Fuzzy VRIO and THES Based Model of University Competitive Advantage

Sudiyatno¹, Setyabudi Indartono², Ferry Wahyu Wibowo¹

¹Department of Mechanical Engineering Education, Faculty of Engineering, Universitas Negeri Yogyakarta, Yogyakarta 55283, Indonesia
²Department of Management, Faculty of Economics, Universitas Negeri Yogyakarta, Yogyakarta 55283, Indonesia
³Department of Informatics, Faculty of Computer Science, Universitas Amikom Yogyakarta, Yogyakarta 55283, Indonesia

This paper has proposed a novel framework model of university competitive advantage. This model implemented 3 combination model i.e. fuzzy logic; valuable, rareness, inimitability, and organizable (VRIO); and times higher education supplement (THES). This framework model was developed using materials of the model of strength, weakness, opportunity, and threat (SWOT) in making the university strategic plan. The research methodology used in this paper was a qualitative research. The VRIO model in this paper using valuable criteria such as unable, 1 capability, 2 capabilities, and 3 or more is achieved; rareness criteria such as no ability evidence to solve problem, able to solve problems for the last 3, 5, and 10 years; inimitable criteria such as more than 5 competitors are able to replace the strength within 10 years, only less than 3 competitors, only 1 competitor, and no competitor; and organizable criteria such as strength owned unable to support functions in management, able to support certain functions, most of the functions, and support all kinds in management.

Keywords: Competitive Advantage, Framework, Fuzzy, VRIO, THES.

1. INTRODUCTION

Model of evaluation and development for strategic plan based on valuable, rareness, inimitability, and organizable (VRIO) and times higher education supplement (THES) has been done. The model was used to evaluate and develop the university strategic plan. The model strategy was developed using materials from the model of strength, weakness, opportunity, and threat (SWOT) to build the university strategic plan. This model could revise weaknesses and limitations of SWOT model to build a strategic plan. This model has also been aligned with the university’s vision and mission so the programs and activities could be considered by the side of the management structure to build the university strategic plan. The strategic planning is a process that is done by organizations to decide the strategies to make a decision in allocating the resources to obtain this strategy. There are several institutions that haven’t done a strategic planning and others don’t have appropriate tools in developing the strategic plan based on the competitive advantage. The instruments could be made in order to get the model of the advantage competitive for strategic management. The analysis in the strategic management needs should be done in the institution business model due to the changing management.

¹Email Address: sudiyatno,
setyabudi_indartono@uny.ac.id, ferry.w@amikom.ac.id
This paper aims at building an assessment for university strategic plan based on fuzzy logic, VRIO, and THES. This assessment is used to make a framework in making a strategic plan to evaluate the competitive advantage condition from the university.

2. RELATED WORKS

Many fuzzy models have been implemented in the competitive advantages of the institutions or productions. Determining competitive advantage weights and lean attribute impacts with some criteria have been applied through fuzzy logic. This approach could assist stakeholders to decide the policy in getting a new perspective\(^7\). In the business environment could also use the Fuzzy logic in proposing a holistic model in making decisions between two areas i.e. quality and strategic management. This model could be an integrated decision model due to the advantage competitive in the quality managements and services\(^\text{8}\). Developing a framework in the competitive advantages could be based on resource and theory of dynamic capability. This framework could implement Fuzzy logic to be applied in analyzing data\(^\text{9}\). In this paper presents applying a Fuzzy logic in the model of VRIO-THES. The criteria of THES are used to model the competitive advantages of the university.

3. METHODOLOGY

This paper implemented a research method of qualitative. The validation of VRIO-THES framework is using a qualitative analysis method that covers a content validation. The fuzzy VRIO-THES framework module is initially made with considering processes and justifications of SWOT analysis and appropriate with the THES standard.

3.1 SWOT and VRIO-THES Model

Some questions that can affect the university in making a strategic plan from the SWOT that was changed into VRIO-THES model namely:

1. Could the university exploit an opportunity and / or facing an external threat with its resources?
2. Is the uniqueness of control in the university due to the resources or capabilities of the university relative few?
3. Could the university resources or capabilities difficult to imitate and what is the significant cost to the university to develop, obtain, and duplicate the resources or capabilities?
4. Is the university ready and capable to exploit the resources or capabilities?

The resources used in THES-VRIO approach are internal resources from SWOT. If this positive potential is in the internal then it will be the strength and chosen to get its factors to get an unusable strength and if it is a negative potential will be weakness and chosen to avoid it to get an unusable strength. But if the resources are external then if the potential is a positive it will be an opportunity and it needs to be exploited to get an unusable strength and valuable strength and if it is a negative potential it will be grouped into a threat and it needs to be chosen how to neutralize and exploit it to get an unusable strength and valuable strength. From a valuable strength then it will be assessed related to a rareness, inimitability, and organizable by sorting unusable strength from each of these points to get a sustainable strength. The sustainable strength used to develop competitive strategies statements i.e. optimize teaching strength strategies, optimize research strength strategies, optimize citation strength strategies, optimize innovation strength strategies, and optimize international outlook strength strategies. In this context, the teaching point is the learning environment; the research point consists of volume, income, and reputation of the university’s researches; the citation point shows the influence of the research; the innovation can attract the income from industries; and the international outlook. If the five strength strategies have sufficient resources, the competitive advantage could be evaluated to obtain a smart goal setting to develop competitive program and effective activities. The THES-VRIO model from the SWOT materials can be shown in Figure 1.

