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Effect of Technological Capability on Performance of Commercial Banks in Kenya

Cleophas MOCHOGE[1], Melchizedeck NYAKONI[2] , Penvilia CHEPKEMOI[3]
[1]*Kabarak University, 13 P.O. Box Private Bag, Kabarak, 20157, Kenya*
Tel: +254713342076, Email: mochoge@kabarak.ac.ke
[2]*Kenya Methodist University, P.O Box 45240, Nairobi,00100,Kenya*
Tel: +254727599189, Email: mmelckzede@gmail.com
[3] *University of Kabianga, P.O. Box 2030,Kericho, 20200, Kenya*
Tel: +254720648266, Email: cpenvilia@gmail.com

Abstract: In the modern rapidly changing business environment, information technologies (IT) has become an essential component of firm capability and a source of sustainable competitive advantage. The main purpose of the study was to determine effect of technological capability and firm performance among commercial banks in Kenya. Explanatory research design was used in this study. A sample size of 173 top management employees from 32 hotels in Nairobi County. Cronbach alpha coefficient test was employed to measure the internal consistency of the instruments. The study used descriptive statistics such as means, standard deviation, frequency and percentages. Study findings indicated that technological operating capability, technological upgrading capability and technological acquiring capability had positive and significant effect on bank performance. However, technological upgrading capability had most influential effect bank performance. The study concluded that technological operating capability, technological upgrading capability and technological acquiring capability is important factor for enhancing bank performance.

Keywords: information technologies, technological operating capability, technological upgrading capability and technological acquiring capability

1. Introduction

Firm Performance has been considered one of the most important critical factors behind economic success of both developed and developing countries due to their multiple contributions in economic growth, employment generation and innovations (Kongolo, 2010; Asian Productivity Organization, 2011). Firm performance is related to the ability of the firm to gain profit and growth in order to achieve its general strategic objectives. Business performance is the result of the interplay between actions taken in relation to competitive forces that allow the firm to adapt to the external environment, thereby integrating the efficiency and effectiveness (Covin, 2016).

2. Problem formulation

Performance of firm has implications to organization's health and ultimately its survival. The Firms' management effectiveness and efficiency in making use of company's resources is highly reflected by high performance and this in turn contributes to the country's economy at large (Naser and Mokhtar, 2004). Company performance is very essential to management and other stakeholders such as shareholders, debt holders and the government as it is an outcome which has been achieved by an individual or a group of individuals in an organization related to its authority and responsibility in achieving the goal legally, not

against the law, and conforming to the morale and ethic (Iswatia, & Anshoria, 2007). Abera (2012) argues that it is important to know what drives firm's profitability (financial performance). Entrepreneurship scholars have attempted to explain performance by investigating the relationship between technological capability and firm performance (Lumpkin & Dess, 2001; Wiklund & Shepherd, 2005; Zahra & Garvis, 2000).

Technological capability (TC) is widely known as a strategic source of growth and wealth at the national and the firm levels (Monopoloulos et al, 2009). The employment of technology demands considerable effort, devoted to learning the new technology and developing the capability, for efficient development of industry. In this context, since the 1980s, TC has become the main focus of conceptualizing technology study. It is the decisive factor in developing competitive positions, competitive strengths, and sustained growths (Ngoc Ca, 1999). The firm level TC has been regarded as an important strategic resource, enabling firms to achieve competitive advantage within their industry. Those firms with superior TC can secure greater efficiency gains by pioneering process innovations and can achieve higher differentiation by innovating products in response to the changing market environment (Tsai, 2004).

Although it is widely accepted that IT resources contribute to performance and future growth potential of the firm, many Banks face the constraints of technological backwardness, insufficient use of information technology, poor product quality. As a result, there exists a low level of performance (Asian Productivity Organization, 2006, 2011). Moreover, The Most Banks in developing countries are considered less technology oriented than those of developed counties (Herath and Mahmood, 2013).

In Kenya, Kenya banking sector has witnessed many changes since the beginning of e-banking. Today, there is a lot of different among banks on customers of banks efficiency, speed and convenience in they offer banking services due to technological innovations such as ATMS, Online Banking, and Mobile banking among others. Some banks are seems to be doing better that other's in terms of innovations as well as performance. Basing on Ortega (2010) and McEvily et al., 2004) that technological capability enables a firm to create valuable innovative product and service for its customer so that it will define the performance of a firm, this suggests a very interesting question; does technological capability may one of the cause in innovations and performance difference among bank in Kenya.

