

# Analysing pro-poor innovation acceptance by income segments

Analysing pro-poor innovation acceptance

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Received 28 September 2019  
Revised 26 December 2019  
Accepted 21 February 2020

## Abstract

**Purpose** – To enhance the understanding of the moderating influence of different bottom of the pyramid (BOP) income segments on the antecedents of pro-poor innovation acceptance.

**Design/methodology/approach** – In this study, 320 BOP consumers with a range of low-to-moderate literacy and low-income levels were used as a convenience non-probability sample for undertaking quantitative analyses.

**Findings** – Only the influence of perceived usefulness on intention is moderated by income segments, such that the effect will be stronger for low-income BOP segment. Moreover, the influences of relative advantage, compatibility and observability on intention are moderated by income segments.

**Practical implications** – This empirical work has considerable private sector and public policy implications for companies and government designing/selling products for millions of poor people in developing and emerging economies.

**Originality/value** – This study contributes originally to knowledge in the subject area as there are very few studies that clearly and systematically analyse the key antecedents influencing the adoption intention of pro-poor technological innovations in the BOP market.

**Keywords** Bottom of the pyramid consumers, Innovation acceptance, Income segments

**Paper type** Research paper

## Introduction

Two-thirds of the world's population live in developing or least developed countries. A vast majority of the population from this part of the world are low-income individuals. They are scattered across several continents, predominantly in Asia, Africa and Latin America and are inhabitants of developing nations such as Bangladesh, Kenya and Venezuela. This consumer segment has become known as the bottom of the pyramid (BOP). Consumers belonging to the BOP are often disenfranchised in not having enough education or literacy, access to basic health care and voice of participation in the national life through mainstream media. They are also in some cases geographically isolated, and their weak position as consumers is exacerbated by inexperienced consumption practices (Prahalad, 2005). Extant literature further posits that the BOP is dramatically different from the middle- and high-income consumers owing to the various infrastructural challenges, political instability, economic constraints (e.g. low GDP, high inflation) to which they are subject (Prahalad, 2005; Rogers, 2003; Nwanko, 2000; Johnson *et al.*, 2007; Eifert *et al.*, 2005). To address the variety of challenges that are faced by the BOP, innovations must be made. Interventions and innovations ought to be tailored for this market addressing its unique characteristics and needs. Moreover, some innovations may have more developmental impact in improving the



life of the poor as opposed to other innovations or products. Ramani *et al.* (2012, p.678) identified these innovations as pro-poor innovations and define pro-poor innovation as “those that cater to the essential needs of the poor such as healthcare, housing, food, water, and sanitation or enhance productivity and income generation capacity”. Increasingly economically able segments of BOP customers are having needs, which are not well served within many categories. However, this is changing as organisations are realising the economic potential of tackling and meeting those needs. This raises some interesting questions as to how organisations can begin to satisfy the BOP consumer needs more readily, and create product offerings, which will be accepted in this space. Although many marketing academic papers offer insights into innovation acceptance in developed economies – that of in Europe, Japan, the United States and the United Kingdom (e.g. Shih and Venkatesh, 2004; Plouffe *et al.*, 2001), the literature on BOP markets and the developing countries context is sparse. It can be assumed that this is so owing to the lack of economic importance of these regions in the bygone eras.

The first wave of studies concerning the spread of innovation and its adoption in developing countries took place in the 1960s (e.g. Rahim, 1961; Deutchmann and Borda, 1962). These studies were called diffusion studies, and in the 1960s the American rural sociologists launched such studies on an international scale. These international studies were mainly focused on agricultural development, and consequently the topic of farming innovations was mostly explored (Rogers, 2003). As agricultural innovations were the focus of these studies, farmers and villagers became, ostensibly, the unit of analysis in these rural studies. Technological innovations such as wireless devices – mobile telephones to be precise, personal digital assistants (PDAs), PC kiosks and mobile banking – have been and are being widely used by the BOP. This phenomenon has surprised many managers and researchers. The cost, infrastructure and other barriers that exist within the BOP context can potentially be surmounted by the application and usage of such information and communication technology (ICT). ICT also ensures development in the developing country *vis-a-vis* BOP context. To enable the BOP consumers’ efficient access to banking services, ICT is being harnessed to bring forth financial services via mobile platforms (Berger and Nakata, 2013).

