



Analysis of Obstacles in Implementing the Finished Banknotes Business Model: A Case Study on Banknotes Printing in Indonesia

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Article Info	Abstract
<p>Keywords: Banknotes printing; Business model; Finished banknotes; Perum peruri; Obstacles bound testing analysis</p>	<p>Purpose - Bank Indonesia as a central bank uses Perum Peruri as a banknote printing service provider. In general, Bank Indonesia is a consumer and a banknote paper provider that intends to change the business model from printing services to finished banknotes or end-to-end processes. Therefore, this study aimed to analyze the obstacles faced while implementing the finished banknotes business model by Perum Peruri.</p> <p>Methodology - A total of 9 obstacles were identified based on the literature and discussions with five experts from the banknotes printing industry, Bank Indonesia as a consumer and regulator, the Ministry of State-Owned Enterprises, and the Indonesian Printing Security Association. An interpretive structural modeling analysis was used to measure the strength of the relationship between obstacles, develop hierarchical levels, and classify and rank each obstacle.</p> <p>Findings - The results showed that the main obstacles included limited working capital, dependence on supplies of foreign banknotes, the complexity of their procurement, and barriers to accessing banking. These obstacles can be solved when Perum Peruri improves its capabilities and receives support from the government.</p> <p>Originality - This study is original and provides new knowledge about the obstacles faced by banknote printing companies when changing their business model.</p>
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1. Introduction

Companies must adapt to environmental changes to maintain business continuity (Wheelen *et al.*, 2018). Business model changes are also intended to improve services, attract new users, grow strategy by increasing user base, and ability to retain existing customers (Panda 2020). The business model canvas (BMC) helps identify whether current business processes follow environmental conditions (Osterwalder *et al.*, 2010). The business model reflects a company's strategy as a way to realize various strategic choices (Marseille and Chereau 2019). In this regard, the transformation from the conventional to a modern business model adaptive to the business environment is essential for growth and development. The company would maintain its sustainability by evolving from a traditional to a sustainable business model. This transformation

requires significant changes to their strategy, business model, organization, talent, operations, and culture. Furthermore, companies should transform certain functions, business units, or the entire organization (Shuili *et al.*, 2021; Van Tonder *et al.* 2020; McNally 2018). A more holistic approach also needs to develop a business strategy model (Kitsios and Kamariotou 2019).

It is insufficient to measure companies from economic, social, and environmental aspects (Martí 2018; Müller and Pflieger 2014). An example is how manufacturing companies in China are competing again in the international market after two years of being hit by the Covid-19 pandemic. They entered a new normal by transforming and upgrading to increase market competitiveness and sustainable development (Shuili *et al.*, 2021).

Threats to business continuity also exist in the banknotes printing industry. This sector has a limited number of companies because not all countries have banknotes printers. However, they face threats such as the trend towards digital-based payments (Lloyd *et al.* 2016; Stalmachova *et al.* 2022; Polinkevych 2022; Bouwman *et al.* 2020), environmental issues (Hayta and Oktav 2019), the demands to use money security features on paper, design, and printing technology, and government regulations (Nasdaq’s OMX’s 2019; Bank Indonesia 2019). The limited number of banknotes printing companies worldwide has made the competition more challenging.

The banknotes printing industry uses the printing service and the finished banknotes business models. The printer only provides banknotes printing services in the printing service business model. As the primary raw material, banknotes are prepared by the monetary authority, the Central Bank, or the government as the customer giving the order. This business model is commonly used in commercial printing, such as the National Printing Office (NPO) in the Philippines (NPO 2019) and National Printing Bearue, Japan (NPBJ 2018). Additionally, the model is currently being implemented by Bank Indonesia (BI) and Perum Peruri (PP) (Peruri 2020).

Key Partners	Key Activity	Value Proposition	Relationship	Customer Segment
Security Ink Supplier, Banking	Design, Printing, and Delivery	Banknotes Printing Services Provider	Customer Gathering, Monitoring, and Evaluation	Bank Indonesia (Central Bank)
	Key Resources Designer, Printing machine operators		Distribution Channel Logistic, ERP Integration	
Cost Structure Direct labor costs, Machine work hours, Security Ink		Revenue Stream Income from Banknotes Printing Services		

Figure 1. Business model canvas banknotes printing services

This business model has several characteristics using the Business Canvas Model approach (Osterwalder *et al.* 2010). First, it aims to serve banknotes printing services in the value proposition aspect. Second, the key activity is printing, and revenue comes from payment for services. Third, the cost structure comprises all printing components but does not include banknotes paper. Fourth, key resources are humans competent in printing, while the main partners are ink suppliers and banks that provide capital. Fifth, the key relationship involves customer gathering, monitoring,

and evaluation, and distribution is accomplished with Logistic. Sixth, there is ERP integration, and the customer segment is Bank Indonesia (BI) as the central bank. These characteristics are shown in Figure 1.

The finished banknotes business model handles overall production processes, including procuring and printing banknotes and processing paper waste. This model has been utilized by many world-class banknotes printers, such as De Larue in the UK, which received orders from various countries in Africa, Asia, Europe, and parts of South America (Echo *et al.* 2020). Other competitors such as Giesecke+Devrient, Germany (G&D 2019), Crane Currency, Malta (Crane Currency 2019), and The Fábrica Nacional de Moneda y Timbre, Spain (FNMT 2019) have fewer marketing networks. De Larue is the world's largest banknotes printing company, with a network of more than 140 countries, as shown in Figure 2.

