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Determinant Factors of Supply Chain Performance: Case at Seaweed Business in Takalar Regency, South Sulawesi Province of Indonesia

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Abstract: The purpose of this study was to test and analyze the influence aspects of quality, flexibility, responsiveness, and efficiency aspect toward supply chain performance of seaweed business in Takalar. The population of this study was the all group of seaweed in the two areas i.e.: District of Mangarabombang and District of Sanrobone, Takalar Regency. The number of farmers of seaweed in District Mangarabombang was 2,800 people, While District Sanrobone as many as 2,300 people. Respondents are independent farmers / members of the group / group leader was chosen according to the research objectives. Sampling technique used purposive sampling. The number of sample was 110 people. To get more information related to this study, the interviews were conducted at 10 person from stakeholders (traders, government, associations, NGOs and higher education) as informants. Methods of analysis used descriptive analysis, factor analysis, and path analysis. Data were computed by using IBM SPSS and AMOS 23. Results show that quality aspects have a significant influence on supply chain performance. Efficiency aspects have a significant influence on supply chain performance. Whereas, aspects of flexibility and responsiveness have no significant effect on supply chain performance. This was an indication that the producers/ farmers of seaweed business are not flexible and responsive to meet variations of market demand.

Keywords: quality aspect, flexibility aspect, responsiveness aspect, efficiency aspect, supply chain performance, and seaweed business.

1. INTRODUCTION

The supply chain management is one of best approaches that can be used to solve problem of consumer needs. The supply chain not only includes manufacturing and suppliers, but also transportation, storage, retail, and consumers themselves. The main purpose of the supply chain is to satisfy of the customer needs. The supply chain activities start from customers/market demand and finished when the customer has been satisfied (Chopra and Meindl, 2004). Supply chain management is the integration of activities of

the procurement of materials and services, changing into semi-finished goods and finished products, as well as delivery to customers that include purchasing activities, outsourcing, and other important function to relationship between suppliers and distributors or producers (Heizer and Render, 2010). Some of major players who have an interest in supply chain management i.e.: supplier, distributor/ producer, retailer, and consumer (David *et.al.* in Indrajit and Djokopranoto, 2006).

APICS defines supply chain as the processes from the initial raw materials to the ultimate consumption of the finished product linking across supplier-user companies; and the functions within and outside a company that enable the value chain to make products and provide services to the customer (Cox *et al.*, 1995). By this time, the usage of the term SCM had been established, with its emphasis on the physical supply chain (Sherer, 2005). A right supply chain strategy to implement supply chain management (SCM) processes is widely believed to be able to improve SCM performance (Sun, and Hsiang Hsu, 2009). Related to supply chain, Lee (2002) proposed four viable Supply chain strategies efficient, responsive, risk-hedging, and agile Supply chain strategy to gain best supply chain performance.

Development of seaweed business in Takalar Regency is a priority program each year by Local Government. Seaweed as one of the leading commodities in Takalar. It progressively enhance both in terms of volume, and quality. However, farmers that cultivate this commodity has not yet to get optimal benefits. Therefore, development of seaweed have to do with a different approach, namely effective supply chain management. By identification and test of determinant factors of supply chain performance, it expected that all members of the supply chain can get more benefit, especially farmers level. Based on the above explaining, then the purpose of this study was to examine and analyze the effect of aspects quality, flexibility, responsiveness, and efficiency to supply chain performance of seaweed business in Takalar Regency of Indonesia.

2. LITERATURE REVIEW

2.1. Supply Chain Concept

According to Chopra and Meindl (2004) supply chain involves all parts or members either directly or indirectly to meet consumer demand. Ballou (2004) defines supply chains as all activities (transportation, inventory control, and so on) that use network to transform materials and also information to final customers. According to Heizer and Render (2010) supply chain includes all interactions among suppliers, manufacturers, distributors and customers. These interactions are also related to transportation, information, scheduling, credit transfer, and cash as well as the transfer of raw materials between the parties involved.

2.2. Determinants of Supply Chain Performance

According to Pujawan (2005) measurement of supply chain performance is essential to the organization. Measurement system of supply chain used for monitoring, controlling and communicating organizational objectives to all members. Supply chain performance measurement aims to support, evaluation of performance and also determine future action on the strategic, tactical and operational level (Gunasekaran *et al.*, 2004). Then, there were seven barriers in implementing supply chain management namely, management practices, human resource capabilities, customer service, external orientation, internal communication, innovation and employee motivation (Mafini, 2016).