However, there are very few studies that clearly and systematically analyse the key antecedents influencing the adoption intention of pro-poor technological innovations in the BOP market.

Technology acceptance behaviour in developing country settings has been explained by several theories and models. These models, however, are limited in their explanatory power as they do not expand on all the variance. In the case of the universe of the BOP, there are many contextual real-world factors that should be considered (Sun and Zhang, 2006). A lack of deeper insight with regard to the moderating factors may be responsible for the limited explanatory power. Adam *et al.* (1992) highlight the importance of examining the moderating factors. There are several studies (e.g. Lucas and Spitler, 1999; Venkatesh *et al.*, 2003) that also recommend the inclusion of moderating effects. Agarwal and Prasad (1997) criticised the absence of moderating factors in the technology acceptance model (TAM). It was found by Venkatesh *et al.* (2003) that the explanatory power of each model enhanced after they included moderating factors. To this effect they tested eight models. In order to understand better how BOP consumers effectively and successfully adopt pro-poor innovations, an understanding of the influence of the moderating factors on the antecedents of innovation acceptance, therefore, maybe important.

Rangan *et al.* (2011, p. 114) held that “The 4 billion people at the base of the pyramid whose output represents one-third of the world’s economy-are not a monolith”. Therefore, Rangan *et al.* (2011) enjoin the significance of segmenting the BOP. There is almost no empirical research about innovation adoption across different BOP segments. This research adds to the

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existing body of knowledge by understanding the moderating influence of different BOP income segments on the antecedents of pro-poor innovation acceptance.

### **BOP segments**

Rangan *et al.* (2011) segmented the BOP into three segments: 1) low income segment, 2) subsistence segment and 3) extreme poverty segment.

#### *Low-income segment*

The low-income segment consists of people who live on \$3–\$5 a day (Rangan *et al.*, 2011). The segment is 1.4 billion strong. Although they are deemed very poor, many of them are generating significant discretionary income that allows them to own consumer goods such as bicycles, cell phones and television sets (Rangan *et al.*, 2011). Consumers in this segment also attempt to obtain an education and, in comparison to other BOP segments, have work that pays better and is relatively more stable. This segment, consequently, needs better housing, acceptable health care and access to credit.

#### *Subsistence-income segment*

The subsistence-income segment is constituent of people who live on \$1–\$3 a day (Rangan *et al.*, 2011). The income earned by this segment is mostly spent on essential products or services that must be had to maintain a life (Rangan *et al.*, 2011). Their income is unsteady and majority of the segment is obliged to derive an income from menial work (such as that of a day labourer) and temporary work. Consumers from this segment can afford one proper meal a day, and the nutritional content of that meal is substandard in most cases. They borrow money frequently from informal money lenders at a high interest rate and are often exploited by them.

#### *Extreme poverty segment*

This segment relates to those consumers who live on below \$1 a day (Rangan *et al.*, 2011). Approximately 1.6 billion make up this segment. The extreme poverty segment finds it hard to meet the most basic needs such as adequate shelter, enough food and clean water. They are often even beyond the fringes of the organised economy of a nation and are in that situation owing to lack of education, lack of any financial resources and absence of marketable skills. Since this segment struggles to meet their basic needs, they are unable to spend money on technology. Since technology is out of bounds for this segment, only low-income and subsistence-income segments' antecedents, which lead to intention toward using pro-poor technology, were explored in this research. In the sections that follow we will discuss the theoretical bases and the conceptual framework for this research before specifying the research hypotheses.

### **Theoretical bases and conceptual framework**

TAM and diffusion of innovation model (DOI) are two seminal areas of work on consumers' innovation adoption. These two seminal works provide theoretical guidance to this study. DOI was identified as a landmark work in the field and founded as a standard introduction of diffusion study. Moreover, DOI is the most widely recognised academic work on innovation adoption, which was more generic to the adoption of various kinds of innovations. DOI has been implemented and has progressed to serve the innovation study across consumer and business domains.