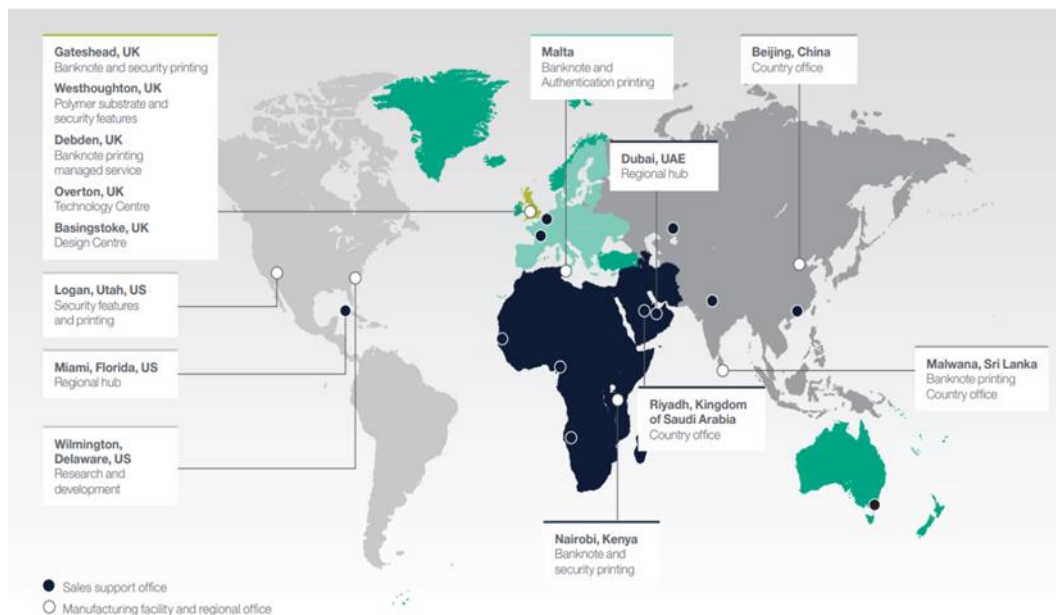


Figure 2. Coverage area de larue

The finished banknotes business model has several characteristics using the Business Canvas Model approach (Osterwalder *et al.*, 2010). First, the value proposition is to serve end-to-end or finished banknotes providers. Second, a key activity is to procure paper, design, print, deliver banknotes, and destroy waste. Third, the revenue comes from selling finished banknotes and the margin from paper purchases. Fourth, the cost structure is purchasing banknotes paper, waste treatment, and printing components. Fifth, key resources are HRs competent in procuring banknotes, printing, and design. Sixth, key partners are suppliers of banknotes paper, ink, and banks as capital providers. Seventh, the key relationship involves customer gathering, monitoring, and evaluation, and distribution is accomplished with Logistic. Eighth, there is ERP integration, and the customer segment is Bank Indonesia (BI) as the central bank. These characteristics are shown in Figure 3.

Key Partners	Key Activity	Value Proposition	Relationship	Customer Segment
Banknotes paper supplier, Security Ink Supplier, Banking	Procure for banknotes paper, Destroying Waste, Design, Printing, and Delivery	End to end or finished Banknotes Provider	Customer Gathering, Monitoring, and Evaluation	Bank Indonesia (Central Bank)
	Key Resources HR expertise in procurement, Designer, Printing machine operators		Distribution Channel Logistic, ERP Integration	
Cost Structure Purchase of Banknotes Paper, Direct labor costs, Machine work hours, Security Ink, Waste treatment.		Revenue Stream Sale of finished banknotes Margin from the purchase of banknotes paper		

Figure 3. Business model canvas finished banknotes

In 2020, BI issued an Independence Day Note 75,000 to commemorate the 75th Independence Day of the Republic of Indonesia. The issuance was a trial of the finished banknotes business model on PP applied to various world banknote printers companies. Moreover, the trial tested PP's dynamic capabilities in utilizing the opportunities offered by BI. A company's dynamic capabilities increase when it explores and exploits opportunities, enabling it to maintain business continuity (Rengkung 2018). The driving factor for changing business models is market and technology turbulence, the chosen strategy, and innovative types of activities (Gatautis et al. 2020).

There are two methods of printing banknotes regarding BI Regulation No. 21/10/PBI/2019 about the Management of Rupiah Banknotes. The first method is printing Rupiah Banknotes, including providing raw materials by BI (Bank Indonesia 2019). The most significant revenue in PPs business is printing Rupiah banknotes (Perum Peruri 2021). This makes PPs vulnerable to BI regulations, including changes in the business model from printing services to finished banknotes. Also, changes in government policies impact the current business model (Berti and Casprini 2018). The seven factors leading to business model innovation are market pressure, government policies, entrepreneurship, culture and strategy, technology, human resources, and organizational capabilities (Tian *et al.*, 2019). This makes PP consider maintaining and improving its performance in the future.

