 above. The ' long-term savings ' score is 0.410, with a relevance score between 0.593. In the emotion keyword analysis, 43.69% was the highest sadness emotion for " long-term savings ." We know that the benefit of the retrofit program for customers is the sharing of benefits for the long-term energy cost savings that they can get through replacing with new equipment over old equipment. The results of the NLP are in line with the statement by the MWS board of directors that there is a lack of incentives for assistance from the government in implementing the retrofit program in Indonesia. Barriers in the form of no incentives in the form of input taxes, corporate income tax reductions, or VAT reductions are also known as barriers to transaction costs that arise in the energy efficiency industry. It can be interpreted that the benefits of energy efficiency programs for energy service companies that offer retrofit funding programs are complicated. This lack of incentives ultimately reduces the company's interest in implementing energy efficiency programs.

A relevance and sentiment analysis of suspension, where the authors explore opinions to see **'are there any retrofit regulations based on business practices ?'** The authors find that the 'minimum requirements or standards ' regarding the 'retrofit practice' rules have a neutral sentiment, respectively, with relevance scores of 0.585 and 0.566. The ' sad ' emotion score has the highest score of 22.03% and anger emotions of 20.29% for 'minimum requirements or standards ' and ' retrofit rules .' Meanwhile, the choice between a radical and pragmatic approach has a positive sentiment, with a score of 0.584 and 0.548, with emotional fear of 28.40% and 23.5%, respectively. It suggests that while a pragmatic approach is preferred, the fear of emotional analysis suggests that respondents are concerned about the dearth of pro-market regulations and changing regulations. Thus, certification of energy efficiency building equipment is one way to overcome this industry's ' market failure. ' Without certification, the energy efficiency industry leads to high costs and significantly reduces the current underinvestment.

For keywords, suspension sentiment, and emotional Analysis, The suspension for retrofit practice in Indonesia can be seen in Table 6 below. The keywords, suspension sentiment, and suspension sentiment analysis were obtained using IBM Watson. The author explores the keywords, suspension sentiments, and suspension emotions about *stakeholder* opinions when asked - **' potential retrofit practice of energy equipment. '**

Through the sentiment analysis collected, the results found by the author for all documents are positive sentiment with a score of 0.031. The emotion scores showed 16.84%, 53.28%, 10.77%, 7.06%, and 8.07% for sadness, joy, fear, disgust, and anger. While the detailed results related to keywords, the word 'green building' has a happy sentiment at a score of 69.71%, the word 'conventional lamp' has a sad sentiment, and the word 'given time' has a fearful sentiment at a score of 34.24%. For sentiments of disgust and anger, the highest terms occurred in the words 'building association' and 'PLN' with a score of 26.61% and 22.09%, respectively. The results below from the interview will be contextualized to answer RQ1, as follows:

RQ1: What does the alternative conceptual-based PSS business model adopted by MWS, translated into capabilities and competencies, look like?

When the author explores MWS operations to see - 'how was the opportunity found?', 'how innovative can the retrofit concept be with the customer? The author finds that 'Potential customers,' ' retrofit programs,' 'energy savings,' and 'potential customers' are in positive sentiment through sentiment analysis. The scores for 'potential customers' were 0.470, followed by 0.650, 0.670, and 0.510 for ' retrofit programs,' 'energy savings,' and 'potential customers' respectively. Regarding potential customers, 67.27% is Joy's highest emotion, 58.99% for retrofit programs, 48.27% for energy savings, and 14.23% for potential customers.

Table 7. Keywords, sentiment, and analysis of emosi for retrofit practice

| **Keywords** | **Sentiment** | | **Emo si** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Sad (%)** | **Happy (%)** | **Fear (%)** | **Fed up (%)** | **Angry (%)** |
| Documents | **positive** | **0.031** | 16.84 | **53.28** | 10.77 | 7.06 | 8.07 |
| **Score. sentiment** | | | **Sad (%)** | **Happy (%)** | **Fear (%)** | **Fed up (%)** | **Angry (%)** |
| Green Building | negative | 0.270 | 5.84 | **69.71** | 7.09 | 10.13 | 2.12 |
| Building management board | positive | 0.710 | 12.32 | 21.67 | 21.84 | 1.34 | 21.57 |
| Indonesian government | positive | 0.920 | 10.57 | 9.45 | 1.65 | 2.28 | 4.22 |
| PLN | positive | 0.600 | 24.17 | 6.29 | 6.06 | 10.05 | **22.09** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Jakarta | positive | 0.430 | 3.86 | 47.78 | 10.40 | 1.56 | 0.52 |
| Building association | positive | 0.830 | 10.56 | 11.66 | 12.67 | **26.61** | 5.91 |
| Government | positive | 0.620 | 12.00 | 15.64 | 27.67 | 6.04 | 7.94 |
| Majority of Customers | Neutral | 0.000 | 12.6 | 4.98 | 4.16 | 4.88 | 3.73 |
| Chairman of the building management board | positive | 0.710 | 12.32 | 21.67 | 21.84 | 1.34 | 21.57 |
| Energy usage | negative | 0.400 | 1.72 | 18.5 | 4.3 | 1.03 | 5.66 |
| Damn, it is a real customer | positive | 0.470 | 15.22 | 67.27 | 8.1 | 4.06 | 2.91 |
| Great attention | negative | 0.260 | 32.63 | 16.13 | 5.91 | 1.58 | 3.56 |
| Conventional lamp _ | positive | 0.440 | **33.23** | 10.52 | 6.73 | 1.67 | 9.89 |
| Energy efficiency equipment prices | positive | 0.790 | 31.79 | 6.52 | 5.26 | 7.44 | 4.12 |
| Where is the building? | positive | 0.410 | 14.24 | 17.08 | 8.13 | 8.15 | 10.25 |
| Consept green building | negative | 0.420 | 5.10 | 70.32 | 7.46 | 9.87 | 1.59 |
| Product Purchase | positive | 0.400 | 21.6 | 68.31 | 1.74 | 2.26 | 1.58 |
| Retrofit Program | positive | 0.650 | 16.00 | 58.99 | 5.86 | 4.15 | 5.40 |
| Saver tan e nerg i | positive | 0.670 | 10.78 | 48.27 | 17.48 | 6.52 | 5.34 |
| Conventional equipment _ _ | positive | 0.790 | 17.32 | 6.75 | 7.38 | 6.38 | 3.40 |
| Pers eps I savings | negative | 0.510 | 17.23 | 4.75 | 19.04 | 6.15 | 17.99 |
| P customer prospective | positive | 0.510 | 14.4 | 14.23 | 6.65 | 3.56 | 4.79 |
| Big savings | positive | 0.760 | 18.47 | 15.93 | 27.33 | 1.81 | 2.98 |
| Strong corporate team | positive | **0.950** | 7.85 | 52.21 | 16.39 | 1.04 | 17.87 |
| Allotted time | negative | 0.590 | 6.39 | 2.18 | **34.24** | 9.14 | 3.82 |
| Procedure | positive | 0.240 | 5.61 | 12.45 | 4.61 | 2.98 | 5.04 |
| Bidding time | negative | 0.570 | 17.31 | 16.62 | 2.05 | 2.10 | 3.83 |