![Fig. 1 THES-VRIO model from SWOT](image-url)
3.2 VRIO-THES Evaluation Analysis

Some forms of evaluation for VRIO analysis obtained from SWOT analysis can be generated and observed as some areas as written follows:

1. **Valuable**
   The examples in this valuable case are strength: the organizational structure of the university is systematic and complete with very clear description. This university has an excellent management and leadership system based on the complete regulation. The university has also very structural and clear quality assurance system and accreditation status; exploit opportunity: Increased public confidence in the university as an institution of a world-class education based on devotion, self-reliance and intellect; and neutralize threat: The adoption of ASEAN Economic Community (AEC) poses a serious threat to the university if it isn’t visionary far ahead. This evaluation could be expanded more to get the value of the university. The evaluation of this valuable point can be shown in Table 1.

<table>
<thead>
<tr>
<th>STRENGTH</th>
<th>EXPLOIT</th>
<th>EXPERIENCE</th>
<th>NEUTRALIZE</th>
<th>EXPERIENCE</th>
<th>THREAT</th>
</tr>
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<tbody>
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<td>3.</td>
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</tbody>
</table>

2. **Rare**
   The evaluation of this rarity point can be shown in Table 2.

<table>
<thead>
<tr>
<th>STRENGTH</th>
<th>EXPERIENCE</th>
<th>RARITY</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1.</td>
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<td>2.</td>
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<td>3.</td>
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</tbody>
</table>

3. **Inimitability**
   The evaluation of this inimitability point can be shown in Table 3.

<table>
<thead>
<tr>
<th>STRENGTH</th>
<th>EXPERIENCE</th>
<th>RARITY</th>
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<tbody>
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<td>1.</td>
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</table>

4. **Organizable**
   The evaluation of this inimitability can be shown in Table 4.

<table>
<thead>
<tr>
<th>STRENGTH</th>
<th>EXPERIENCE</th>
<th>RARITY</th>
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<td>1.</td>
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<td>3.</td>
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</tbody>
</table>

For the competitive implications used in this paper consists of a competitive disadvantage, competitive parity, temporary competitive advantage, and sustained competitive advantage.

For the THES parameters, there are two components for analyzing model i.e. performance categories and weightings. The table for this can be shown in Table 5.

<table>
<thead>
<tr>
<th>NO</th>
<th>PERFORMANCE CATEGORIES</th>
<th>WEIGHTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Teaching – the learning environment</td>
<td>a. Reputational survey – teaching (15%)</td>
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<td></td>
<td></td>
<td>b. Ph.D awards per academic (6%)</td>
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<tr>
<td></td>
<td></td>
<td>c. Undergraduates admitted per academic (4.5%)</td>
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<tr>
<td></td>
<td></td>
<td>d. Income per academic (2.25%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e. Ph.D awards/bachelor’s awards (2.25%)</td>
</tr>
<tr>
<td>2.</td>
<td>International outlook – staff and students</td>
<td>a. Ratio of international to domestic staff (3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Ratio of international to domestic students (2%)</td>
</tr>
<tr>
<td>3.</td>
<td>Research – volume, income, and reputation</td>
<td>a. Reputational survey – research (19.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Research income (scaled) (5.25%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Papers per academic and research staff (4.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d. Public research income/total research income (0.75%)</td>
</tr>
<tr>
<td>4.</td>
<td>Citations – research influence</td>
<td>a. Citation impact (normalized average citations per paper) (32.5%)</td>
</tr>
<tr>
<td>5</td>
<td>Industry income - innovation</td>
<td>a. Research income from industry (per academic staff) (2.5%)</td>
</tr>
</tbody>
</table>

4. RESULTS AND DISCUSSION

The VRIO model in this case can be made rubric on the points from the SWOT materials as shown below.