Despite the importance many studies discussing contribution of CT to performance and future growth potential of the firm, the empirical results of the relationship between IT capability and firm performance is still ambiguous (Artz et al., 2010). Another explanation for the inconclusiveness in the literature is that most studies dealing with the impact of IT on firm performance fail to explicitly distinguish (1) IT investments from IT capability, and (2) value creation from firm profitability (Lin, 2007). This study will therefore assess effect of Technological Capability and Firm Performance among commercial banks in Kenya.

3. Objectives of the study

i. To determine the effect of technological operating capability on firm performance
ii. To determine effect of technological upgrading capability on firm performance
iii. To determine effect of technological acquiring capability on firm performance
iv. To determine the mediating effect of innovativeness on the relationship between technological operating capability and firm performance
v. To determine the mediating effect of innovativeness on the relationship between technological upgrading capability and firm performance

vi. To determine the mediating effect of innovativeness on the relationship between technological acquiring capability and firm performance

4. Literature Review

4.1 Hypothesis development

TOC refers to capabilities to operate, use and sustain production equipments and facilities. Accompanying with the TC promotion, firms will shorten the gaps with other leading companies when they continuously introduce more advanced and more complex product and process innovation and finally they will be able to produce the original product and process innovation. Operations capability is defined as the integration of a complex set of tasks performed by a firm to enhance its output through the most efficient use of its production capabilities, technology, and flow of materials (Dutta et al., 1999; Hayes et al., 1988). Superior operations capability increases efficiency in the delivery process, reduce cost of operations and achieve competitive advantage (Day, 1994). Operations capabilities are fundamental proficiencies that enable firms to achieve production-related goals such as consistent product quality, cost reduction, volume and product flexibility, and delivery dependability and speed (Boyer and Lewis, 2002, Terjesena et al., 2011)

Superior operations capabilities have long been recognized as a source of competitive advantages and superior performance outcomes (eTerjesena et al., 2011; Peng et al., 2008). It argues that a firm can achieve competitive advantage by handling an efficient material flow process, careful utilization of assets, and acquisition and dissemination of superior process knowledge (Tan et al., 2007). Among the operations capabilities most commonly, strongly, and positively associated with competitive success are those contributing to a firm's ability to compete on the bases of time, flexibility, low costs, and product quality (White, 1996). Some empirical studies have identified the important effect of operations capability on firm performance (Rosenzweig et al., 2003; Nath et al., 2010; Terjesena et al., 2011). Using a sample of 167 UK-based high technology manufacturing firms, Terjesena et al. (2011) found that that firm performance (such as sales growth, return on sales, and return on assets) is significantly predicted by tcehnnlogy operations capabilities that promote low operating costs and product quality. Rosenzweig et al. (2003) found that enhanced competitive capabilities (such as product quality, cost, process flexibility, and delivery reliability) generally improve business performance. Using archival data of 102 UK-based logistics companies, Nath et al. (2010) also found that operations capability significant impacts business performance (such as profitability).

Effective operational capabilities are necessary for achieving and sustaining competitive advantage (Zollo and Winter, 2002). Following literature review, which highlights that technological and marketing capabilities are central to the competitive advantage process, this study focus on these two types of operational capabilities (Danneels, 2002; Song et al., 2005; Teece et al., 2007; Prasnikar et al., 2008). Moreover, the research sample is composed of manufacturing firms operating in different industries. In such firms, technological and market-related capabilities are identified as critical to creating sustainable competitive advantage because they form the basis for the development of new products and processes (Dutta et al., 1999; Spanos and Lioukas, 2001; Danneels, 2002, 2008). Furthermore, technological and marketing capabilities were assessed as extremely important for gaining and maintaining competitive advantage by the top managers of 14 established manufacturing firms during the questionnaire development and design phase.

