

Strategic Market Planning Using SWOT Approach for Robotic Post-Stroke-Rehabilitation Product

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Abstract

HERRO is a post-stroke-rehabilitation robot developed by the UGM Center of Rehabilitation Robot and Assistive Technology team to help independently rehabilitate post-stroke patients in Indonesia so they don't lose muscle function. The XI Economic Policy Package issued by the Indonesian Coordinating Minister for Economy in 2016 is one of the stimulants undertaken by the government to strengthen the domestic medical device market. This policy indicates that there is an opportunity provided and supported by the government. The SWOT approach is needed to identify organizational capabilities, opportunities and threats from products in order to penetrate the domestic medical device market. The purpose of this study is to formulate a suitable strategy to be used in launching HERRO. The method used in this study is SWOT Analysis and Space Matrix. The results obtained from this study are an External Factor Evaluation (EFE) value of 2.64 and an Internal Factor Evaluation (IFE) value of 2.58. The results of the SWOT and Space Matrix analysis show that an Aggressive strategy is suitable to be used in launching HERRO products.

Keywords: Post-Stroke, Rehabilitation Robot, SPACE Matrix, SWOT Analysis

1. Introduction

The dynamic medical device industry is an opportunity that can be utilized for the development of domestic medical products. The XI Economic Policy issued by the Indonesian Coordinating Minister for Economy in 2016 is one of the stimulants taken by the government to strengthen the domestic medical device market. The focus of this policy is to develop and increase exports of the pharmaceutical industry and medical devices (Ministry of Finance, 2016). The action plan of this policy is to recommend the use of domestic medical devices by making an integrated system with the BPJS (the Health Social Security Agency) program. Indonesia Government support this policy by issuing supporting policies and making a supporting roadmap for the availability of raw materials for domestic medical devices. The policies that have been formulated by the government since 2016 have actually had a positive effect on public confidence in the production of domestic medical devices and increase purchasing power.

HERRO products are research project that has been carried out since 2013. Various studies have been conducted, from concept development, system level design, testing, and production to market analysis. Various product diversifications have been created, including rehabilitation robots for the upper limbs, lower limbs, fingers and wrists. This research is intended to complement existing research on HERRO products. The SWOT approach (Strength, Weakness, Opportunity, and Threat) is a two-way analysis that can be used to identify new opportunities and match product / organizational opportunities and capabilities. This study adds a quantitative element by calculating the weight of the internal and external scores from the SWOT factor evaluation to determine the management strategy that will be used by HERRO. Research Question that will be answered through this study is the selection of strategic market planning so that HERRO products can penetrate the domestic medical device market in Indonesia.

1.1 Objectives

The purpose of this research is to select strategic market planning in accordance with HERRO’s capabilities analysis while still considering the opportunities and threats that exist. The approach used to meet this objective is a hybrid methods, both quantitative and qualitative method. The qualitative method used in this study is the SWOT analysis. The calculation will be conducted by calculating the internal and external weights and then plotted in the SPACE Matrix quadrant. The result of the space matrix is a recommended suitable strategy.

2. Literature Review

Brownlie and Spencer (1995) state that the issues to be faced when penetrating the market are confusion and uncertainty. Adapting to an environment full of uncertainty requires the ability to identify markets. Golicic, et al., (2003) said that in order to enter and survive in a new market, some structured market information is needed. Some research have been conducted and shows that SWOT is the most frequently used analytic tool (du Toit, 2016) SWOT is one of the approaches recommended by Golicic, et al., (2003) in evaluating market opportunities in the Woodruff and Gardial (1996) framework. SWOT (Strength, Weakness, Opportunities and Threat) analysis is a two-way process between identifying new opportunities and matching existing opportunities with organizational capabilities. SWOT analysis is a method to identify opportunities between the capabilities of the product and the external environment. Ommani (2011) explains that SWOT is a method commonly used by business managers to evaluate the strengths, weaknesses, opportunities and threats of products or services. SWOT analysis helps business people to see past mistakes, evaluate and provide possible solutions to problems faced, both for new and old businesses (Nouri et al., 2008).