The finished banknotes model significantly increases PP's income because BI purchases the banknotes at prices higher than the printing services business model. There is also a new revenue stream from banknotes paper components because the procurement is transferred to PP. Therefore, the change in the business model helps increase revenue and the company's viability. PP could increase profitability by innovating and efficiently procuring banknotes and the production process. Banknote procurement efficiency could be increased by establishing sustainable relationships with paper producers. The company has built a bundling model of internal resources and inter-company relationships to improve performance (Yang 2017). This enables printing companies to estimate the raw material needs to reduce ordering and storage costs (Irmayanti 2019). Additionally, good coordination in the supply chain makes procurement more efficient (Wankmüller and Reiner 2021).

This study aimed to analyze the obstacles faced while implementing the finished banknotes business model. A comprehensive analysis is needed to identify the obstacles hindering the implementation of the new model. Furthermore, analyzing the main constraints on implementing the finished banknotes business model helps map independent, linked, dependent, or autonomous obstacles (Saxena *et al.* 1992). Identifying these various obstacles is expected to help companies

mitigate all harmful risks in the long term.

There is no study on changes in the finished banknotes business model in the banknote printing industry. Most studies focus more on using security features to distinguish genuine or counterfeit banknotes. However, some other studies discuss the issues surrounding banknotes as a means of payment. This study provides new knowledge about the obstacles faced by banknote printing companies when changing their business model into finished banknotes.

2. Research Method

This study used Interpretative Structural Modeling (ISM) analysis to identify the main obstacles to implementing the finished banknotes business model. The ISM method is a modeling technique developed for strategic policy planning (Marimin, 2017). It turns an ambiguous and poorly articulated problem into a visible and well-defined model useful for many purposes. Identifying a system's structure is invaluable in dealing with the system effectively and in better decision-making. Structural models include matrices and interaction graphs (Warfield, 1973). The ISM model has nine elements, including sectors of society affected, program needs, main obstacles, possible changes, program objectives, and benchmarks to assess each objective. Others elements are activities required for action planning, measures to evaluate the results, and institutions involved in the program implementation (Saxena *et al.* 1992).

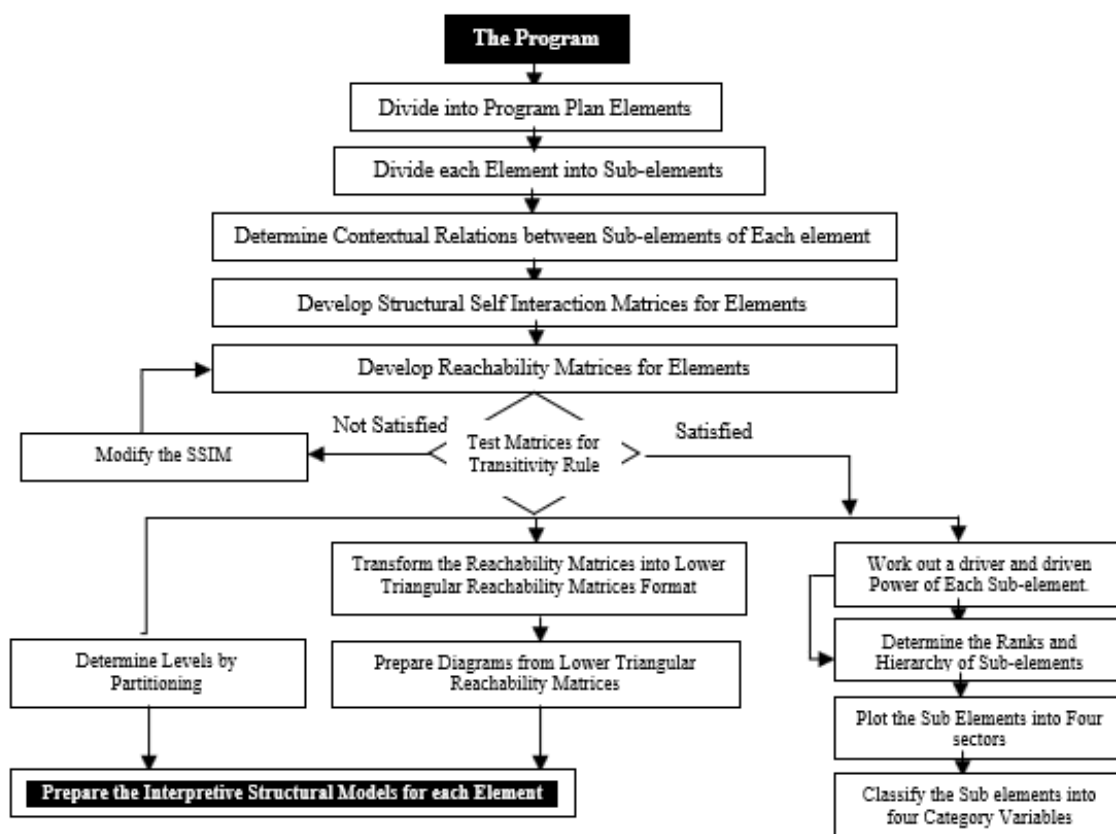


Figure 4. Stages for preparing ISM method

The stages in compiling the implementation of Interpretive Structure Modeling (ISM) were initiated by brainstorming with experts with knowledge about the study subject. The discussions with experts were formulated into a program and divided into elements and sub-elements. Furthermore, a contextual relationship was developed between the sub-elements. The next step

involved composing a structured single interaction matrix (SSIM) representing the respondent's perception of the relationship between elements. The Reachability matrix (RM) was compiled by changing the notation V, A, X, and O into numbers 1 and 0. Additionally, the ISM model was compiled as a problem-solving model, as shown in Figure 4 (Saxena *et al.* 1992).