H_1: Higher levels of Technological operating capability increase firm performance

TAC refers to capabilities to acquire new knowledge through formal, informal, internal and external channels. In general, they form their own TC by gradually absorbing, digesting and improving this knowledge. These Capabilities instead involve learning and accumulation of new knowledge on the part of the firm, and also the integration of behavioral, social and economic factors into a specific set of outcomes. Consequently, capabilities are to be taken as the results of adaptive learning processes that, in their collective dimension, can be highly localized, giving rise to 'system' capabilities, i.e. referring to a specific spatial and industrial setting (Iammarino and McCann, 2009). For instance, an endowment of highly qualified human resources is not a capability per se, but a resource that, through learning, may become a source of technological capabilities for the firm or the system as a whole. In other words, variables related to human resources, or cooperative linkages for innovation with external actors, are to be considered as (among the) determinants of a firm's technological capabilities, rather than as the capabilities themselves (von Tunzelmann and Wang, 2003, 2007)

A study conducted by Sears and Hoetker (2012) in their study indicated that the performance of technological acquisitions depends heavily on the overlap between the knowledge bases of the target and acquirer. Their findings showed that each affects the value created from the firms' technological capabilities differently due to absorptive capacity, knowledge redundancy, and organizational disruption. Further, the low quantity of innovations observed in acquisitions with low target overlap may conceal an offsetting increase in their novelty

Much of the foundational research on technological acquisitions examined the relationship between acquisition performance and the amount of overlap between the technological knowledge bases of the target firm and acquiring firm (Ahuja & Katila, 2001; Kapoor & Lim, 2007; Graebner, Eisenhardt, & Roundy, 2010). More recent research has extended the concept of technological overlap by investigating the effects that technological similarities and complementarities have on acquisition performance (Makri, Hitt, & Lane, 2010).

Accordingly, technological acquisitions have become an important stream in the broader acquisitions literature (Graebner, 2009; Puranam, Singh, & Chaudhuri, 2009; Makri et al., 2010). Work in this stream has focused on the acquisition of small, technology-intensive target firms, as do we. Beyond their managerial importance, such acquisitions allow researchers to focus on the effects of technological synergies by minimizing the impact of potential confounding factors usually present in the acquisition of large and/or non-technological targets, such as cost (scale) synergies or market power synergies. Thus, based on the above argument this study hypothized that;

H_2: Higher levels of technological acquiring capability increase firm performance

TUC refers to capabilities to improve greatly on products and processes depending on firm's own strength and adjust the current product and process parameters according to changing market demands. The upgrading results will allow the firms to reach higher TC level. Justin Yifu Lin (2005, 2010, 2012, etc.): technology upgrading by 'copying industries'based on latent comparative advantages in transition from low to middle income.

A study by Rasiah and Vinanchiarachi (2012) on the purpose is to demonstrate if industrial and location specificities and industrial policy instruments matter in upgrading outcomes. The results show that transnational corporations drove automotive and electronics clusters in Buenos Aires and Penang respectively, while domestic firms dominated the origin of salmon and button clusters in Los Lagos and Qiaotou. Domestic organizations have been the prime drivers of upgrading in Los Lagos and Qiaotou. Whereas the meso organizations in Los Lagos adapt knowledge from frontier clusters abroad, they

are the basis of knowledge generation in Qiaotou. Whatever the differences, the role of government through institutional change has been critical in stimulating upgrading, but the extent and nature of intervention in the four clusters were industry and location specific. Although in recent years scholars have shown renewed interest in the technological development of emerging economies (e.g. Cuervo-Cazurra and Genc, 2008; Hobday, 2010; Kafouros and Wang, 2014; Kumaraswamy, et al. 2012), the catch-up process that allows emerging countries to upgrade their technological capabilities is not yet fully understood

Schoenecker and Swanson (2002) use a number of indicators to measure technological capability such as R&D expenditure, patent, and new product introduction in chemical industry, electronic industry, and pharmaceutical industry. They conclude that the intensity of R&D activity as the proxy indicator to measure technological capability of a firm has positive effect on sales and profit growth of the business. Jonker et al. (2006); Wang et al. (2006), and Ortega (2010) also state that technological capability has positive effect on firm performance. In addition, other empirical studies confirm that technological capability has positive correlation with firm performance (Madanmohan et al., 2004; Zahra et al., 2007). Therefore, the study hypothesized that;

H_3: Higher levels of technological upgrading capability increases firm performance

