

THE DRIVERS OF CHOOSING THIRD-PARTY LOGISTIC (3PL) PROVIDERS: A FRAMEWORK MODEL USING STRUCTURAL EQUATION MODELING

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ABSTRACT

Logistics management is termed as the detailed process of planning, implementing, and controlling the efficient, cost effective flow and storage of materials and products, and related information within a supply chain to satisfy demand, and logistics is recognized as the key enabler that allows a company to increase and maintain its competitive advantage and ensure maximum customer satisfaction. The company which uses 3PL method is called the provider. It indicates the company that provides logistics services for its customers. The main objective is how 3PL can provides the customer service to the customers with consider the services. However, the problem found that not all managers use the all logistics service into the same priority. It means that logistics decisions depend on preference of managers. Thus, this paper attempts to elaborate the factors affecting the decisions to choose 3PL based on manager's perspective using Structural Equation Modeling (SEM). There are some methods to measure the relation between preference of manager and the 3PL decision, such as Analytical Hierarchy Process, Multiple Logistic Regression, and SEM. In this paper, we attempt to explore the variables that drives managers to choose 3PL for their logistics activities.

Keywords: Logistics, 3PL, SEM, customer service

1. INTRODUCTION

Nowadays, business competition among the factories in Indonesia starts to increase sharply. Sohal and Rahman (2013) described that over past 2 decades, there is a massive growth in the Asia – Pacific region in terms of manufacturing and logistics and supply chain activities. China and other nations in South East Asia have now emerged as a new power – house of manufacturing. In the 21st century, manufacturing activity is becoming a very different game, not only because of the availability of new and advanced manufacturing technologies and practices, but also because of location and resources (human and materials). Limited resources force the companies to do outsourcing in their part or full logistics activities. Utilization of 3PL in supply chain activities may give advantages to the company in term of 3PL specialization in scale, know-how, searching ability, IT skills and the risk of uncertain business environment (Tezuka, 2011). Therefore, the role of 3PL provider selection

is the important aspect in considering 3PL utilization.

Boysen et al. (1999) investigated the relationship between business activities and 3PL by surveyed logistics managers and found that the prerequisites for a successful 3PL operations are: non – biased identification of 3PL providers, evaluation of costs and improvements, sound contracts, centralized control, and proper monitoring of the 3PL operations. The most reasoning consideration in using 3PL in the logistics activities is gaining a better customer satisfaction. The decisions of having a relationship with 3PL providers is not only about minimizing costs but it is all about the focus on the core of the business.

Information Technology (IT) can be used in Supply Chain Management to achieve a competitive edge (Bowersox and Daugherty 1995, Powell and Dent-Micallef 1997). It means that IT is one of the important part of 3PL facilities which can increase respon to the customer. At the same time, customer relationship management is used to gain competitive advantage (McHugh et al. 2003,

Whipple and Frank 2000). Customer relationship management is related to trust of customers. Trust is considered “a critical factor fostering commitment among supply chain partners. The presence of trust improves measurably the chance of successful supply chain performance. A lack of trust among supply chain partners often results in inefficient and ineffective performance as the transaction costs (verification, inspections and certifications of their trading partners) mount” (Kwon and Suh 2004, 4).

Ghijssen et al. (2009) investigated that more of 3PL functions is associated with higher service performance levels. A better service performance increases the perception of trust. Trust leads to customer satisfaction and customer satisfaction leads to loyalty. Service performance alone does not lead to customer satisfaction; there is no direct linear effect on customer satisfaction. The difference between this study and previous research is not talking about loyalty but aim to investigate the relationships of 3PL and customer satisfaction. This paper attempts to elaborate the factors affecting the decisions to choose 3PL based on manager’s perspective using SEM

2. THEORETICAL BACKGROUND

The concept of supply chain management encompasses holistic integration of multiple upstream and downstream processes in the provision of goods and services. While the terms “supply chain management” and “logistics management” are often interchangeably, the latter is generally understood to have a narrower focus – the internal integration of processes within a firm. Logistics management has significant impacts on the costs and customer satisfaction of manufacturing firms. It may even give an organization competitive advantages in the market. Third party logistics (3PL) is the employment of outside companies whose expertise is in the logistics area of handling a firm’s logistical processes. With the increasing emphasis on downsizing and outsourcing in today’s global economy, 3PL is being embraced by many firms. These outside companies are called 3PL providers.