Rogers (1995, 2003) acknowledged the key characteristics of innovations that affect innovation adoption decisions of consumers. According to Rogers (1995, 2003), the process of innovation refers to the mental process through which an individual passes from hearing about an innovation to final adoption. Rogers continued with another important definition regarding process of diffusion, which is the spread of an innovation within a social system of potential adopters (Rogers, 1995, 2003). In this theory, Rogers (1995, 2003) gives some attributes that affect adoption, that is, relative advantage, compatibility, complexity, triability and observability. In the same way, TAM, another seminal work on the consumers' acceptance of innovation, was proposed by Davis (1989). The main contribution of TAM was in recognising two antecedents. These two antecedents were the perceived ease of use (PEU) and the perceived usefulness (PU).

Aside from the TAM model, it has been posited that through observational learning, new or innovative technology can be adopted. There is evidence from research that observational learning can help research subjects adopt technology both in laboratory and in real market settings (Song and Walden, 2003). When it comes to innovation or technology adoption, decision-makers often become actuated by a herd pressure: they observe another person using an innovation or technology, and as more and more use the technology they believe the innovation is conferring benefit to the adopters, and therefore the innovation is adopted. This is particularly true for complex products such as IT-enabled services or IT products (Walden and Browne, 2009). Now it appears that the model proposed by Walden and Brown of observational learning to explain technology adoption decisions is not likely to contradict the antecedents of TAM model. Several of the hypotheses discussed further raise the issue of PU, and the model suggested by Walden and Brown would have corroborated that through observation that the BOP may judge the usefulness of adoption before adopting the innovation in question.

### Research hypotheses

To examine the moderating effect of low-income segments and subsistence-income segments on the antecedents suggested by TAM model, we proposed the following hypotheses.

- H1.* Influence of perceived usefulness on intention will be moderated by BOP income segments.
- H2.* Influence of perceived ease of use on intention will be moderated by BOP income segments.

To examine the moderating effect of low-income segments and subsistence-income segments on the antecedents suggested by DOI model, we proposed the following hypotheses.

- H1.* Influence of relative advantage on intention will be moderated by BOP income segments.
- H2.* Influence of complexity on intention will be moderated by BOP income segments.
- H3.* Influence of compatibility on intention will be moderated by BOP income segments.
- H4.* Influence of trialability on intention will be moderated by BOP income segments.
- H5.* Influence of observability on intention will be moderated by BOP income segments.

### Method

Generally the BOP population have a lower literacy rate. Consequently, several issues are relevant during the administration of this survey. When it comes to conducting studies, the

BOP consumers are difficult to recruit as subjects of studies leading to restricted sample sizes and the need for careful administration procedure. [Viswanathan et al. \(2009\)](#) argue that several issues such as the poor reading and writing abilities of the BOP, careful personal administration of the respondents by well-trained interviewers and the use of realistic stimuli and tasks that respondents can relate to relating to their own their life experiences are central here. Therefore, on this occasion, face-to-face survey was identified as the most efficient data collection method for this research.

These face-to-face surveys were administered verbally (e.g. [Davis et al., 2008](#)), and visual stimuli (i.e. different-sized boxes or pictorial symbols presenting level of agreement) for Likert-type scales (e.g. [Martini and Page, 1996](#)) were used in this study. Bangladesh was chosen as the research environment for this study because it has large segments of BOP consumers in each category that had been identified. Additionally, bKash, a mobile banking service, which provides 24 h banking services to BOP consumers of Bangladesh through mobile platforms, was chosen as a unit of investigation. bKash was chosen because at the time of the study, its adoption of innovation among the BOP consumers was emerging. bKash provides services such as cash in, cash out and new account opening through the use of mobile phones. For this research, bKash mobile banking was considered to examine our hypotheses. In this study, 320 BOP consumers with a range of low-to-moderate literacy and low-income levels were used as a sample. Finally, 311 responses could be utilised for this analysis (as nine responses were considered invalid since participants skipped some items). As mentioned earlier, owing to impediments that are posed by BOP consumers, the study was difficult to conduct; therefore, convenience non-probability sampling was used for this study. For the purpose of data analyses, partial least squares statistical method commonly known as PLS ([Lowry and Gaskin, 2014](#)) was used due to its suitability in analysis that would generate utilisable findings.

## Measures

Previous literature was first reviewed to identify relevant measurement instruments. Therefore, items, validated in previous researches adapted to technologies and consumer studies, are borrowed from previous literature. The list of these instruments and their sources is provided in [Table 1](#).