	Strengths	Weaknesses
Opportunities	How do I use these strengths to take advantage of these opportunities?	How do I overcome the weaknesses that prevent me from taking advantage of these opportunities?
Threats	How do I use my strengths to reduce the impact of threats?	How do I address the weaknesses that will make these threats a reality?

Figure 1. SWOT Analysis

Weihrich (1982) once called SWOT as TOWS Matrix and introduce 7 step to compile the external values and external factor of the organization. Step 1, preparation of the organizational profile, step 2 -3 are identifying and doing evaluation of the external factor, step 4 focuses on the internal values, step 5-6 are doing strategy development, step 7 prepare a backup plan.

Several studies on the hybrid SWOT have been conducted. (Wang, Zhang, & Yang, 2014) conducted research on strategic planning for express mail service in China using the SWOT approach and AHP. Meanwhile, (Phadermrod, Crowder, & Wills, 2019) conducted a SWOT research in combination with an Importance Performance analysis. Several researchers have proven that SWOT is an effective tool for strategic analysis. (Wang et al., 2014) said that this method alone is not sufficient to carry out the analysis, this method needs to be complemented by other methods so that the research obtained is more comprehensive

Another method that is widely used to determine the management strategy a company will use is the SPACE Matrix. SPACE (Strategic, Position and Action Evaluation) Matrix divides strategy into four quadrants which will be used to determine the most appropriate strategy for the company. The four quadrants are conservative, aggressive, defensive and competitive. Each quadrant has its own strategic characteristics. The determination of the quadrant is seen from the total weighted score obtained from the calculation of External and Internal Factor Evaluation. (Rowe, et al., 1994)

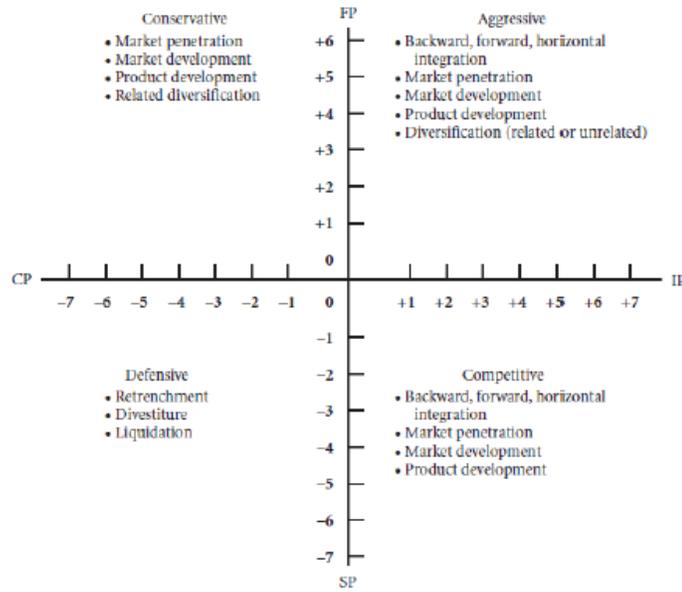


Figure 2. Quadrant SPACE Matrix

3. Methods

Research object in this study is a post-stroke-rehabilitation robot, called HERRO which has been created and researched since 2013. The method used is a hybrid method both in quantitative and qualitative. The qualitative approach used in this study is a SWOT analysis. This method conducted in 2 stages, the first step is by identifying market opportunities, then analyzing product capabilities. The next step is to calculate the weighted score of each evaluation point. The method is carried out by calculating the weight of the internal and external scores using the SPACE Matrix. Space Matrix is a framework that shows a strategy that is most suitable for an organization. The axes in the space matrix represent the internal and external dimensions. The Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) values obtained are then used to plot the space matrix quadrant. From the plotting results, recommendations will be obtained on strategies that can be used by the product.

