

The Technology, Technical Skill, and R&D Capability in Increasing to the Competitive Advantage in Indonesia Telecommunication Service Companies

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Abstract

The companies required to maintain competitive advantage in order to achieve high performance in a hyper competitive setting. The research aims at examining the influence of technology, technical skill and R&D capabilities to competitive advantage in Telecommunication Services Company. The research method used is causal research or verification, the survey was conducted on telecommunication service companies in Indonesia. The method of analysis is used as path analysis. The finding suggests that the third component of company's core competence consist of technology, technical skill, and R&D capability influence to the competitive advantage significantly and simultaneously.

Keywords

Core Competencies, Technology, Technical Skill, R&D Capabilities, Competitive Advantage

1. Introduction

Telecommunication development can be seen from the number of telephone subscriptions and the quality of telecommunication services. The number of the fixed telephone customers in Indonesia for the last five years as shown in Figure 1, shows the trend of decline in growth of the fixed telephone customers, especially in the last third years.

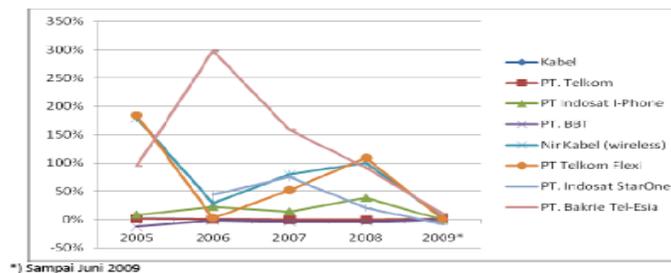


Figure 1: The growth of the number fixed telephone customers 2004 – 2009

Trend decline in the growth of mobile cellular subscribers in the last four years were also seen in the Figure 2. This is apparently caused by the start of market mature due to mobile cellular penetration is already high enough and tight competition among operators. The number of customers who have more than half its population of Indonesia is an indication that the market already mature.

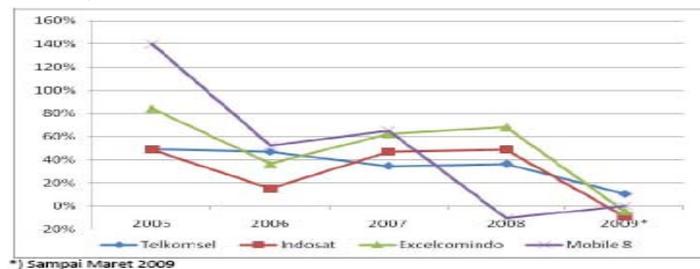


Figure 2: The growth of the number mobile cellular customers 2005-2009

The ARPU (Average Revenue per User) as shown in Figure 3 shows that in general the decline in ARPU on all operators with a fairly sharp decline in the last five years.

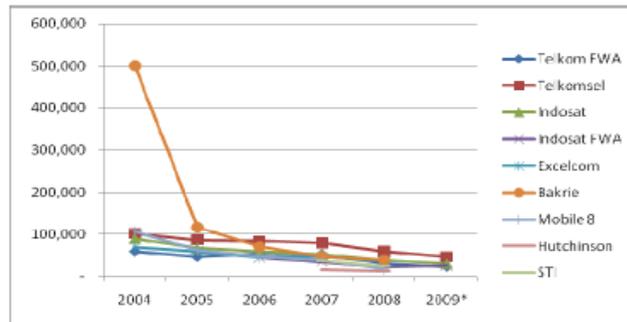


Figure 3: Trend ARPU of operators in Indonesia

Meanwhile, from view of new technology, the continuing new invention of telecommunication technology growth as presented by the Gilder's Law [1] that findings of telecommunication technology broadband allowed bandwidth increase its capacity to double every 9 months as illustrated in Figure 4.

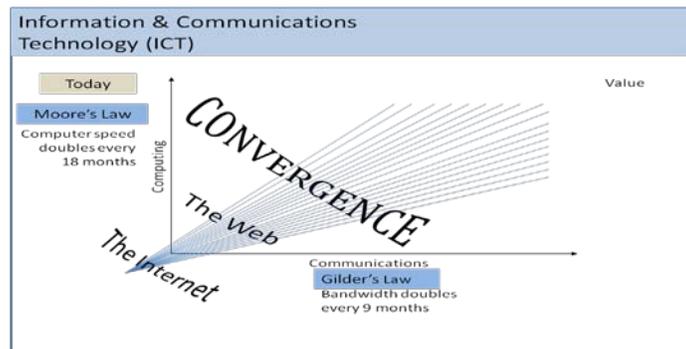


Figure 4: ICT Technology Progress, ICT Issues and Opportunities

Based on the phenomena described above, this paper proposed solution for telecommunication service companies can survive related back to basic is to improve the company's core competence which is a source of competitive advantage. Especially in the future telecommunication services business no longer relies on growth in the number of customers but rather on the content of telecom services. Core resources and capabilities tend to require the presence of complementary resources and capabilities in order to create or add value.