Futhermore, Aramyan *et al.* (2006) states that there are four indicators to measure supply chain performance, namely flexibility, quality, responsiveness and efficiency. Then, Pujawan (2005) confirmed

that the performance of the supply chain in the context of the integration of the supply is determined by quality, flexibility, responsiveness, and cost efficiency. Heizer and Render (2010) defines quality as the ability of product or service to meet customer needs. Kotler (2012) defines the quality of the products is “the ability of a product perform it’s function”. Then, Flexibility means speed or agility of the supply chain reactions in response to market or customers needs. Flexibility in a supply chain system is the ability to respond changes, either it changes that come from within a company as well as with the changes that come from outside the company.

Swafford *et al.* (2006), organizational flexibility can provide the capability to the organization to embed the changes in the marketplace and exploit market opportunities with speed and quickness. Supply chain flexibility or agility must have instrument to measure the effectiveness this tool because without such an instrument, researchers cannot provide a foundation for expanding the theories regarding causal links among supply chain agility practices, capabilities and performance outcomes. Responsiveness is rate of responsive in responding to any issues or complaints (SCOR, 2010). The higher responsiveness in supply chain system can generate customer satisfaction. The efficiency is defined as the management of production costs in producing output for fulfillment the customers need. Efficiency also related to transportation costs, labor costs and other expenses (SCOR, 2010).

Some previous studies have been conducted in relation to supply chain performance. Aramyan *et al.* (2006) noted that to assess the performance of a supply chain used four indicators, namely flexibility, quality, responsiveness and efficiency. Pujawan (2005) asserts that the performance of the supply chain in the context of supply chain integration highly determined by the level of quality, flexibility, responsiveness, and cost efficiency. Irmawati (2007) finds that variable of marketing planning gives the greatest influence on the strategy of supply chain. Then, Jie *et al.* (2008) conducted research about the supply chain performance at meat industry in Australia. some of the findings are: quality, flexibility, responsiveness, and efficiency have a significant effect on competitiveness of producers; and quality, flexibility, responsiveness and efficiency have a significant effect on competitiveness of supplier and retailers. Based on the review of the theory and previous research, the conceptual framework model of research can be presented in the following figure.

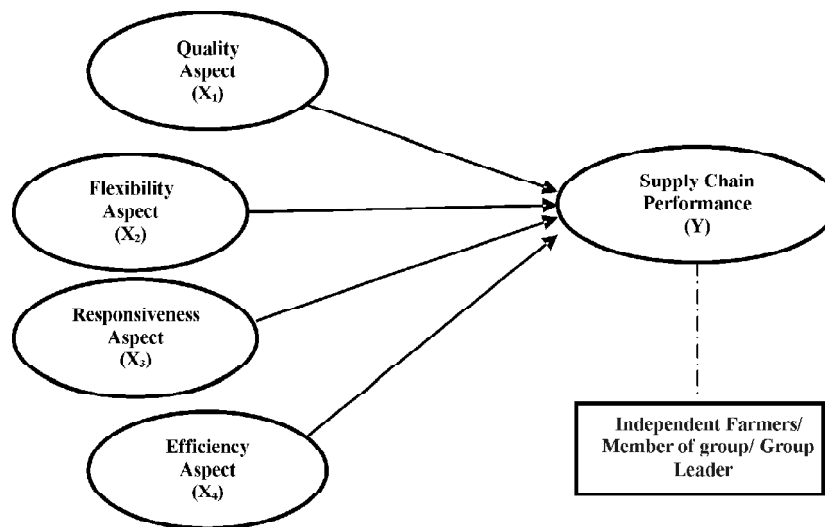


Figure 1: Conceptual Framework

3. METHODOLOGY

The study was conducted in the province of South Sulawesi, Takalar Regency. There are 2 locations seaweed production centers namely: District of Mangarabombang, and District of Sanrobone. The study population is entire group of seaweed in District Mangarabombang and Sanrobone, Takalar Regency. The number of farmers cultivating seaweed in District Mangarabombang is 2,800 people, and the District Sanrobone as many as 2,300 people. The respondents of this study consisted of independent farmers / members of the group / group leader which chosen according to the research objectives and meet certain criteria (purposive sampling). Therefore, the sample size was set at 110 people. Then, for the purpose of get information more deeply, the interviews were conducted at 10 stakeholders (traders, government, associations, NGOs and PT) as informants in this study. Validity testing was done through the analysis of items used Pearson Product Moment Correlation method. Next, test of validity was done by correlating scores that obtained on each item with the total score of item. An indicator or item can said to be valid if it has a value of correlation greater than 0.30 ($r > 0.30$). Internal consistency reliability test performed by using Cronbach's alpha coefficient (α). According to Hair *et al.* (2011) and Sekaran (2009) an instrument can be said to be reliable if the value of α greater than 0.60. Furthermore, the analytical method used in this research are: (1) Descriptive Analysis, (2) Factor Analysis, and (3) Path Analysis. Data were analyzed using IBM SPSS and AMOS 23 software.