2.1 Interaction relationship between sub-elements

The relationships between elements is interpreted as in Table 1. Were arranged using symbols or the notation V, A, X, and O, whose meanings are:

- The notation V is given for the element E_i to the element E_j .
- The notation A is given for the element E_j to the element E_i .
- The notation X is given for the interrelationship between E_j and the elements E_i .
- The notation O is given when there is no relationship between the E_j and E_i elements.

Table 1. Relationship between sub-elements in the ISM method

Relationship type	Interpretation
Comparative	A is more important, big, or beautiful than B
Statement (<i>Definitive</i>)	A is attribute B A is included in B A means B
Influence	A causes B A is Partial cause of B A develops B A Moves B An Increase B
Space (<i>Spiral</i>)	A is south or north of B An above B A to the left of B
Time (<i>temporary/Time scale</i>)	A precedes B A follows B A has more priority than B

Source: Results of Research Data Processing, 2021

The reachability matrix (RM) was prepared by changing or converting the notation in SSIM:

- When the relationship between the elements E_i and $E_j = V$, the elements $E_{ij} = 1$ and $E_{ji} = 0$
- When the relationship between the elements E_i and $E_j = A$, the elements $E_{ij} = 0$ and $E_{ji} = 1$
- When the relationship between the elements E_i and $E_j = X$, the elements $E_{ij} = 1$ and $E_{ji} = 1$
- When the relationship between the elements E_i and $E_j = O$, the elements $E_{ij} = 0$ and $E_{ji} = 0$

2.2 Interpretation of ISM results

Marimin (2017) stated that the ISM results could be interpreted using a driven power-dependence matrix comprising the following 4 quadrants:

- **Quadrant 1:** Autonomous or weak driver dependent variable. The sub-elements in this quadrant are little related to the system.
- **Quadrant 2:** Dependence or weak driver strongly dependent variable. The sub-elements in this quadrant are not independent and are influenced by other sub-elements.

- **Quadrant 3:** Linkage or strongly dependent variable. The sub-elements in this quadrant affect other sub-elements.
- **Quadrant 4:** Independent or strong driver weak dependent variable. The sub-element in this quadrant is the strongest and becomes a key element.

ISM data could be processed using the Eksimpro application. Figure 5 shows the mapping of the driver power and dependence sub-elements.

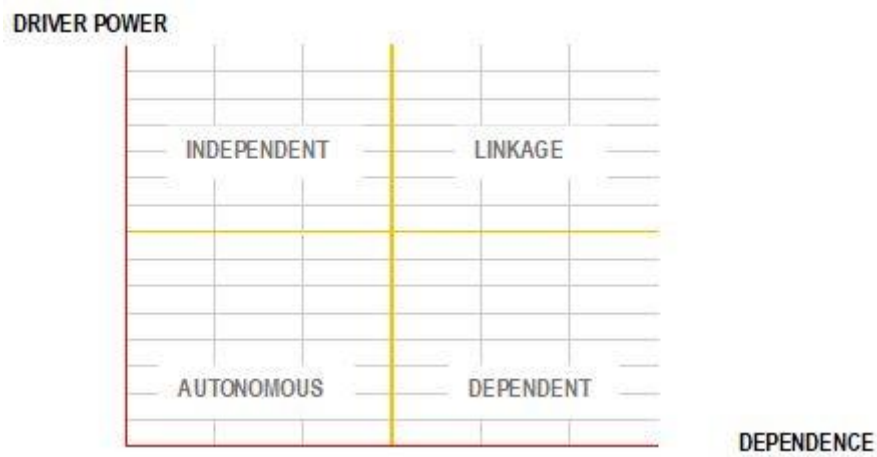


Figure 5. Example of Driver Power-Dependence Matrix

3. Results and Discussions

This study used Interpretive Structural Modeling (ISM) to identify the main obstacles in implementing the finished banknotes PP business model. A focus group discussion was conducted to determine the relationship between elements in terms of mutual influence, cause-effect, or un-relatedness (Marimin, 2017). Informants comprised experts in the money printing industry and security documents in Indonesia. They included BI, PP, Kem BUMN as shareholders, and the Printing Security Company Association (Aspersindo), as shown in Table 2.

Table 2. Characteristics of ISM respondents

Agency	Position	Amount	Field of work	Years of service
Bank Indonesia	Director of Cash Management Department	2	Cash Management	>10 years
Ministry of SOEs	Head of Non-Banking Finance Services	1	SOE Performance Monitoring	>10 years
Aspresindo	Vice-Chairman	1	Printing Security Industry	>10 years
Peruri Perum	Head of Indonesian Banknotes Printing- SBU	1	Banknotes Printing	>10 years

Source: Results of Research Data Processing, 2021

The discussion with experts identified nine sub-elements as the main obstacles to implementing the finished banknotes business model. Firstly, the price of banknotes is susceptible to foreign currency fluctuations. Second, limited working capital for the cost of procuring many banknotes. Third, dependence on the supply of foreign paper money. Fourth, shareholders' policy to reduce Interest Bearing Debt Ratio to EBITDA. Fifth, the complexity of procuring many

banknotes. Sixth, limited supporting infrastructure for providing end-to-end money. Seventh, cost of fund not absorbed by Bank Indonesia. Eighth, barriers to accessing banking due to limited collateral. Ninth, the standard cost calculation system has not changed.