2. Literature Review

Core competence thinking is a powerful and widely promoted approach to focus and mobilize an organization's resources [2]. The core competency statements capture the essence of the firm's business and technology strategy. However, they are at a high level of abstraction and do not seem particularly useful in determining what should be done to exploit the competency to enter new business areas, to enhance competitiveness in existing product categories, or to focus R&D and technology investments.

Core competence must be a skill or capability of a firm. A core competence is central to a firm's value-generating activities. Competitive advantage is a capability or resource that is difficult to imitate and valuable in helping the firm outperform its competitors [3]. The drives of competitive advantage come from resources, capabilities, competencies and assets [4].

The own distinctive capabilities company is the core competence. These core competences must be prepare and used well to increase market share and to reach the opportunity because competence and professionalism is core activity to successful. The fortunes of high-technology firms depend on investment in intangible capital, which is comprised

of intellectual capital as well as marketing capital. While the importance of intellectual capital – R&D capability, human capital, and the like – has been well established, the central role of complementary marketing capital – in the form of brand name and other marketing assets – in the process of innovation needs greater understanding.

Competitive advantage stems from a firm’s ability to leverage its internal strengths to respond to external environmental opportunities while avoiding external threats and internal weaknesses [5]. The resource-based view of a firm offers an alternative to this basic framework by focusing on superior resources as a source of sustained competitive advantage [6, 7].

Competitive advantage, whatever its source, ultimately can be attributed to the ownership of a valuable resource that enables the company to perform activities better or more cheaply than its competitors [8]. Firm sustain competitive advantage when their competencies possess strong causal ambiguity because competitors are less likely to identify or understand such competencies well enough to imitate them [9]. Competitive advantage is whatever value a business provides that motivates its customers (or end users) to purchase its products or services rather than those of its competitors and that poses impediments to imitation by actual or potential direct competitors [10]. This paper based on framework that core competence is distinctive resources consists of technology, technical skill and capability R&D [11-14], as shown in Figure 5.

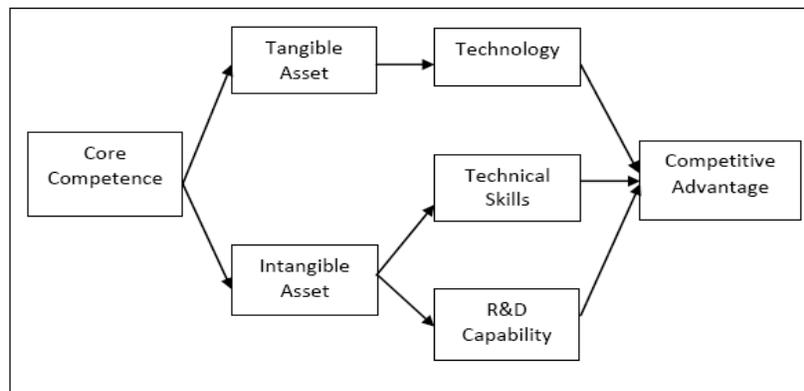


Figure 5: The influence of technology, technical skill and capability R&D to competitive advantage

Based on this model structure, key success factor competitive advantage company is created through its own capability that representing core competence. Core competence consist of technology that representing tangible asset, while technical skill and R&D capability representing intangible asset.

3. Method

This study is causal/verification research because intend to determine the relationship between the variables research in causal relationship so that there are independent variables and the dependent variable.

The unit of analysis is telecom service companies that describe the technology, technical skill, R&D capability and competitive advantage. Base on the time horizon is cross sectional. Sources of data from primary data obtained through survey directly on the telecommunication services companies by using questionnaires with measurement ordinal scale. The test statistic used is the Path Analysis, with sample study by 84 companies.

Path Analysis is the statistical technique used to examine causal relationships between two or more variables. A measured variable is a variable that can be observed directly and is measurable. Measured variables are also known as observed variables, indicators or manifest variables. Path analysis connected only with measured variables. The amount of the relationship of independent variables to dependent variables called path coefficients (P_{yx}).