The majority scale in the questionnaire of this study was Likert scale, which is a form of multichotomous questions as well as an itemised rating scale. Respondents were asked to rate their responses to items along a continuum from strongly disagree to strongly agree or negative end to positive end ([Chisnall, 2001](#)). Previously, the Likert scales were used and showed good reliability in many studies. It provides respondents more freedom in response and delivers information about the degree of respondent's feelings ([Chisnall, 2001](#)). Seven-point Likert scale is more spread than the five-point Likert scale, and respondents will have more choices available than five-point Likert scale. This also prevents respondents' bias by choosing a neutral value. Therefore, seven-point Likert scale was used for majority of constructs. We also evaluated the moderating influences of subsistence BOP segments and low-income segments, coded as 0/1 dummy variable.

### *Testing reliability and validity of constructs*

The reliability and validity of reflective constructs were tested through the use of PLS by running a bootstrap of seven models using 500 samples. Therefore, confirmatory factor analysis (CFA) was conducted as part of the PLS run. Firstly, convergent validity was tested by identifying whether the items were loaded with significant values on their theoretical constructs. In this test, all reflective indicators represent significant value at the 0.05 level.

Adoption intention	(1)	Given the opportunity, I will use bKash mobile banking services	Schierz <i>et al.</i> (2010)
	(2)	I am likely to use bKash mobile banking services in the near future	
	(3)	I am willing to use bKash mobile banking services in the near future	
	(4)	I intend to use bKash mobile banking services when the opportunity arises	
Perceived usefulness	(1)	bKash is a useful mode of payment	Schierz <i>et al.</i> (2010)
	(2)	Using bKash makes the handling of payments easier	
	(3)	bKash allows for a faster usage of mobile applications (e.g. money transfer, cash in, cash out)	
	(4)	By using bKash, my choices as a consumer are improved (e.g. flexibility, speed)	
Ease of use	(1)	It is easy to become skilful at using bKash	Schierz <i>et al.</i> (2010)
	(2)	The interaction with bKash is clear and understandable	
	(3)	It is easy to perform the steps required to use bKash	
	(4)	It is easy to interact with bKash	
Relative advantage	(1)	bKash offers advantages that are not offered by competing products	Cooper and Kleinschmidt (1987)
	(2)	bKash is, in my eyes, superior to competing products	
	(3)	bKash solves a problem that I cannot solve with competing products	
Complexity	(1)	Working with bKash is complicated, it is difficult to understand what is going on	Cheung <i>et al.</i> (2000)
	(2)	Using bKash involves too much time doing mechanical operations, that is, data input, understanding menu	
	(3)	It takes too long to learn how to use bKash to make it worth the effort	
	(4)	In general, bKash is very complex to use	
Compatibility		Using bKash fits well with my lifestyle	Schierz <i>et al.</i> (2010)
		Using bKash fits well with the way I like to purchase products and services	
Triability		I would appreciate using bKash instead of alternative modes of payment (e.g. credit card, cash)	Zolait (2009)
		Before deciding on whether or not to use bKash, I want to be able to use it on a trial basis	
		Before deciding on whether or not to use bKash, I want to be able to properly try it out	
Observability		I want to be permitted to use bKash, on a trial basis for some time long enough to see what it can do	Meuter <i>et al.</i> (2005)
		I would have no difficulty telling others about the results of using bKash	
		I believe I could communicate to others the outcomes of using bKash	
		The results of using bKash are apparent to me	

**Table 1.**  
List of instruments and their sources

Later, *t*-values of the outer loadings of these indicators were examined and all the outer loadings were significant at the 0.05 level. The results of convergent validity tests are provided in the following tables (see [Tables 2 and 3](#)).