Experts evaluated and weighed the nine elements based on their importance. The results are shown in Table 3:

Table 3. Main constraint elements

No	Sub-Element	Rank	Score
E1	Dependence on the supply of banknotes paper	5	0.152
E2	Sensitivity price of banknotes paper	3	0.091
E3	Limited working capital	6	0.182
E4	Shareholders' policy to reduce the cost of fund	3	0.091
E5	The complexity of procuring banknotes paper	5	0.152
E6	Limited infrastructure	2	0.061
E7	Cost of Fund not absorbed by Bank Indonesia	2	0.061
E8	Barriers to accessing banking	4	0.121
E9	The standard cost has not changed.	3	0.091

Source: Results of Research Data Processing, 2021

The Structural Self Interaction Matrix (SSIM) and Reachability Matrix (RM) results in Tables 4, and 5 show the relationship between the main constraint sub-elements. Figures 6 and 7 show the results of the power-dependence driver matrix and the structural model of the main constraint elements.

Tabel 4. Self structural interaction matrix

Sub elements main obstacles		E1	E2	E3	E4	E5	E6	E7	E8	E9
Dependence on the supply of banknotes paper	E1		V	A	V	V	V	V	V	V
Sensitivity price of banknotes paper	E2			A	V	A	V	V	A	X
Limited working capital	E3				V	V	V	V	V	V
Shareholders' policy to reduce the cost of fund	E4					A	V	V	A	A
The complexity of procuring banknotes paper	E5						V	V	V	V
Limited infrastructure	E6							O	A	A
Cost of Fund not absorbed by Bank Indonesia	E7								A	A
Barriers to accessing banking	E8									V
The standard cost has not changed.	E9									

Source: Results of Research Data Processing, 2021

Tabel 5. Matrix reachability

Sub elements main obstacles		E1	E2	E3	E4	E5	E6	E7	E8	E9
Dependence on the supply of banknotes paper	E1	1	1	0	1	1	1	1	1	1
Sensitivity price of banknotes paper	E2	0	1	0	1	0	1	1	0	1
Limited working capital	E3	1	1	1	1	1	1	1	1	1
Shareholders' policy to reduce the cost of fund	E4	0	0	0	1	0	1	1	0	0
The complexity of procuring banknotes paper	E5	0	1	0	1	1	1	1	1	1
Limited infrastructure	E6	0	0	0	0	0	1	0	0	0
Cost of Fund not absorbed by Bank Indonesia	E7	0	0	0	0	0	0	1	0	0
Barriers to accessing banking	E8	0	1	0	1	0	1	1	1	1
The standard cost has not changed.	E9	0	1	0	1	0	1	1	0	1

Source: Results of Research Data Processing, 2021

A power-dependence driver matrix graph was constructed from the results of data processing using the eksimpro application, as shown in Figure 6:

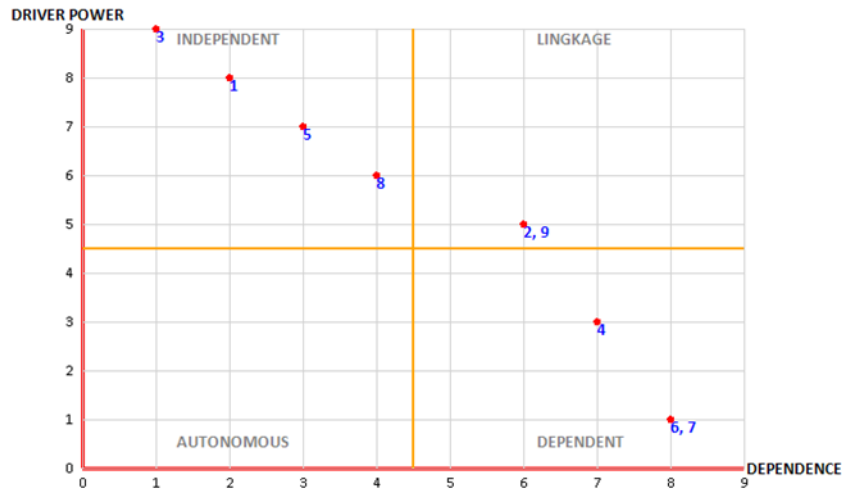


Figure 6. Driver power-dependence matrix main obstacles

Figure 6 shows that the main constraint sub-elements, including limited working capital (E3), dependence on the supply of banknotes paper (E1), the complexity of procuring banknotes paper (E5), and barriers to accessing banking (E8), are in the INDEPENDENT quadrant 4. These four constraints are the main ones, are not tied to other sub-elements, and could even affect other sub-elements. Therefore, they should be prioritized to be resolved. In contrast, the sub-elements of sensitivity price of banknotes paper (E2) and the unchanged standard cost (E9) is in the LINKAGE quadrant 3. That means every action on a sub-element in this sector impacts other sub-elements. The sub-element of shareholders' policy to reduce the cost of fund (E4), limited infrastructure (E6), and cost of Fund not absorbed by Bank Indonesia (E7) are in the weak driver-strongly or DEPENDENT quadrant 2. These sub-elements have independent characteristics and depend on other sub-elements. Therefore, a hierarchical structure is formed between the sub-elements based on the power-dependence driver matrix, as shown in Figure 7.