Hypothesis: technology, technical skill, and R&D capability influences to competitive advantage simultaneously and partially.

The testing as follows:

1) Structuring

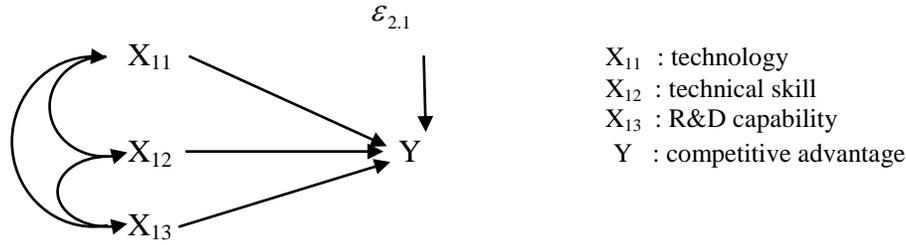


Figure 6: Path Structure

2) Calculate the equation

$$Y = P_{YX_{11}} X_{11} + P_{YX_{12}} X_{12} + P_{YX_{13}} X_{13} + \varepsilon_1 \quad \dots\dots (1)$$

3) The decision of acceptance or rejection of H_0

a) Operational hypothesis formulation

$$H_0 : P_{YX_{1i}} = P_{YX_{1j}}$$

$$H_i : P_{YX_{1i}} \neq P_{YX_{1j}} ; i \neq j$$

b) Decision criteria

Reject H_0 if $t_{\text{account}} \geq t_{(0,05)(n-k-1)}$

Accept H_0 if $t_{\text{account}} < t_{(0,05)(n-k-1)}$

Where
$$t = \frac{P_{Y X_{1i}} - P_{Y X_{1j}}}{\sqrt{\frac{(1 - R^2_{Y(X_{11}, X_{12}, X_{13})})(C_i + C_j + 2C_{ij})}{(n - k - 1)}}$$

4. Results

In the result calculation by Lisrel 8.7 path diagram between the three variable of technology, technical skill, and R&D capability to competitive advantage, such as the path coefficients obtained in Table 1.

Table 1. Path Coefficient Technology, Technical Skill, R&D Capability to Competitive Advantage

Variable	Path Coefficient	T_{count}	$R^2 = 0,4850$
X_{11}	0,3475	3,3373	
X_{12}	0,4114	3,9136	
X_{13}	0,0281	0,3186	

For the overall core competencies contribute in influence to the competitive advantage at 48,50% (R^2 Value) in telecommunication service companies. Among the three variables of core competencies, technical skill (X_{12}) provide the most influence to the competitive advantage, follower by technology (X_{11}), and the latest R&D capability (X_{13}).

Diagram of the structural equation between the three variables of core competencies to competitive advantage in the telecommunication service companies described as follows.

$$Y = 0.3475 * X_{11} + 0.4114 * X_{12} + 0.02808 * X_{13}, \text{ Errorvar.} = 0.5150, R^2 = 0.4850 \quad \dots\dots (2)$$

(0.1041) (0.1051) (0.08811) (0.08142)
 3.3373 3.9136 0.3186 6.3246

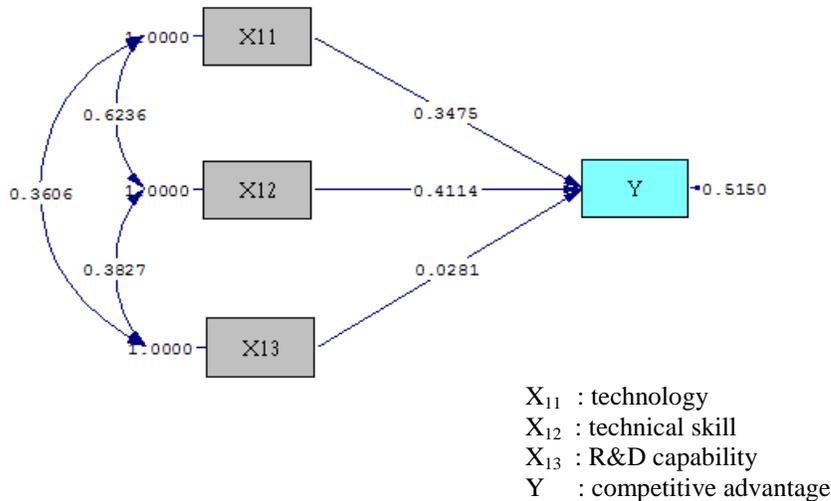


Figure 7: Path Diagram Technology, Technical Skill, and R&D Capability to Competitive Advantage