4.2 Theoretical framework

Kim (1997) integrates Utterback's three-stage model (1975) with his three-stage model (1980) to analyze the process of building technological capability (Figure 2-1) and to describe the TC development process in emerging countries. According to Kim's theory, during the early stage of the TC development, companies in emerging countries acquire mature (specific-state) foreign technology from MNCs since they lack adequate local production and innovation capabilities. Local companies develop their production processes through the acquisition of these 'packaged' foreign technologies. Companies merely assemble foreign inputs to produce standardized, undifferentiated goods. However, once companies have acquired the transferred technology, they make efforts to assimilate the transferred technology to manufacture more advanced and differentiated products. Companies repeat the process with higher-level technologies in the intermediate technology stage (growing technology). If they are successful in growing technology, companies may eventually accumulate indigenous TC to develop and generate the emerging technologies on their own and compete on leading-edge innovation with companies in advanced countries (Kim, 1997). Only few companies in emerging countries reach the third stage. For instance, in the early 1900s the origins of NEC were laid through a joint venture with Western Electric, an American telephone company, to transfer technology for exploitation in Japan. After the Second World War, NEC started to export indigenous technology to emerging countries in the Asia-Pacific region. With substantial R&D efforts, NEC gained a leading technology position by the 1970s and started to export technology to the US, the source of its initial technology provision. By the mid-1980s, NEC was eventually acclaimed a worldwide leader in its field of top-end mainframe and general- purpose computers. The nature of R&D changes through the progress in these three stages. Technological activities in the acquisition stage emphasize duplicative imitation, producing knockoffs and clones of the mature technology, normally without improvement of the technology. In the assimilation stage, the technological emphasis is creative imitation, producing facsimile products but with new features. In the third stage, indigenous innovation is essential (Kim, 1999). Most research in emerging countries supports Kim's idea that companies make efforts to master the transferred mature technologies and practice them efficiently, but

companies make no or only little improvement (Dahlman et al., 1987; Lall, 1987, 1990). Moreover, the TC development of companies generally follows this three-stage model, moving from acquisition to assimilation and finally to improvement (or innovation). Some researchers examined companies in Korea, such as Samsung, to provide further evidence for this model of the TC development process (e.g. Kim, 1997, 1999; Lee, 2001).

To summarize, Kim's theory of the TC development process is: In emerging countries, the state of technological capability develops from mature to growing and to emerging technology. Most companies in these countries are at the stage of mature technology; few reach the stage of emerging technology. There are clear and discernible boundaries between these three different stages. Technological capability must develop from one stage to the next, step by step. The main R&D activities of companies in emerging countries are acquisition and assimilation of the transferred mature technologies, not development of the mature technology**.**

5. Methodology

The study adopted ex adopt explanatory. This design was chosen because it applied closely to the research objectives of this study and was practical in testing the study hypotheses. The total population will be 25 banks within Nairobi CBD. From the 25 banks database, there is a total 225 head of departments. Using this Nassiuma (2000) formula a sample of 119 head of departments was selected using stratified random sample. The data collection instruments used in this study was a questionnaire. The researcher ensureed the content validity of the questionnaire by giving to the supervisor and other research experts to ensure that the questions test or measure what they are supposed to measure. The Cronbach's coefficient alpha was applied on the results obtained to determine how items correlate among them in the same instrument. Cronbach's coefficient Alpha of more than 0.7 was taken as the cut off value for being acceptable which will enhance the identification of the dispensable variables and deleted variables. Means and standard deviations was used to establish the typical average value or deviations in the distribution of independent variables. Multiple regressions to assess the relationship between the dimensions of TC as independent variables on first, organizational performance as dependent variable was conducted. The beta (β) coefficients for each independent variable will be generated from the model, will be subjected to a t –test, in order to test each of the hypotheses under study. The regression model will be used to test is shown below:

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon$$

Where, Y = bank performance
α = Constant
$\beta_1 \ldots \beta_4$= the slope representing degree of change in independent variable by one unit variable.
X_1= Technological operating capability
X_2 =technological acquiring capability
X_3 = technological upgrading capability
ε = error term

6. Results

This section opens with a section on the demographic description of participants who were involved in data collection. This was followed by reporting of data pertaining to the research objectives posed in this study and regression analysis.