By outsourcing logistics functions to 3PL providers, companies can focus on their core activities and leave logistics functions to 3PL providers to manage.

Lieb (1992) defines 3PL as involving “... the use of external companies to perform logistics functions that have traditionally been performed within an organization. The functions performed by the third party can encompass the entire logistics process or selected activities within that process.” 3PL providers add value to their customers by providing services that range from transportation activities to integrated warehousing, distribution, forwarding, packaging, customs handling, kitiing, and information management activities. As the adoption of outsourcing of logistics functions has increased, so has the research on this phenomenon. Logistic is one of the important thing in firm source globally. Carter (2005) described five principal motives in logistics especially in procurement involved establish, plan, and execute global procurement. Firstly, achieve cost-effective growth in the supply base for goods, service, and technologies in their value chains. Secondly, focus on core competencies and reduce capital investment. Thirdly, match the outsourcing activities and reduce capital investment. Fourthly, improve non-competitive cost structures. Fifthly, establish a future sales footprints in a low-cost country.

These are the advantages cited for companies using 3PL: 1) 3PL enables user firms to gain competitive advantages (Daugherty et al., 1995), 2) 3PL providers have the expertise to do their job more effectively (Troyer et al. 1995, Richardson 1993, Dillon 1989), 3) 3PL providers have better processes and resources to handle operation (Byrne 1993, Richardson 1990, Bask 2001), 4) 3PL can assist user firm to save on their logistics costs (Kasilingam, 1998).

Many researches have explored the reasons for the growth in 3PL. Due to expansion of global markets, each firm has to develop and provide better products and services while reducing operating costs to allow them to gain competitive advantage.

Third party logistics providers can enhance value creation for customers,

leading them to become more competitive and profitable through speedy and superior customer service (Daugherty and Pittman, 1995). The companies have been forced to focus on their core competencies and furthermore to outsource non-core activities, for the sake of the increasing competition, globalization, customer demands, and pressure of cost reduction. This study uses the definition by Africk and Calkins (1994) of third party logistics: *"a relationship between a shipper and third party which, compared with basic services, has more customized offerings, encompasses a broader number of service functions and is characterized by a longer-term, more mutually beneficial relationship"* (Murphy and Poist 1998, 26).

The shipper refers to the party that either sends or receives the goods; the source or destination of the goods. Longer-term, mutually beneficial relationships suggest possible benefits from incorporating relationship marketing theory into the study of third party logistics (Stock 1997, 2002).

The Role of Information Technology (IT)

Information technology is important in developing logistics services in a customized supply chain environment. In current research, information technology in the logistics area has been intensively investigated (Evangelista and Sweeney 2006, Gammelgaard and Larson 2001, Van Hoek 2001). Porter and Millar (1985) suggested that the diffusion of IT into the activities of the supply chain strengthened its value-creating potential.

According to Brandyberry et al. (1999), IT has the potential to manage the flow and to influence many of the dimensions of the supply chain such as cost, quality, delivery, flexibility and responsiveness, and thereby increase the profits of the firm. As noted by Sauvage (2003), technological effort has become a critical variable in a highly competitive business characterized by time compression. IT seems of critical importance in determining the final success in managing the supply chain and is a necessary factor in the survival of supply chain management projects (Auramo et al. 2005, Handfield and Nichols 1999).

One of the advantages of IT is communication. For many companies, email

is the principal means of communication between employees, suppliers and customers. Email was one of the early drivers of the Internet, providing a simple and inexpensive means to communicate. Over the years, a number of other communications tools have also evolved, allowing staff to communicate protocol (VOIP) telephones and smart-phones offer even more high-tech ways for employees to communicate.

The other advantage is data management. The days of large file rooms, rows of filling cabinets and the mailing of the documents is fading fast. Today, most companies store digital versions of documents on servers and storage devices. These documents become instantly available to everyone in the company, regardless of their geographical location. Companies are able to store and maintain a tremendous amount of historical data economically, and employees benefit from immediate access to the documents they need.