MWS had to adapt quickly and innovate in their internal processes to promote their retrofit projects. This change process requires fundamental structure, culture, corporate competencies, operations, and partnerships (Baines, Lightfoot, Benedettini, and Kay, 2009; Pawar, Beltagui, and Riedel, 2009). strong' is in positive sentiment with a score of 0.95. The score is the highest among the collected emotions. The sentiment is happy on the 'strong enough team' with 52.21%. These results align with statements from the board of directors who shared their views on customer readiness.

RQ2: How many risks and barriers prevent switching to an alternative conceptually based PSS business model in MWS?

Through sentiment analysis, the authors found that 'energy use,' 'lots of attention, 'green building concept,' 'perceived savings,' 'given time,' and 'initial offer time' are in negative sentiment. The score for 'energy use' was 0.400, followed by 0.260, 0.420, 0.510, 0.590, and 0.570 for 'lots of attention,' green building concept,' 'perceived savings,' 'time allotted' and 'initial offer time.' The highest sadness emotion score was 3 3, 2 3% for 'conventional lights, fear emotion score was 34.24%, and 26, 61 % score for disgust emotion for ' building association,' and anger emotion score was 22, 0 9% for the perception of 'PLN.' This research confirms that there are many barriers to implementing energy-saving programs in the commercial building sector in Indonesia and lack of awareness for energy efficiency. These results are consistent with statements from the board of directors who shared their views on 'barriers to retrofit practice. '

## 5. Conclusion

In this research study, adopting the Product-Service System (PSS) business model within Energy Service Companies (ESCOs) emerges as a pivotal strategy to address the intricacies of the energy efficiency sector. Employing an action-based Soft System Methodology (SSM), the study first delves into the complexities of the ESCO problem, retrofits contracts and constructs a conceptual ESCO model. Acknowledging the multifaceted nature of the energy efficiency industry, characterized by diverse stakeholders with disparate objectives, the research underscores the economic interests of these stakeholders as the driving force for overcoming challenges. However, to unlock the full potential of the PSS model in ESCOs, a strategic approach is imperative.

The focal point of this case study revolves around understanding the managerial implications of why companies in the MWS sector opt for the PSS business model and how they execute this strategic decision. As ESCO industries navigate business changes, a persistent focus on sustainability becomes crucial. The concept of "sustainability" is introduced as a potential solution, urging ESCO managers to leverage social and environmental performance alongside financial metrics for comprehensive business success. The ambiguity surrounding the definition of "sustainability" necessitates a strategically based scorecard system that aligns social and environmental objectives with financial outcomes and competitive advantage. This shift towards a service-oriented paradigm demands a customer-centric approach, effective risk management, and strategic collaborations for ESCO managers.

The study integrates strategic management theories to elucidate organizational behaviour in adopting the PSS strategy and scrutinizes the operational implementation of the PSS plan, emphasizing tactical aspects. Adopting the Business Model Canvas (BMC) as a starting point aligns the proposed framework with general business model literature, providing ESCOs with a practical tool for strategic planning, idea expression, understanding customers, competitor analysis, and innovation planning. Empirical research further categorizes PSS into three archetypes, namely, product-oriented service (POS), use-oriented service (UOS), and result-oriented service (ROS), highlighting the need for clarity in value propositions. The profitability of the PSS business model is affirmed by empirical findings, showcasing increased competitiveness through perceived value, flexibility, quality improvement, and stable revenues. As the essay concludes, it emphasizes that implementing the PSS model in ESCOs holds immense potential for capitalizing on energy efficiency opportunities, with implications extending beyond mere business practices to contribute to theoretical advancements in business models, sustainability, and strategic management. ESCO managers must carefully navigate this transition to fully harness the benefits offered by the PSS model fully, ensuring long-term business success and environmental impact.

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