Descriptive Statistics

The study adopted an 'average score approach' to calculate respondents' total score (Osborne, 2013). This approach aggregates and calculates only those items answered by the respondents (e.g., if five items are used to measure a scale and one item is missing, the syntax calculates the average of the four items answered). Therefore, it provides an accurate total score for each construct by eliminating the missing responses. The syntax used was "MEAN#.X (a,b,c…)" where X is the minimum number of items with a valid score. In order to use this method, a majority of items must be answered (Osborne, 2013). Table 4.16 shows the results on data transformation. From the findings, firm performance had the highest mean (3.95) followed by networking financing (3.57), followed by Technological operating capability (3.22) followed by technological acquiring capability (2.97), Hospital bed capacity had mean of (2.33) while facility level had the lowest (1.35). The standard deviations for the variables were less than 1 except Hospital bed capacity indicating less variation in the responses. Finally, all independent variables and the dependent variables were normally distributed as shown in Table 2 below. From the results in table 2, there is a positive and significant correlation between the independent variables and firm performance. Particularly, the correlation results showed that Technological operating capability has a positive and significant relationship with firm performance (r =0.619, ρ<0.01). Technological acquiring capability positively correlate with firm performance (r = -0.255, ρ<0.01). Moreover, results indicate that a network financing positively relates to firm performance (r =0.574, ρ<0.01).

Table 1: Descriptive and correlation statistics

n=216	Mean	Std. Deviation	Skewness	Kurtosis	1	2	3	4
1	3.73	0.63	-1.98	5.23	1			
2	3.22	0.59	-1.38	2.87	.619**	1		
3	2.97	0.78	-0.61	-0.08	.255**	0.122	1	
4	3.57	0.68	-1.67	3.39	.574**	.745**	0.13	1

1 = Firm performance
2 = Technological operating capability
3 = Technological acquiring capability
4 = Technological upgrading capability

Table 2: Hypothesis Testing (Direct effect, Hypothesis 2, 3, 4)

	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	2.07	0.20		10.62	0.00
Technological operating capability	0.48	0.08	0.45	6.37	0.00
Technological acquiring capability	-0.28	0.04	-0.35	-7.30	0.00
Technological upgrading capability	0.26	0.07	0.29	4.03	0.00
Model Summary					
R	0.73				
R Square	0.53				
Adjusted R Square	0.52				
Std. Error of the Estimate	0.43				
Model Fitness					
F	79.739				
Sig.	.000				

a Dependent Variable: Firm performance

7. Recommendation

Thus, in order for banks to acquire technology which enhance performance they need cooperate with scientific research institutions, suppliers, customer and other industries to develop technologies capable of increasing their sales.

8. Conclusion

Based on the above findings the study concludes that banks with high levels of technology capability (technological acquiring capability, technological acquiring and technological operating capability) improve banks performance. The findings from this study contribute to the empirical research on the relationship between IT capability and organizational performance of Kenyan banks. It was identified that adopting IT has helped Nigerian banks to streamline the back office operations by improving both efficiency and cost reduction. Advances in technology also influence the way bank services are delivered with the aim of making it more convenient for customers. Thus, in order for banks to acquire technology which enhance performance they need cooperate with scientific research institutions, suppliers, customer and other industries to develop technologies capable of increasing their sales.

Regression Assumptions

Statistical assumptions were tested to establish if the data met the normality, heteroscedasticity, linearity, multicollinearity and autocorrelation assumptions. It was on the basis of these results, that the tests of associations and prediction were performed. For the purposes of this study, normality tests were performed by utilizing the commonly used