Companies are using IT to improve the way they design and manage customer relationships. Customer Relationship Management (CRM) systems capture every interaction a company has with a customer, so that a more enriching experience is possible. If a customer calls a call center with an issue, the customer support representative will be able to see what the customer has purchased, view shipping information, call up the training manual for that item and effectively respond to the issue. The entire has a better, more focused experience and the company benefits from improved productivity.

Services of 3PL Providers

The services provided by 3PLs have been summarized in various articles. Sink et al. (1996) show that the most common activities of 3PLs that are outsourced are: transportation, warehousing, inventory management, order processing, information systems, and packaging. Coyle et al. (1996) suggest five types of 3PL suppliers: transportation, warehousing/distribution, forwarder, shipper/management and financial/information based.

Bardi and Tracey (1991) and Lieb and Randall (1996) analyzed firms using outsourced services (rather than 3PLs) to determine the extent to which they used the services of outsourcing partners. According to Bardi and Tracey (1991), the outsourcing of logistics functions is becoming increasingly common, and the most commonly outsourced functions are those that are non-core, routine-based, or asset based. Lieb et al. (1993, 1996, 2004a, 2004b, 2005) made comparisons of 3PL services by large US manufacturers respectively from the year 1991 to 2004. Sink and Langley (1997) and Rabinovich et al. (1999) suggest the framework of 3PL services can be divided into four categories: warehousing, transportation, customer service, and inventory and logistics management. Arroyo et al. (2006) report that the most frequently outsourced services are customs brokering, product delivery, fleet management and operations, supplier payment and auditing and shipment planning and consolidation. Wilding and Juriado (2004) concluded that the most frequently used functions of 3PL are transportation, warehousing and inventory and information systems.

Service Performance

There is overall support that third party logistics providers will have a positive influence on the performance of their customers: via cutting costs, saving time, expanding into new markets and increasing flexibility (Power et al. 2007, Sanders et al. 2007, Foster and Muller 1990). These providers can enhance value creation for their customers by leading them to become more competitive and profitable through speedy and superior customer service (Daugherty and Pittman, 1995).

Boyson et al. (1999) indicated that the outsourcing of logistics functions has proven to be effective in helping US firms to achieve competitive advantage, improve their customer service levels and reduce their overall logistics costs. Skjøtt-Larsen (2000) stated that the usage of 3PL will help to cut the transaction costs and build network development. Knemeyer et al. (2003) suggested that there the benefits outweigh

the increased costs of developing closer partnerships with 3PLs.

Information Technology (IT) Usage in 3PL

IT usage impacts the 3PL industry in terms of bringing about new e-services, new functions, and new alliances (Evangelista and Sweeney 2006). The use of technological capabilities may leverage transport and logistics services, facilitate more effective integration across companies in the supply chain, enable the rapid customization of products and maintain competitive lead-times. In short, IT applications can directly or indirectly impact the competitive advantage in the 3PL industry by creating value for customers as many value-added activities (Crowley 1998).

Indicators of IT impact on the supply chain are IT department technical quality, IT plan utilization, and top management of IT, which positively affect the supply chain (Byrd and Davidson, 2003).

Customer Relationship Outcomes

Customer satisfaction is a customers overall or global judgment regarding the extent to which product or service performance matches expectations (Stank et al. 1999, Anderson and Sullivan 1993). Developing and maintaining satisfactory customer relationships can help to reduce perceived risk, reduce transactions costs, increase customer loyalty and customer retention and thus impact on organizational performance (Bejou et al. 1996). Increased customer satisfaction can offer some respite from intense price-based competition and is likely to result in improved market share (Daugherty et al. 1998).

Empirical studies in operations, marketing, and logistics offer support for links between performance and customer satisfaction (Crosby et al. 1990, Cronin and Taylor 1992, Innis and La Londe 1994, Youngdahl and Kellogg 1997, Daugherty et al. 1998). Customers tend to be more satisfied with providers who have a better delivery performance (De Wulf et al. 2001). Cronin and Taylor (1992) report that higher service quality leads to higher customer satisfaction, and Leuthesser and Kohli (1995) state that suppliers' relational behavior pertaining to communications and

responsiveness influence buyer satisfaction. Furthermore, both operational performance and relational performance affect customer satisfaction positively (Innis and La Londe 1994, Daugherty et al. 1998).