*Results of convergent validity.* After establishing convergent validity, the reliability of reflective constructs was tested. Reliability is defined as the degree to which a scale presents consistent and stable measures and it is applicable only for reflective indicators. PLS computes composite reliability score, which has similarity to Cronbach's alpha in that they both measure internal consistency (Lowry and Gaskin, 2014). In this research, each reflective

Items	T-statistics
AttitudebKash_1_Bad_Good → Attitude	13.791*
AttitudebKash_2_Negative_Positive → Attitude	13.587*
AttitudebKash_3_Unfavourable_Favourable → Attitude	9.945*
AttitudebKash_4_Unpleasant_Pleasant → Attitude	23.765*
Ease_of_use_1 → ease of use	22.517*
Ease_of_use_2 → ease of use	40.339*
Ease_of_use_3 → ease of use	32.712*
Ease_of_use_4 → ease of use	10.309*
Intention_1 → Intention	25.044*
Intention_2 → Intention	9.512*
Intention_3 → Intention	50.912*
Intention_4 → Intention	23.417*
Usefulness_1 → Usefulness	18.85*
Usefulness_2 → Usefulness	13.335*
Usefulness_3 → Usefulness	14.045*
Usefulness_4 → Usefulness	19.654*

**Note(s):** \* $p < 0.05$

**Table 2.**  
T-statistics for convergent validity of TAM

Items	T-statistics
Compatibility_1 → Compatibility	34.731*
Compatibility_2 → Compatibility	39.244*
Compatibility_3 → Compatibility	29.023*
Complexity_2 → Complexity	2.851*
Complexity_3 → Complexity	3.315*
Complexity_4 → Complexity	3.442*
Intention_1 → Intention	24.968*
Intention_2 → Intention	10.099*
Intention_3 → Intention	55.847*
Intention_4 → Intention	24.442*
Observability_1 → Observability	4.822*
Observability_2 → Observability	11.111
Observability_3 → Observability	14.596*
Relative_advantage_1 → Relative advantage	73.852*
Relative_advantage_2 → Relative advantage	130.805*
Relative_advantage_3 → Relative advantage	56.457*
Trialability_2 → Trialability	4.22*
Trialability_3 → Trialability	6.018*

**Note(s):** \* $p < 0.05$

**Table 3.**  
T-statistics for convergent validity of DOI

construct presented a level of reliability well above the recommended threshold of 0.70 (Chin, 1998). The results of testing reliability are provided in the following tables (see Tables 4 and 5)

Now, to test the discriminant validity of reflective constructs, the correlation of individual constructs with each other was measured, and these correlations were compared with the AVE square roots for each construct. Smart PLS measures AVE by computing the variance shared by each item of a particular construct. Therefore, discriminant validity of the key seven models is represented in the following tables. The diagonal numbers of these tables represent the square roots of the AVE. The diagonal numbers require to be greater than the off-diagonal numbers for the same row and column (not the AVE values) to ensure the discriminant validity. Strong discriminant validity for each construct was presented through



this analysis, and it further confirms our options of retaining and dropping items (see [Tables 6 and 7](#)).

*Tests of hypotheses.* The research hypotheses are tested in this section. Tables 8 and 9 represent findings of the hypotheses of TAM and DOI model, respectively.

The following findings of TAM model are revised model after dropping insignificant variables.

We can see from the aforementioned table that only the influence of PU on intention is moderated by income segments, such that the effect will be stronger for low-income BOP segment.

We can see from the findings of [Tables 8 and 9](#) that the influences of relative advantage, compatibility and observability on intention are moderated by income segments. In detail, the influence of compatibility on intention is moderated by income segments such that the effect

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**Table 4.**  
Reliability of TAM

Constructs name	Composite reliability
Attitude	0.826
Ease of use	0.863
Intention	0.888
Usefulness	0.828

**Table 5.**  
Reliability of DOI

Constructs name	Composite reliability
Compatibility	0.888
Complexity	0.893
Intention	0.888
Observability	0.763
Relative advantage	0.951
Trialability	0.804

**Table 6.**  
Discriminant validity of TAM

	Attitude	Ease of use	Intention	Usefulness
Attitude	0.737			
Ease of use	0.405	0.784		
Intention	0.489	0.377	0.816	
Usefulness	0.406	0.456	0.402	0.739

**Table 7.**  
Discriminant validity of DOI

	Compatibility	Complexity	Intention	Observability	Relative advantage	Trialability
Compatibility	0.852					
Complexity	-0.045	0.859				
Intention	0.515	-0.05	0.816			
Observability	0.6	0.001	0.427	0.724		
Relative advantage	0.556	0.001	0.289	0.303	0.931	
Trialability	0.008	-0.073	0.14	0.1	-0.052	0.82



is greater for subsistence consumer segment. Influence of relative advantage on intention is also moderated by income segments such that the effect is greater for low-income BOP consumer segment. Influence of observability on intention is moderated by income segments such that the effect is greater for low-income BOP consumer segment.