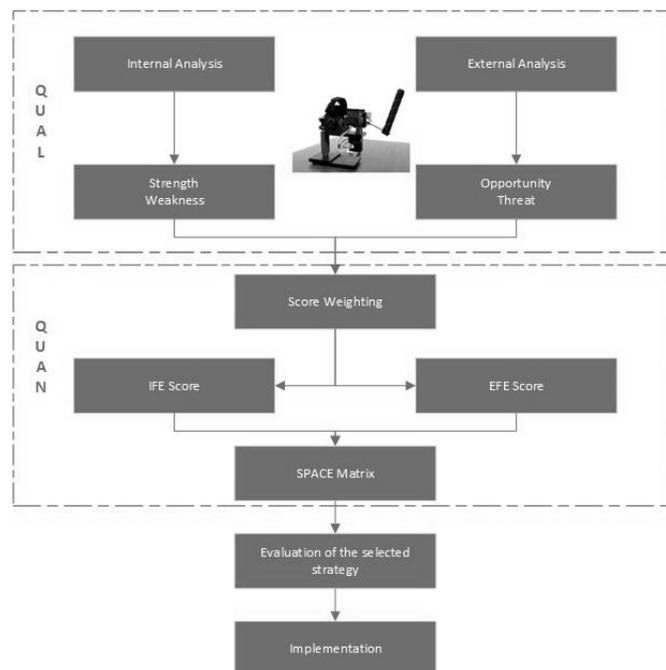


Figure 3. Research Framework

4. Data Collection

SWOT Approach aims to identify the organization's capabilities with the opportunities available and how the organization competes with product competitors. Evaluation at this stage is carried out using the SWOT analysis method (Strength, Weakness, Opportunities and Threat). This phase includes 2 evaluations, there are the identification of market opportunities and adjusting to the capabilities of the HERRO Post Stroke Patient Rehabilitation Robot product

4.1 Identification of market opportunities

Some data is needed to complete the identification of market opportunities such as forecast demand data, willingness to pay, and product segmentation. Forecast demand data is obtained by estimating the number of patients using the linear regression method. The graph that continues to increase shows the number of robot demanded by the patients per year. On the contrary, the number of robot produced by the team seems to be limited so that the market is difficult to fulfill. Market segmentation shows that potential buyers (physiotherapists and post-stroke patients) tend to prioritize practicality in doing therapy. This indicates that in the next year the number of requests will increase over time. Mastriswadi (2015) states that the average potential income of a HERRO buyer is in the range of IDR 5.000.000 – 10.000.000, with an average rehabilitation expenditure of >IDR 500.000 and choosing to carry out rehabilitation process 4 times a month. The HERRO development team must consider the sales strategy of this product so that it can be more accessible to potential buyers. One strategies that can be carried out include considering rental salesman or collaborating with government so that HERRO can be included in the list of suppliers of therapeutic neurology equipment recognized by the government through the Health Service e-catalogue.