Role of Trust in 3PL

Trust is regarded as an outcome of good internal service quality within organizations, plays a key role within service provision and is considered important in building relationships (Chenet et al., 2000). The concept of trust has received special attention in marketing literature due to the notable influence on the attainment of long-lasting and profitable relationships. It encompasses the person's behavioral intentions as the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party (Mayer et al. 1995, 712). Some studies state that trust is a unitary concept (Rotter 1971), although most report multidimensional concept (Rousseau et al. 1998). In this paper, the definition of Gefen et al. (1999, 2003) is used; trust is a set of specific beliefs dealing mainly with the integrity (trustee honesty and promise keeping), benevolence (trustee caring and motivation to act in the truster's interest), competence and predictability (trustee's behavioral consistency) of a particular vendor.

Trust is considered to be of remarkable importance in the process of building and maintaining relationships (Lagace 1991, Morgan and Hunt 1994, Oakes 1990). Firms invest a considerable amount of resources in building trust relationships with their business partners and the termination of such relationships often leads to a significant loss for both parties. Such negative consequences clearly show the importance of trust in business-to-business relationships. Zucker (1986) summarized three types of trust: process-based, institution-based, and characteristic-based. Process-based trust is created through social exchange between organizations and individuals; institution-based trust is created through a third party; and characteristic-based trust is created through a sense of

shared commonality with the other party. We look at characteristic-based trust and explore the relationship between performance, customer satisfaction and trust in 3PL industry.

Performance is positively related to trust in business marketing relationships (Stank et al. 1999) and according to Hess and Story (2005), trust and satisfaction develop from the product/service performance. The longevity of the relationship depends on the ability of the provider's services to fully meet the requirements of the buyer (Gounaris 2005). Walter et al. (2003) concluded after a study of information from 745 purchasing managers from different sectors that the degree to which the supplier could meet the functional requirements of the purchasing managers influenced the level of trust of the managers.

3. RESEARCH METHOD

Most descriptive research uses cross sectional approaches which perform data collection from certain sample in the same time (Malhotra, 2004) or in another word is single cross sectional, which perform data collection from a respondent in the same time. This quantitative method is used for observe in population or certain sample, sampling technique perform randomly, data collection uses research instrument, analysis is quantitative/ statistical which aims for testing the predetermined hypothesis (Sugiyono, 2009). In this paper, quantitative method about the influence of 3PL usages to service performance, IT usage to service performance, service performance to trust, service performance to customer satisfaction, trust to customer satisfaction.

Data Collecting Method

In data collection, sample determination is performed with probability sampling, that is determination sample technique which give the same probability to element population members (Sugiyono, 2009), so each respondent has the same chance to be selected as sample. In cross sectional method, collecting data method is used for finding primary data which is performed by personally administered questionnaire,

respondent will be asked to fill questionnaire directly (Malhotra, 2006). Secondary data will be performed by literature study and data finding in journals with the same topics. Variable research scale will use likert scale with 4 points, which is from 1 scale (strongly disagree) until 4 scale (strongly agree).

The questionnaire includes: 3PL usage, IT usage, service performance, trust, and customer satisfaction. In the first part of questionnaire, general company profile questions with respect to industry, size, location, and investment in other countries can be found. These questions are based on Arroyo et al. (2006). In the second part of the questionnaire, companies are asked to rank the three most important reasons for outsourcing their logistics services. In the third part of the questionnaire, questions regarding the items for the latent variables in the conceptual model are posed.

The measures on the extent of 3PL usage are constructed by asking what the frequency of the 3PL usage is and the percentage of their logistics budget that is outsourced (Arroyo et al. 2006, Wilding and Juriado 2004). The measure for service performance was originally from Gassenheimer and Ramsey (1994), with a four-item. Satisfaction and trust was adapted from De Wulf et al. (2001). Finally IT usage use the measurement adapted by Byrd and Davidson (2003). Respondents were asked to fill in this part, keeping their largest 3PL provider in mind.