1. **Valuable**
   The criteria in this case should be changing Weakness (W), capturing Opportunity (O), and neutralizing Threat (T). There are four points and criteria respectively in making a Fuzzy logic i.e.:
   1 - Unable
   2 - Only 1 capability
   3 - Only 2 capabilities
   4 - 3 or more is achieved
   So the fuzzy logic for the valuable can be shown in
The functions of Fuzzy member for the valuable criteria can be shown in formula below:

\[
\begin{align*}
\mu_{V_1} &= \begin{cases} 
1-x & 0 \leq x \leq 1 \\
0 & 1 \leq x 
\end{cases} \\
\mu_{V_2} &= \begin{cases} 
2-x & 1 \leq x \leq 2 \\
0 & 2 \leq x \\
0 & x \leq 1 \text{ or } x \geq 3 
\end{cases} \\
\mu_{V_3} &= \begin{cases} 
x-1 & 1 \leq x \leq 2 \\
3-x & 2 \leq x \leq 3 \\
0 & x \leq 2
\end{cases} \\
\mu_{V_4} &= \begin{cases} 
x & 2 \leq x \leq 3 \\
1 & 3 \leq x
\end{cases}
\end{align*}
\]

2. Rareness

The criteria in this case are seen it is very mature or not mature. There are four points and criteria respectively in making a Fuzzy logic i.e.:

1 - Haven’t shown evidence of ability to solve problem
2 - Able to solve problems for the last 3 years
3 - Able to solve problems for the last 5 years
4 - Able to solve problems for the last 10 years

So the fuzzy logic for the rarity can be shown in Figure 3.

\[
\begin{align*}
\mu_{R_1} &= \begin{cases} 
1-x & 0 \leq x \leq 1 \\
0 & x \geq 1 
\end{cases} \\
\mu_{R_2} &= \begin{cases} 
3-x & 1 \leq x \leq 3 \\
0 & x \geq 3 \\
0 & x \leq 1 \text{ or } x \geq 5
\end{cases} \\
\mu_{R_3} &= \begin{cases} 
x & 1 \leq x \leq 3 \\
0 & x \geq 3 \\
0 & x \leq 1 \text{ or } x \geq 5 
\end{cases} \\
\mu_{R_4} &= \begin{cases} 
1-x & 1 \leq x \leq 3 \\
3-x & 3 \leq x \leq 5 \\
5-x & 5 \leq x \leq 10
\end{cases}
\end{align*}
\]

3. Inimitability

The criteria in this case are uniqueness and/or substitution. There are four points and criteria respectively in making a Fuzzy logic i.e.:

1 - More than 5 competitors are able to replace the strength within 10 years
2 - There are only less than 3 competitors who can imitate / replace the strength within 10 years
3 - Only 1 competitor can replicate / replace the strength within 10 years
4 - No competitor can replicate / replace the strength within 10 years

So the fuzzy logic for the inimitable can be shown in Figure 4.

The functions of Fuzzy member for the inimitability criteria can be shown in formula below:

\[
\mu_{I_1} &= \begin{cases} 
1-x & 0 \leq x \leq 1 \\
0 & x \geq 1
\end{cases} \\
\mu_{I_2} &= \begin{cases} 
3-x & 1 \leq x \leq 3 \\
0 & x \geq 3 \\
0 & x \leq 1 \text{ or } x \geq 5
\end{cases} \\
\mu_{I_3} &= \begin{cases} 
x & 1 \leq x \leq 3 \\
3-x & 3 \leq x \leq 5 \\
5-x & 5 \leq x
\end{cases}
\]

Figure 2.

![Figure 2 Fuzzy logic for valuable](image)

Figure 3 Fuzzy logic for rarity

![Figure 3 Fuzzy logic for rarity](image)

Figure 4 Fuzzy logic for inimitability

![Figure 4 Fuzzy logic for inimitability](image)
4. Organizable
The criteria in this case are organizable. There are four points and criteria respectively in making a Fuzzy logic i.e.:
1. Strength owned isn’t able to support functions in management effectively and efficiently
2. Strength owned is able to support certain functions in management effectively and efficiently
3. Strength owned is able to support most of the functions in management effectively and efficiently
4. Strength owned is able to support all kinds of functions in management effectively and efficiently
So the fuzzy logic for the organizable can be shown in Figure 5.

The functions of Fuzzy member for the organizable criteria can be shown in formula below:
\[
\mu_{O_i} = \begin{cases} 
1; & 0 \leq x \\
2 - x; & 1 \leq x \leq 2 \\
0; & 2 < x \\
0; & x \leq 1 \text{ or } x \geq 3 \\
x - 1; & 1 \leq x \leq 2 \\
3 - x; & 2 \leq x \leq 3 \\
0; & x \leq 2 \text{ or } x \geq 4 \\
x - 2; & 2 \leq x \leq 3 \\
4 - x; & 3 \leq x \leq 4 \\
0; & 3 \geq x \\
x - 3; & 3 \leq x \leq 4 \\
1; & 4 \leq x 
\end{cases}
\]

5. Competitive Implications
The criteria of the competitive implications are a competitive disadvantage (D), competitive parity (P), temporary competitive advantage (T), and sustained competitive advantage (S). So the fuzzy logic for this can be shown in Figure 6.

5. CONCLUSIONS
This paper has proposed a novel framework model of Fuzzy VRIO-THES. The analysis model based on VRIO and also points and weightings from THES framework have been made. The evaluation and analysis are very important to clustering the problems from the SWOT analysis that has been obtained. In this paper has also been categorized into Fuzzy logic. The future work will be made a Fuzzy VRIO-THES based application.

ACKNOWLEDGMENTS
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