**Discussion and managerial implications**

According to Easterlin (1974), high incomes do correlate with happiness, but over the long run increased income does not correlate with increased happiness. Also, increased income does not correlate with increased happiness, and this is only true for people who have sufficient income to meet their basic needs. However, BOP segments do not have sufficient income to meet basic needs properly; therefore, higher income is correlated with higher happiness. Kahn and Isen (1993) argue that happy persons are most likely to save and spend different parts of their income, to allocate differently over time and to adopt different combination of products than do less happy persons. In the case of adopting different new products, product benefits such as relative advantage, observability, compatibility and usefulness influence the adoption decision of consumers (Rogers, 2003; Davis, 1989), and this is consistent with our findings. We can clearly see that higher income leads to happiness for BOP consumers and happiness leads to more consumption by looking into relative advantage, observability and usefulness of products. In our research, it is found that the influence of relative advantage and usefulness on intention is greater for low-income consumer segments (live on \$3–\$5 a day) because higher income and happiness lead to seek more product benefits such as relative advantage and usefulness. Similarly, the influence of observability on intention is greater for low-income segments because their higher income and happiness lead them to see more benefits and positive attributes of pro-poor innovation. On the other hand, subsistence BOP

Dependent variable: Intention	R <sup>2</sup>	Adjusted R <sup>2</sup>	Beta
Income segments → Intention	47.90%	47.30%	0.141*
Interaction effect: Income segments (Product indicator) → Perceived usefulness → Intention			0.486*
Perceived ease of use → Intention			0.194*
Perceived usefulness → Intention			0.295*

**Note(s):** \**p* < 0.05

**Table 8.** Findings of TAM model

Dependent variable: Intention	R <sup>2</sup>	Adjusted R <sup>2</sup>	Beta
Compatibility → Intention	72.20%	71.50%	0.356*
Income segments → Intention			0.064
Interaction effect: Income segments (Product indicator) → Compatibility → Intention			-0.43*
Interaction effect: Income segments (Product indicator) → Observability → Intention			0.692*
Interaction effect: Income segments (Product indicator) → Relative advantage → Intention			0.248*
Observability → Intention			0.145*
Relative advantage → Intention			0.093
Trialability → Intention			0.139*

**Note(s):** \**p* < 0.05

**Table 9.** Findings of DOI model

segment (living on \$3–\$5 a day) represents lower income than low-income segment (living on \$3–\$1 a day). Rangan *et al.* (2011) argue that subsistence BOP segment spends mainly on essential products or services, and it represents that this segment is more concerned about compatibility of pro-poor innovation than low-income segment. Therefore, we can argue that subsistence BOP segment is more concerned about compatibility of pro-poor innovation than low-income BOP segment, and this is consistent with our findings.

This empirical work has considerable private sector and public policy implications for companies and government designing or selling products for millions of poor people in developing and emerging economies. Understanding the adoption behaviour based on BOP segments will enable the corporations and governments to ensure successful adoption of pro-poor innovation. For instance, if companies are designing pro-poor innovation for subsistence BOP segments, then they should ensure compatibility of pro-poor innovation for successful adoption by the relevant consumers of various income segments. Income segments are important in marketing because of segmentation, targeting and positioning exercises that take place in the practice of marketing on a regular basis, as it is the case for BOP consumers (Rangan *et al.*, 2011). In contrast with the developed countries (Angot and Plé, 2015), for the policymakers in the developing society, working effectively with the poor is a major concern as it fulfils the government's development and growth promise to the citizens in the developing world (Agnihotri, 2017; Hasan *et al.*, 2017; Lowe *et al.*, 2018; Shams, 2016a; Shams, 2016b; Shams *et al.*, 2018).

### Conclusion

While we apply the models utilising PLS for the product bKash in Bangladesh, we can see from the findings that only the influence of PU on intention is moderated by income segments, such that the effect will be stronger for low-income BOP segment. Moreover, we also see that the influences of attributes such as relative advantage, compatibility and observability on intention are moderated by income segments.

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