1) Overall Testing

- | | |
|---|--|
| H_0 : All $\rho_{YX_i} = 0$
i = 1,2 | Technology, technical skill and R&D capability simultaneously do not influence to competitive advantage. |
| H_a : There $\rho_{YX_i} \neq 0$
i = 1,2 | Technology, technical skill, and R&D capability simultaneously influence to competitive advantage |

The hypothesis testing through the F test statistic to reject H_0 if the F_{count} is greater than F_{table} , or otherwise to accept H_0 if F_{count} less than or equal to F_{table} . Through the value of coefficient of determinant (R^2 value) in table 1 can be calculated the value of F by the following formula.

$$F_{count} = \frac{(n - k - 1)R_{Y(X_{11}, X_{12}, X_{13})}^2}{k(1 - R_{Y(X_{11}, X_{12}, X_{13})}^2)} \quad \dots\dots (3)$$

$$F_{count} = \frac{(84 - 3 - 1) \times 0,4850}{3 \times (1 - 4850)}$$

$$F_{count} = 25,1133$$

From table F for significance level of 0.05 and degrees of freedom (3, 80) obtained F_{table} values of 2,719. Because F_{count} (25,1133) is greater than F_{table} (2,719) then with the error rate 5% it was decided to reject H_0 and accepted H_a . So with confidence level 95% can be concluded that the variables of technology, technical skills, and R&D capability simultaneously influences to competitive advantage significantly in telecommunication services company.

2) Partially testing : the influence technology to competitive advantage

- | | |
|---------------------------------|---|
| H_0 : $\rho_{YX_{11}} = 0$ | Technology partially does not influences to competitive advantage |
| H_1 : $\rho_{YX_{11}} \neq 0$ | Technology partially influences to competitive advantage |

Based on the processing results in table 1 can be seen the value of the variable t_{count} technology to competitive advantage by 3,3373. While from table t with error rate 5% and degrees of freedom 80 obtained values T_{table} of 1,990. Because of the variable T_{count} technology (3,3373) is grater than T_{table} (1.990), then with error rate 5% it was decided to reject H_0 and accepted H_a . So with confidence level 95% can be concluded that the technology influence to the competitive advantage partially and significantly in telecommunication service companies.

With increasingly sophisticated in technology that will enhance to the competitive advantage in telecommunication services companies.

The influence of technology to the competitive advantage.

- The direct effect of technology to competitive advantage = $(P_{YX_1})^2 = (0,3475) \times (0,3475) = 0,1208$ (12,08%)
- The indirect effect of technology to competitive advantage because of its relationship with the technical skills = $P_{YX_1} \times r_{X_1X_2} \times P_{YX_2} = (0,3475) \times (0,6236) \times (0,4114) = 0,0892$ (8.92%).
- Indirect effect of technology to competitive advantage because of its relationship with R&D capability = $P_{YX_1} \times r_{X_1X_3} \times P_{YX_3} = (0,3475) \times (0,3606) \times (0,0281) = 0,0035$ (0,35%)

So the total influence of technology to the competitive advantage telecom services companies = 12,08% + 8.92% + 0.35% = 21.35% with a positive direction, meaning that 21.35% change on competitive advantage can be explained by technology in the telecom services companies.

3) Partially testing : the influence technical skill to competitive advantage

$H_0 : \rho_{YX_2} = 0$ Technical skills partially does not influences to competitive advantage

$H_1 : \rho_{YX_2} \neq 0$ Technical skills partially influences to competitive advantage

Based on the processing results in table 1 can be seen the value of the variable t_{count} technical skill to competitive advantage by 3,9136. While from Table t with error rate 5% and degrees of freedom 80 obtained values T_{table} of 1,990. Because of the variable T_{count} technical skill (3,9136) is greater than T_{table} (1.990), then with error rate 5% it was decided to reject H_0 and accepted H_a . So with confidence level 95% can be concluded that the technical skill influence to the competitive advantage partially and significantly in telecommunication services companies. With increasingly sophisticated in technical skill that will enhance to the competitive advantage in telecommunication service companies.

The influence of technical skills to the competitive advantage.