methods namely the Kolmogorov-Smirnov and Shapiro-Wilk tests (Ghasemi & Zahediasi, 2012). Evidently, the results confirmed that normality of the data was not a problem because tests of K-S and S-W of all the variables were not significant. Hence, the data distribution in the study was reliable for multivariate analysis. Heteroscedasticity was measured by Levene's test. The findings revealed that basing on Levene statistic, homoscedasticity is not a problem for all the variables, p-value > .05. This essentially means that there is a linear relationship and there is no need to have a non-linear data transformation or quadratic term to fix.To conduct the heteroskedasticity test, this study uses Breusch-Pagan and Koenker test. The findings indicated that Chi2 (1) was 6.60 which was less than p value of 0.16 and Koenker test indicated that Chi2 (1) was 6.22 which was less than p value of 0.18 revealing that null hypothesis was not rejected suggesting that assumption of constant variance was not violated. Normally, tests of linearity are done using scatter plots and analysis of Variance (ANOVA). When ANOVA is employed in testing the assumption of linearity, the rule of thumb is that if the ρ – value is less than 0.05, then the relationship between independent and dependent variables is said to be linear and deviation from linearity have a ρ – value greater than 0.05 (Hair *et al.*, 2010; Garson, 2012). Evidently, all the relationships indicated that they are linear, thus, can be considered reliable for regression analysis in the study. Multicollinearity was tested using Variance Inflation Factor (VIF), The findings revealed that the VIF values for all the independent variables were below 10. This means that for all the independent variables, there was no presence of multicollinearity. The Durbin Watson (DW) statistic is used test for autocorrelation in the residuals from a statistical regression analysis. The results indicated a significant autocorrelated relationship between all the independent variables and firm performance. This implied non-violation of the autocorrelation assumption.

Hypothesis Testing

A multiple linear regression analysis was performed to calculate the coefficients of independent variables with firm performance. The combined prediction of all the variables accounted for approximately 53% of the total variation in firm performance (R^2 = .53). The ANOVA model showed that the prediction of the independent variable as depicted in Table 2 was statistically significant (F =79.739, ρ=.000). Thus, the model was fit to predict firm performance using Technological capability.

Hypothesis 1(H_1) predicted that higher levels of technological operating capability increases bank performance. the results presented in Table 2 showed a positive and significant association between Technological operating capability and firm performance as indicated by all the positive β=.48 and significance value of less than .05 (ρ<.05). Therefore, based on these results, the hypothesis was accepted. These results were backed by Terjesena et al., (2011) and Peng et al., (2008) argument that Superior operations capabilities have long been recognized as a source of competitive advantages and superior performance outcomes . It argues that a firm can achieve competitive advantage by handling an efficient material flow process, careful utilization of assets, and acquisition and dissemination of superior process knowledge (Tan et al., 2007). The findings are also supported by Terjesena et al. (2011) found that that firm performance (such as sales growth, return on sales, and return on assets) is significantly predicted by technology operations capabilities that promote low operating costs and product quality. The results are also similar with Rosenzweig et al. (2003) found that enhanced competitive capabilities (such as product quality, cost, process flexibility, and delivery reliability) generally improve business performance. Using archival data of 102 UK-based logistics companies, Nath et al.

(2010) also found that operations capability significant impacts business performance (such as profitability).

Hypothesis 2(H_2) stipulated that higher levels of technological acquiring capability increase bank performance Findings showed that technological acquiring capability had coefficients of estimate which was significant basing on β3 = -0.28 (p-value = 0.00 which is less than α = 0.05 hence it was concluded that technological acquiring capability had a positive and significant effect on firm performance. Therefore, based on these results, the hypothesis was accepted. The findings are supported by a study by Sears and Hoetker (2012) who indicated that the performance of technological acquisitions depends heavily on the overlap between the knowledge bases of the target and acquirer. Similarly, the results coincided with much of the foundational research on technological acquisitions examined the relationship between acquisition performance and the amount of overlap between the technological knowledge bases of the target firm and acquiring firm (Ahuja & Katila, 2001; Kapoor & Lim, 2007; Graebner, Eisenhardt, & Roundy, 2010).

Hypothesis 3(H_{o3}) postulated that higher levels of technological acquiring increase bank performance. However, the results presented in Table 2 showed a positive and significant association between technological operating capability and firm performance as indicated by all the positive β=.26 and significance value of less than .05 (ρ<.05). Therefore, based on these results, the hypothesis was accepted. The findings are related with Schoenecker and Swanson (2002) finding that technological capability of a firm has positive effect on sales and profit growth of the business. Jonker et al. (2006); Wang et al. (2006), and Ortega (2010) also state that technological capability has positive effect on firm performance. In addition, other empirical studies confirm that technological capability has positive correlation with firm performance (Madanmohan et al., 2004; Zahra et al., 2007

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