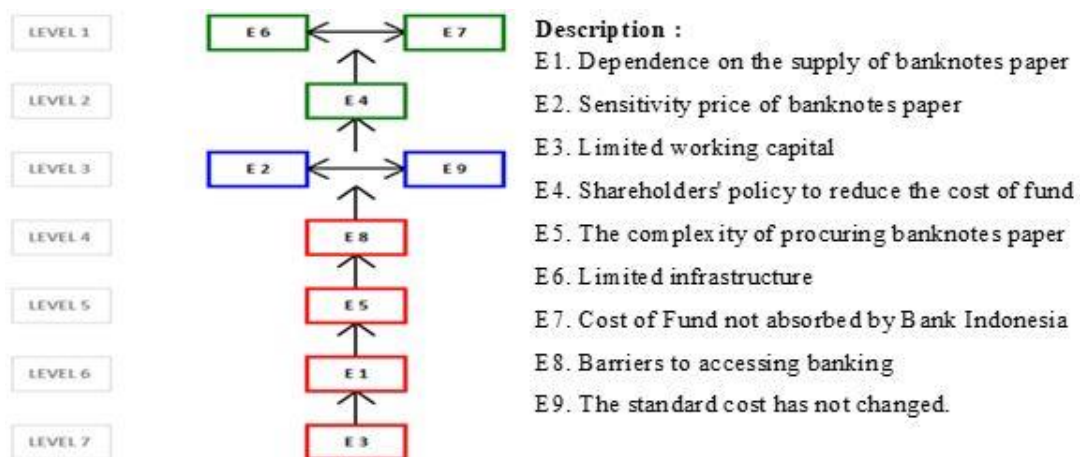


Figure 7. Structural model main obstacles element

The hierarchical structure in Figure 7 shows that the priority of finding solutions could focus on the sub-elements of the four main obstacles, E3, E1, E5, and E8. This is because they hinder the implementation of PP's finished banknotes business model. They are:

- (E3) Limited working capital for the cost of procuring banknotes paper.
- (E1) Dependence on the supply of foreign banknotes paper.
- (E5) The complexity of procuring many banknotes paper.
- (E8) Barriers to accessing banks due to limited collateral.

3.1 PP Has Limited Working Capital to Procure Many Banknotes Paper

The composition of banknotes absorbs almost 35% of the total price of printed notes. The income of IDR 4.6 trillion or 14 billion billets from banknotes printing in 2019-2020 (Perum Peruri, 2021) exceeded the capital of IDR 2.2 Trillion or 14 billion billets spent on purchasing banknotes paper. Whereas the PP's working capital based on the annual report 2020 is only Rp 759 billion. So, the amount is certainly not balanced with PP's financial posture. Therefore, the first solution is negotiating payment schemes with banknotes paper suppliers. The proposed scheme to paper suppliers is payment without a down payment. The second solution is to use the supply chain financing mechanism or supplier credit. This requires PP to conduct fund-raising cooperation with domestic banks or banks in paper supplying countries with a more flexible payment scheme. The Bank would also finance the production of banknotes paper.

3.2 The Complexity of Procuring Banknotes Paper

The annual need for banknotes is estimated at 6,000-8,000 tons. PP only provides printing services in the current business model, while BI procures banknotes paper. The results of discussions with resource persons handling the procurement of banknotes showed a high procurement complexity, and most suppliers are foreigners. Until now, PP has not had sufficient experience procuring large quantities of banknotes paper from abroad. So, if there is a failed tender, it can cause the production to be hampered. Therefore, communication with suppliers must be appropriately maintained. Several factors support the assurance of the supply of banknotes at a more efficient price. They include the ability of the procurement unit to identify the potential providers' production capacity, prepare the price calculation or owner estimate, and negotiate during the tender process. The factors leading to procurement failure are lack of incentives to cooperate, poor communication, unclear division of competencies, and non-compliance with standards and regulations (Wankmüller and Reiner, 2021).

3.3 Dependence on The Supply of Foreign Banknotes Paper

Banknotes are the primary raw material in the banknotes production process that uses cotton to ensure the printed banknotes last longer than pulp paper. The limitations of cotton fields and the number of banknotes paper mills make Indonesia highly dependent on a supply of banknotes paper from other countries. BI imports banknotes from some countries such as Germany, England, Russia, and Korea to meet its needs. Currently, in Indonesia only two companies produce security paper and banknotes paper, namely PT Kertas Padalarang (PTKP) and PT Pura Barutama (PB). However, their capacity is limited, so they can only provide materials for a few banknotes..