- The direct effect of technical skills to competitive advantage = $(P_{YX_2})^2 = (0,4114) \times (0,4114) = 0,1693$ (16,93%)
- The indirect effect of technical skills to competitive advantage because of its relationship with the technology = $P_{YX_1} \times r_{X_1X_2} \times P_{YX_2} = (0,3475) \times (0,6236) \times (0,4114) = 0,0892$ (8.92%).
- The indirect effect of technical skills to competitive advantage because of its relationship with R&D capability = $P_{YX_2} \times r_{X_2X_3} \times P_{YX_3} = (0,4114) \times (0,3827) \times (0,0281) = 0,0044$ (0,44%)

So the total influence of technical skills to the competitive advantage on telecom services companies = 16,93% + 8.92% + 0.44% = 26.29% with a positive direction, meaning that 26.29% change on competitive advantage can be explained by technical skills in the telecommunication services companies.

4) Partially testing : the influence R&D capability to competitive advantage

$H_0 : \rho_{YX_3} = 0$ R&D capability partially does not influences to competitive advantage

$H_1 : \rho_{YX_3} \neq 0$ R&D capability partially influences to competitive advantage

Based on the processing results in table 1 can be seen the value of the variable t_{count} R&D capability to competitive advantage by 0,3186. While from table t with error rate 5% and degrees of freedom 80 obtained values T_{table} 1,990. Because of the variable T_{count} R&D capability (0,3186) is less than T_{table} (1.990), then with error rate 5% it was decided to accepted H_0 and rejected H_a . So with confidence level 95% can be concluded that the R&D capability partially does not influence to the competitive advantage in telecommunication services companies. It is because of the influence of R&D capability to competitive advantage very low at 0.9%.

The influence of R&D capability to the competitive advantage.

- The direct effect of R&D capability to competitive advantage = $(P_{YX_3})^2 = (0,0281) \times (0,0281) = 0,0008$ (0,09%)
- The indirect effect of R&D capability to competitive advantage because of its relationship with the technology = $P_{YX_3} \times r_{X_1X_3} \times P_{YX_1} = (0,0281) \times (0,3606) \times (0,3475) = 0,0036$ (0,36%).
- The indirect effect of R&D capability to competitive advantage because of its relationship with technical skills = $P_{YX_2} \times r_{X_2X_3} \times P_{YX_3} = (0,4114) \times (0,3827) \times (0,0281) = 0,0045$ (0,45%)

So the total influence of R&D capability to the competitive advantage on telecom services companies = 0,09% + 0,36% + 0,45% = 0,9% with a positive direction, meaning that 0,9% change on competitive advantage can be explained by R&D capability but because of very low, it does not influence to competitive advantage significantly as evidenced on the above.

The finally, influence of core competencies to competitive advantage about 48,50% both from technology (21,35%), technical skill (26,29%), and the last R&D capability (0,9%). There is an error 51,50% appreciable can be predicted from external factors that do not accommodated in the model structure. Because core competencies is just internal resources or internal factors of the firm. The external factors coming from marketing aspect and another factors like customer, competitor, vendors, etc.

Technical skill and technology more dominant in improving the competitive advantage than R&D capability. It means that the company's source for competitive advantage comes from technical skill and technology. This is because R&D capability currently at the lowest categories that have not been able to support company to create product or services which superior customer value. In fact the technology, technical skill and R&D capability are sources in create high performance product differentiation that provides chance for company to achieve competitive advantage.

Although the contribution of R&D capability for competitive advantage is very low at less than 1%, but through the activities of R&D can be created services which superior customer value. It also found that the influence of R&D capability to competitive advantage greater from the indirect path through technical skill and technology rather than direct path. It means that R&D capability play role in supporting technical skill and technology for the company. R&D capabilities have not been able to generate superior product or service that directly impact on competitive advantage. It is therefore important for company to increase R&D capability so it can be balanced with company's technical skill and technology.

5. Conclusion

Based on study described in this paper, there are something for conclusion:

Core competence is distinctive resources consist of technology, technical skill, and R&D capability. The third variable: technology, technical skill and R&D capability influence to the competitive advantage significantly and simultaneously. Technical skill the most variable influence to competitive advantage, thus follower by the technology, those are two variables (technology and technical skill) influence to the competitive advantage either partially or simultaneously. While R&D capability not influence to the competitive advantage partially, but just indirectly because of its relation with technical skill and technology. It means that R&D capability on the Indonesia telecommunication services company currently cannot support company to create product or service which superior customer value. So, very important for company to improve the R&D capability that can support to achieve the competitive advantage. Finally, there are another factors not including on the model structure expressed error model, from external factors like marketing aspect, customer, competitor, etc. For future research direction, this model structure have to including another factor as described before which can increase R^2 value and reduce error model.

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