Variable Measured

Form of question in questionnaire is structured non disguised, which is formed multiple choice based on likert scale to measure attitude, opinion, and perception of respondent. Assessment form answer of quistionnaire will use weghting of 4 scales. Weighting and categories measure of respondent are: (Sugiyono, 2009)

Table 1. Score of Likert Scale

Description	Score
Strongly Disagree	1
Disagree	2
Agree	3
Strongly Agree	4

Data Processing and Analysis

In term of data processing techniques of structural equation modeling (SEM), Maruyama (1998) in Wijaya (2009) mentions that SEM is a model of statistical calculations provide an estimate of the strength of association hypothesis within variables in a theoretical model, either directly or through between the variables (intervening or mediating). Observed variables (indicators- indicators) describe the specific latent variables (latent dimension).

As a testing method that combines factor analysis, path analysis and regression, SEM is more of a confirmatory rather than exploratory methods, which aims to evaluate the proposed dimensionality proposed and derived from previous studies by looking at and test the model-dimensional relationship these dimensions. With this understanding, SEM can be used as a tool to confirm the pre-knowledge that has been obtained previously (Hair et.al, 2006) to be used as testing fit model which are:

- a. Ratio chi-square value with ith degrees of freedom of the model (normed chi-square). The ratio between the value of 1-3 is considered appropriate value and the value of more than 5 is considered poor fit of the models
- b. Comparative Fit Index (CFI). CFI value of more than 0.9 is considered as appropriate model.
- c. Root Mean Square Error of Approximation (RMSEA). RMSEA value of 0.05 or less is the best fit value, the value of 0.08 or less is accepted value, while the value of more than 0.1 is considered no model fit.
- d. Used to calculate the weighted proportion of the variance in the matrix sample covariance explained by the population covariance matrix terestimasikan. This index reflects the degree of conformity of the model overall calculated from the residual quadratic model predicted compared with the actual data (Wijaya, 2009). Goodness of Fit Index (GFI). Models can be categorized as good a fit if GFI value close to 1.

- e. Reliability and validity testing. Reliability of the measurement model can be tested by calculating the construct reliability and variance extracted. If the variable has construct reliability > 0.60 and variance extracted > 0.50

Hair et al. (2006) also propose several approaches to estimate model parameters using SEM models are divided into two, namely:

- a. Structural Model (Structural Model). Also called latent variable relationship. The general equation is:

$$\eta = B\eta + \Gamma\xi + \zeta$$

where:

η = A vector of endogenous variables

B, Γ = matrix of structural coefficients

ξ = A vector of exogenous variables

ζ = A vector of error

- b. CFA analysis (confirmatory factor analysis) as a Measurement Model (Model Measurement) consists of two types of measurements, namely:

- Measurement model for the endogenous variables (varabel not free) The general equation:

$$X = \Lambda_x \xi + \delta$$

where:

X = A vector of observed exogenous variables

Λ_x = Matrix of coefficients measuring / loading factor

δ = A vector of exogenous variables

- Measurement model for the exogenous variables (independent variables) The general equation:

$$Y = \Lambda_y \eta + \varepsilon$$

where:

Y = A vector of observed endogenous variables

Λ_y = Matrix of coefficients measuring / loading factor

ε = A vector of measurement errors

The equation above is used with the following assumptions:

- 1 ζ is not correlated with ξ
- 2 ε is not correlated with η
- 3. δ is not correlated with ξ
- 4. ζ , ε , δ are not correlated with each other (mutually uncorrelated)
- 5. $\Gamma - B$ is non-singular

According to Hair et al. (2006) there are 7 stages of formation procedures and SEM analysis are:

1. Establishing a theoretical model as a basis for SEM models that can justifiably strong theoretical. Is a causal model or causal the relationship between the dimensions or variables.
2. Establishing a path diagram of causal relationships that have been established by basic theory. Path diagram will facilitate the researchers looked at the relationship- causality.
3. Dividing the path diagram into a set of measurement models and the SEM.
4. Election matrix of input data and estimate the model proposed. Difference SEM with other multivariate techniques is the input data to be used in the modeling and estimation. SEM uses matrix variance / covariance or correlation matrix as input data for the entire estimation does.
5. Determine the identification of the structural models. This step is to determines that the specified model is not the model under-identified or unidentified. Problems can arise through the identification of symptom- the following symptoms:
 - a. Standard errors for one or several coefficients are very large
 - b. The program is not able to produce a matrix of information that should be presented
 - c. Appear odd numbers such as the presence of negative error variance
 - d. Appear very high correlation between correlation estimates obtained (Eg more than 0.9)
6. Evaluating criteria of goodness of fit or test matches. At this stage suitability of the model was evaluated through a study of the various criteria of goodness of fit as follows:
 - a. Minimum sample size of 100 and with ratio of 5 observations for each parameter estimate.
 - b. Normality and Linearity
 - c. Outliers

d. Multicolinierity and Singularity
 7. Interpretation of results obtained and change the model if necessary. The following figure is flowchart of SEM procedure :