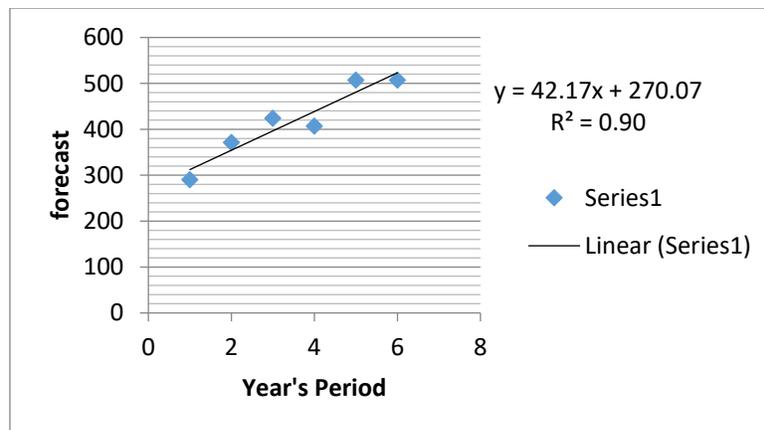


Figure 4. Regression Result

4.2 Product Capabilities

The Following are results of the SWOT analysis

Table 1 SWOT Analysis

	<i>Helpful to the organization</i>	<i>Harmful to the organization</i>
<i>Internal</i>	Practicality in use HERRO Robot emphasizes practicality when doing therapy. The robot are portable so it can be used independently and routinely	Novice product This product is a new high-tech product that is not yet known to the public, so it's hard to gain customer's trust
	Safety and flexibility when using The robot materials are safe for patients and comfortable to use. The robot can also be used both on the right or left hand	High Selling Price The selling price offered by this product is IDR 50.000.000. If this price is offered to individual consumers, then this price will be considered very high.
	A Worthy Investment This robot is expected to be a worthy investment in helping the performance of physiotherapists and doctors when conducting rehabilitation therapy for dozens of patients every day.	Position of use The robot can only be used when the patient is sitting with the robot on the table. This product cannot be used in a sleeping position (for paralysis patients)
<i>External</i>	Government policies that support domestic medical equipment production Several government policies that support the production of domestic medical devices are contained in the economic policy deregulation package XI and coordination with the BPJS to increase the use of domestic products	Budget reduction Sluggish global economic conditions and inappropriate tax revenues have led to a reduction in the State Budget which has an impact on the weakening of the domestic trade volume
	Public Awareness Public awareness of the quality of domestic-made medical equipment products is starting to increase, creating new opportunities for the development of the latest medical devices	Complicated bureaucracy To obtain a license that registered nationally with the Ministry of Health, a new product must follow a long and long licensing procedure. This license is required so that HERRO products can become suppliers in the e-catalogue

5. Result and Discussion

The next step in designing the evaluation matrix is to evaluate the internal (Strength and Weakness) and external (Opportunity and Threat) factors of the organization by providing a ranking and importance ratio for each item. This evaluation step is divided into 2 steps. The first step is calculating the External Factor Evaluation (EFE) and calculating the Internal Factor Evaluation (IFE). For each EFE and IFE calculation, the weighting of each factor is based on the weight and ranking standards determined by Riston (2008). The weight values are in the range 0-1. A value of 0 indicates that the factor has no effect, and conversely the closer to the value of 1 means that the factor is influential and critical. The ranking is in the range 1-4. For EFE, Rating 1 means major threat, rating 2 means minor threat, rating 3 means minor opportunity, and rating 4 means major opportunity. For IFE, Rating 1 means major weakness, rating 2 means minor weakness, rating 3 means minor strength, and rating 4 means major strength. Multiply each item's weight and rating under each EFE and IFE factor to calculate the total weighted score. The following are the calculation table for the EFE:

Table 2 External Factor Evaluation

	<i>External factor</i>	<i>Weight</i>	<i>Rating</i>	<i>Weighted score</i>
<i>Opportunities</i>	Government Policy	0.43	4	1.72
	Public Awareness	0.15	3	0.45
	Total	0.58		2.17
<i>Threats</i>	Budget Reduction	0.37	1	0.37
	Complicated bureaucracy	0.05	2	0.1
	Total	0.42		0.47
<i>Total Weighted Score</i>			2.64	

Table 3 Internal Factor Evaluation

	<i>Internal factor</i>	<i>Weight</i>	<i>Rating</i>	<i>Weighted score</i>
<i>Strength</i>	Practicality in use	0.21	4	0.84
	Safety and flexibility when using	0.09	3	0.27
	A Worthy Investment	0.23	4	0.92
	Total	0.53		2.03
<i>Weakness</i>	<i>Novice Product</i>	0.17	1	0.17
	High Selling price	0.22	1	0.22
	Position of use	0.08	2	0.16
	Total	0.47		0.55
<i>Total Weighted Score</i>			2.58	

Based on the calculation, the external score was 2.64 and the internal score was 2.58. IFE and EFE values are used to construct the Space Matrix. The space matrix strategy is divided into 4 quadrants, such as conservative, aggressive, defensive and competitive. The following is a Space matrix of HERRO Post Stroke Patient Rehabilitation Robot products