Most other paper mill in Indonesia, such as Sinar Mas and Tjiwi Kimia, supply non-security commercial paper with an export orientation (Warta Ekspor, 2019; Widyatama, 2019). To meet the needs of banknotes, the primary source comes from overseas producers that use foreign

currency. This makes the price of banknotes volatile following the fluctuating rupiah exchange rate against the dollar and euro. Therefore, the high risk of purchasing foreign raw materials requires procurement planning to assist companies in reducing additional ordering and storage costs (Irmayanti, 2019).

3.4 The Obstacles to Getting Working Capital From Banking

Financial Services Authority Regulation Number 42/POJK.03/2017 requires banks to follow the principles of proper credit or financing. Therefore, debtors must meet guarantee requirements following the Financial Services Authority (OJK). To reduce this risk, guarantees for providing Credit or Financing based on the debtor's ability to settle the agreement obligations are essential factors that need the banks' consideration.

Recently, asset guarantees are becoming a serious concern from the Ministry of State-Owned Enterprises. This is because many state-owned companies fail to pay their debts with company assets as collateral. The PP 2020 annual report shows that non-current assets such as land, buildings, and PP machinery are IDR 3.8 trillion, while the total debt on investment loans and working capital is IDR 2.9 trillion (Perum Peruri, 2021). As a result, PP's financial position does not allow increasing the debt ratio.

Therefore, BI issued a policy for procuring Rupiah with a payment scheme different from other goods. For instance, a down payment of more than 30% guarantees payment for printing made by PP. Another solution, the Ministry of SOEs provides State Investment to ensure PP has sufficient liquidity to buy many banknotes paper. This policy has been implemented on government strategic projects such as toll road infrastructure development, airport, and harbor.

4. Conclusions

Changes in the business model are the company's efforts to maintain business continuity. The change to finished banknotes benefited PP by increasing revenues and profits due to the transfer of the banknote procurement process from BI to PP. However, the price of printing money increases significantly to 35% due to the inclusion of the paper cost component. Therefore, the impact on PP's profitability depends on PP's ability to get banknotes at a more efficient price.

The production costs would increase when PP fails to obtain banknotes at an efficient price. Several factors made the price of banknotes higher than procurement by BI. For instance, not all banknote producers are willing to lower prices, and limited production causes scarcity and delivery problems due to the Covid-19 pandemic.

It is essential to identify the main obstacles in implementing finished banknotes. The ISM method identified four primary obstacles the company should anticipate when implementing the finished banknotes business model. They are limited working capital to procure banknotes, dependence on supplies of foreign banknotes, the complexity of paper procurement, and obstacles to accessing banks due to limited collateral.

The constraints of limited working capital and the obstacles to accessing funding from banks are solved in several ways. From BI side, BI makes a payment scheme for banknotes supply contracts as the customer and the regulator according to PP's paper payment scheme to suppliers or BI provides amount and time guarantees to state-owned banks regarding the accuracy of payment of banknotes procurement contracts. From government side, the government gives the state an investment scheme to provide additional capital to PP or the addition of state capital is considered government capital participation.

The government increases local content for domestic goods, though the raw material for banknotes paper is imported. Therefore, the government should encourage local paper producers to supply paper with various safety features. Furthermore, it should provide incentives to local paper producers to guarantee raw material availability for banknotes to ensure price efficiency.

PP must adopt the process of BI's banknotes procurement to eliminate interference with production targets and the schedule for remittances to BI. It means PP should review the procurement organizational structure and assess its internal capabilities. This is because their workload has increased considerably after implementing the finished banknotes business model.

References

- Bank Indonesia. (2019). *Bank Indonesia : Menavigasi Sistem Pembayaran Nasional di Era Digital*. Jakarta: Bank Indonesia.
- Berti C, Casprini E. 2018. When regulatory changes become a driver for business model innovation An illustrative case in an Italian airport. 26(1):63–74.doi:10.1108/IJOA-01-2017-1118.
- Bouwman, H., Nikou, S., Molina-castillo, F. J., & Reuver, M. De. (2020). The impact of digitalization on business models. 20(2), 105–124. <https://doi.org/10.1108/DPRG-07-2017-0039>.
- Crane Currency. (2019). *Crane Currency Annual Report 2019*. Malta: Crane Currency.
- Downham, R., & Sears, V. (2017). *Fingermark Visualisation on Polymer Currency* (Bank of England). September.
- Echo, G. N., Uk, D., & Uk, D. (2020). Jobs at risk as De La Rue plans to halt bank note printing in Gateshead. di(June), 2020–2021.
- FNMT. (2019). *Annual Report FNMT 2019*. Madrid: FNMT.
- Gatautis R, Vaiciukynaite E, Tarute A. 2020. Impact of business model innovations on SME ' s innovativeness and performance. 14(4):521–539.doi:10.1108/BJM-01-2018-0035.
- G&D. (2019). *G&D Annual Report 2019*. Munich: G&D.
- Hayta, P., & Oktav, M. (2019). The Importance of Waste and Environment Management in Printing Industry. 3(2), 18–26.
- Irmayanti, H. (2019). Analysis of Raw Material Ordering with Economic Order Quantity Method. 662. <https://doi.org/10.1088/1757-899X/662/3/032011>
- Kitsios, F., & Kamariotou, M. (2019). Business strategy modelling based on enterprise architecture: a state of the art review. *Business Process Management Journal*, 25(4), 606–624. <https://doi.org/10.1108/BPMJ-05-2017-0122>.
- Lloyd, A. D., Antonioletti, M., & Sloan, T. M. (2016). Able but not willing ? Exploring divides in digital versus physical payment use in China. 29(2), 250–279. <https://doi.org/10.1108/ITP-10-2014-0243>
- Marimin, M. (2017). *Teori dan Aplikasi sistem Pakar dalam Teknologi Manajerial*. Bogor; IPB Press.
- Marseille A, Chereau P. (2019). The performance implications of the strategy – business model fit model fit. *J. Small Bus. Enterp. Dev.* 26(3):441–463.doi:10.1108/JSBED-04-2018-0122.
- Martí, I. (2018). Transformational Business Models, Grand Challenges, and Social Impact. *Journal of Business Ethics*, 152(4), 965–976. <https://doi.org/10.1007/s10551-018-3824-3>