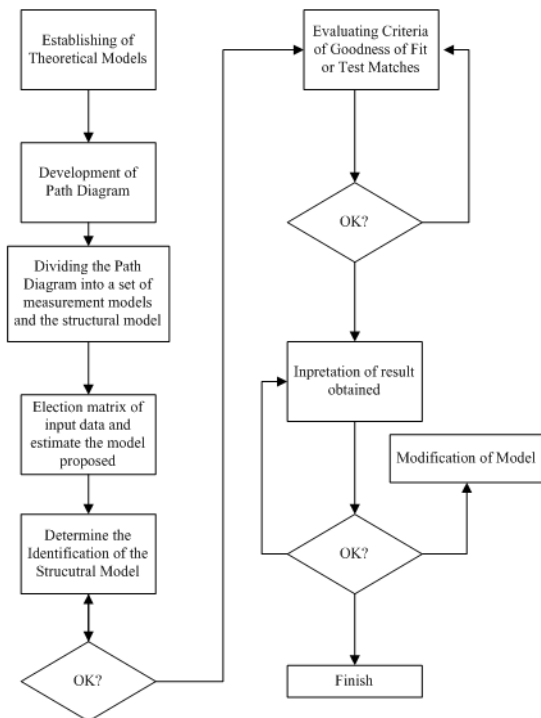


Figure 1. SEM Procedure Flowchart

Model Measurement

These are 5 observed variables based on model above, which are: 3PL usage, IT usage, service performance, trust, and customer satisfaction. The observed variables for 3PL usage can be measured by:

- X1 = Level of 3PL
- X2 = Percentage of outsource logistics budget

The observed variables for IT Usage can be measured by :

- X3 = Hardware and operating system performance
- X4= Business application software performance
- X5 = Communications services efficiency
- X6= Communication service performance
- X7= Application development cycle time
- X8= Information technology investments and expenditures
- X9= Software maintenance efficiency

The observed variables for service performance can be measured by :

- Y1 = Delivery dates
- Y2 = Order cycle times
- Y3 = Accuracy
- Y4 = Fill rate

The observed variables for trust can be measured by :

- Y5 = Commitment
- Y6 = Openness
- Y7 = Risk sharing

The observed variables for customer satisfaction can be measured by:

- Y8 = High quality relationships
- Y9 = Happiness
- Y10 = Satisfaction

Model Structure

This following figure is the structural model that links the extent of 3PL usage and customer satisfaction.

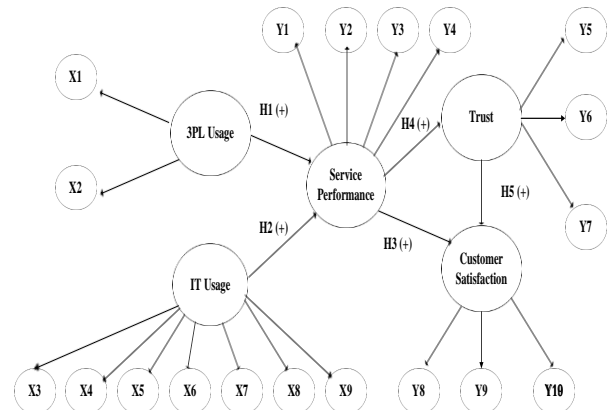


Figure 2. conceptual model that links extent of 3PL usage and customer satisfaction

4. CONCLUSION

This paper explore the variables influence managers' decisions in choosing their third party logistics (3PL) in their logistics activities. Previous research also shows some variables as trust and It usage have a positive relationship to 3PL's service performance. It is believed that there are five variables considered and influenced the service performance of 3PL, which are 3PL usage, IT usage, service performance, trust, and customer satisfaction. The structural model of the relation between those five variables and 3PL service performance and

the dependent variables are also elaborated in this paper.

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