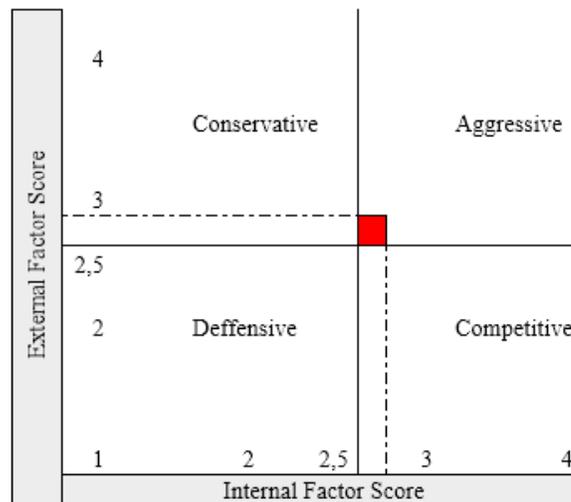


Figure 5. SPACE Matrix

6. Conclusion

The results of the SWOT and Space Matrix analysis show that a suitable strategy to be used in launching HERRO products is the Aggressive strategy. This means that the product can take advantage of its internal strengths to attract opportunities and overcome product weaknesses. Strategies that can be done are to penetrate the market, diversify products and implement backward, forward, horizontal integration according to the company's capabilities. The support and policies issued by the government will greatly affect public confidence in the quality of the product and its selling price. Another strategy that can be applied is to follow government policies in obtaining licenses for HERRO products to help reduce production prices through subsidies so that selling prices can be reached without reducing the quality of the product.

7. References

- Brownlie, D and Spencer,J., 1995, *Managerial Judgement in Strategic Marketing:Some Preliminary Thoughts*, Management Decision,Vol 33 no.6 pp 39-50
- du Toit, A. (2016). *Using environmental scanning to collect strategic information: ASouth African survey*. International Journal of Information Management, 36,16–24
- Golicic et al., 2003, *Conducting a Market Opportunity Analysis for Air Cargo Operations*, Transportation Journal 42, pp. 5-15.
- Kementerian Keuangan Republik Indonesia, 2016, *Transparansi Informasi Kebijakan Fiskal Volume XI*, Indonesia
- Mastriswadi, H., 2015, *Identifikasi Kebutuhan Pelanggan Terhadap Robot Rehabilitasi Pasca Stroke*. Thesis, Program Studi Pasca Sarjana Teknik Industri, Universitas Gadjah Mada, Indonesia.
- Nouri,J., Karbassi,A.R., and Mirkia. S., 2008. *Environmental management of coastal regions in the Caspian Sea*. International Journal of Environmental Science Technology., 5(1): 43-52.
- Ommani, A.R., 2011, *Strengths, weaknesses, opportunities and threats (SWOT) analysis for farming system businesses management: Case of wheat farmers of Shadervan District, Shoushtar Township, Iran*, African Journal of Business Management Vol. 5(22), pp. 9448-9454
- Riston, N., 2008, *Strategic Management*. Neil Riston and Ventus Publishing APS, ISBN 978-87-7681-417-5.
- Phadermrod, B., Crowder, R. M., & Wills, G. B. (2019). Importance-Performance Analysis based SWOT analysis. *International Journal of Information Management*, 44, 194–203. <https://doi.org/10.1016/j.ijinfomgt.2016.03.009>
- Rowe, A.J., Mason, R.D., Dickel, K.E., & Mann, R.B. (1994). *Strategic Management: A Methodological Approach, 4thedition*. Massachusetts: Addison-Wesley
- Wang, X. P., Zhang, J., & Yang, T. (2014). Hybrid SWOT approach for strategic planning and formulation in china worldwide express mail service. *Journal of Applied Research and Technology*, 12(2), 230–238. [https://doi.org/10.1016/S1665-6423\(14\)72339-9](https://doi.org/10.1016/S1665-6423(14)72339-9)
- Wehrich, H., “The TOWS matrix: A Tool for Situational Analysis”, Long Range Planning, vol. 15, no. 2, pp. 54–66, 1982.
- Woodruff, R.B., And Gardial,S.F., *Know Your Customer : New Approaches to Customer Value and Satisfaction*, Cambridge, MA: Blackwell, 1996.

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