- McNally, J. S. (2018). Business Transformation: No Pain, No Gain? *Strategic Finance*, 100(5), 34–39. <https://search-proquest-com.proxy.library.lincoln.ac.uk/docview/2131568738/fulltextPDF/28B91BE5EA6147C3PQ/1?accountid=16461>
- Müller, A. L., & Pflieger, R. (2014). Business transformation towards sustainability. *Business Research*, 7(2), 313–350. <https://doi.org/10.1007/s40685-014-0011-y>
- Nasdaq's OMX's. (2019). Global Security Paper Market is Expected to Reach USD 17.76 Billion by 2025 : Fior Markets. 1–5.
- NPBJ. (2018). *National Printing Bearue Business Guide*.Tokyo: NPBJ.
- NPO. (2019). Philippines : NPO vows to provide world-class printing service. 1–2. Manila: NPO.
- Osterwalder, A., Pigneur, Y., Smith, A., & Movement, T. (2010). *You're holding a handbook for visionaries, game changers, and challengers striving to defy outmoded business models and design tomorrow's enterprises*. New Jersey: John Wiley & Sons.Inc.
- Panda BK. (2020). Application of business model innovation for new enterprises A case study of digital business using a. 2020;39(4):517–24.
- Peruri. (2021). *Perum Peruri Annual Report 2020*. Jakarta: Perum Peruri.
- Peruri. (2020). *Corporate Social Responsibility Report*. Jakarta: Perum Peruri.
- Polinkevych, et all. (2022). Change of business models of Ukrainian insurance companies in the conditions of COVID-19. *Insurance Markets and Companies*. [https://doi.org/10.21511/ins.12\(1\).2021.08](https://doi.org/10.21511/ins.12(1).2021.08)
- Rengkung, L. R. (2018). Modelling of dynamic capabilities: A system dynamics approach. *Academy of Strategic Management Journal*, 17(5), 1–15.
- Saxena, J. P., Sushil, & Vrat, P. (1992). Hierarchy and classification of program plan elements using interpretive structural modeling: A case study of energy conservation in the Indian cement industry. *Systems Practice*, 5(6), 651–670. <https://doi.org/10.1007/BF01083616>
- Shahri, M. H., & Sarvestani, M. N. (2020). Business model innovation as a turnaround strategy. 13(2), 241–253. <https://doi.org/10.1108/JSMA-08-2019-0154>
- Shuili, Y., Xiang, L., & Yi, Y. (2021). Research on the Influencing Factors of Manufacturing Transformation and Upgrading Based on Grounded Theory. *Journal of Physics: Conference Series*, 1827(1), 012103. <https://doi.org/10.1088/1742-6596/1827/1/012103>
- Stalmachova, K., Chinoracky, R., & Strenitzerova, M. (2022). Changes in Business Models Caused by Digital Transformation and the COVID-19 Pandemic and Possibilities of Their Measurement — Case Study.
- Tian, Q., Zhang, S., Yu, H., & Cao, G. (2019). Exploring the Factors Influencing Business Model Innovation Using Grounded Theory: The Case of a Chinese High-End Equipment Manufacturer. <https://doi.org/10.3390/su11051455>
- Van Tonder, C., Schachtebeck, C., Nieuwenhuizen, C., & Bossink, B. (2020). A framework for digital transformation and business model innovation. *Management (Croatia)*, 25(2), 111–132. <https://doi.org/10.30924/mjcmi.25.2.6>
- Wankmüller, C., & Reiner, G. (2021). Identifying Challenges and Improvement Approaches for More Efficient Procurement Coordination in Relief Supply Chains. 1–24.
- Warfield, J. N. (1973). Binary Matrices in System Modeling. *IEEE Trans. Syst. Man. Cybern. SMC-3*, 441-449.
- Warta Ekspor. (2019). *Pulp dan Kertas Produktifitas Industri*. Jakarta: Ministry of Trade of Indonesia.
- Wheelen, T. L., Hunger, J. D., Hoffman, A. N., & Bamford, C. E. (2018). *Strategic Management and Business Policy*. London: Pearson.

- Widyatama, U. (2019). Lean Supply Chain Sebagai Strategy peningkatan produktifitas Study Kasus pada PT Indah Kiat Pulp and Paper. 14, 27–35.
- Yang C. (2017). Revisiting the resource-based view on logistics performance in the shipping industry. doi:10.1108/IJPDLM-05-2017-0184.