4. RESULTS AND DISCUSSION

Before the questionnaire used in data collection, it is important to test the validity and reliability of the questionnaire. The result of testing the validity and reliability of the instrument are presented in the table 1.

Table 1
Result of Validity and Reliability Test

Variables	Indicators	Validity Test		Reliability Test	
		Correlation Coefficient	Description	Alpha Cronbach (\pm)	Description
Quality Aspects (X ₁)	Qual-1	0.609	Valid	0.811	Reliable
	Qual-2	0.557	Valid		
	Qual-3	0.486	Valid		
	Qual-4	0.474	Valid		
	Fleks-1	0.589	Valid		
Flexibility Aspects (X ₂)	Fleks-2	0.447	Valid	0.622	Reliable
	Fleks-3	0.576	Valid		
	Fleks-4	0.672	Valid		
	Respon-1	0.409	Valid		
Responsiveness Aspects (X ₃)	Respon-2	0.64	Valid	0.683	Reliable
	Respon-3	0.536	Valid		
	Respon-4	0.555	Valid		
	Efisien-1	0.609	Valid		
Efficiency Aspects (X ₄)	Efisien-2	0.58	Valid	0.883	Reliable
	Efisien-3	0.566	Valid		
	Efisien-4	0.477	Valid		
	KRP-1	0.443	Valid		
Supply Chain Performance (Y)	KRP-2	0.647	Valid	0.755	Reliable
	KRP-3	0.636	Valid		
	KRP-4	0.67	Valid		

Source: Data processed, 2016.

Based on results which shown in the table above, it can be concluded that: (1) The indicators used in this study was valid because their correlation coefficient meet the standard requirements ($r > 0.30$); (2) The variables used in this study was reliable because they have value of Cronbach's alpha (α) more than 0.60 ($\alpha > 0.60$). Therefore, this research instrument or questionnaire can be used for further data collection. Based on the results of descriptive analysis, the description of respondents according to gender, age, education, income and status can be presented in the following table.

Table 2
Description of Respondents Characteristics

<i>No.</i>	<i>Description</i>	<i>Frequency</i>	<i>Percentage (%)</i>
1.	Gender :		
	- male	96	87.27
	- female	14	12.73
2.	Age (years) :		
	- under 20	3	2.73
	- 20 - 30	12	10.91
	- 31 - 40	55	50.00
	- 41 - 50	30	27.27
	- more than 50	10	9.09
3.	Education :		
	- elementary school	15	13.64
	- junior high school	44	40.00
	- senior high school	40	36.36
	- undergraduated	11	10.00
4.	Income (Rp/ month):		
	- under 1 million	10	9,09
	- 1 - 3 million	50	45,45
	- 3 - 5 million	35	31,82
	- more than 5 million	15	13,64
5.	Status of farmers:		
	- independent farmer	20	18,18
	- member of group	62	56,36
	- leader of group	28	25,45
	Total	110	100.00

Source: Data processed, 2016.

The respondents of this study dominantly was male of 96 (87.27%), while women only by 14 people (12.73%). The age of respondents mostly in the 31-50 years (87%). The majority of respondents have a middle and high school education in the amount of 84 people (76%) with revenues of between 1-5 million (77%). Respondents of this research dominantly was member of group (56%), while others are independent

farmers and the group leader. Furthermore, based on the results of descriptive statistical analysis, it can be seen the mean value of each variables as shown in the following table.

Tabel 3
The average value of the variables

No.	Variables	Mean	Description
1.	Quality Aspects (X_1)	4.17	Good
2.	Flexibility Aspects (X_2)	3.38	Good enough
3.	Responsiveness Aspects (X_3)	3.15	Good enough
4.	Efficiency Aspects (X_4)	4.25	Very Good
5.	Supply Chain Performance (Y)	3.88	Good

Source: Data processed, 2016.

The table above shows that in the context of implementation, efficiency variables are in very good category with average value of 4.25. Variable of quality are in good category with average value of 4.17, followed by variable of supply chain performance with average value of 3.88. While the variable of flexibility and responsiveness in the category good enough with average value each of 3.38 and 3.15. Then, the results of confirmatory factor analysis can be presented in the following table.

Table 4
Results of Confirmatory Factor Analysis (CFA)

Variables	Indicators	Loading Factor	GFI/ AGFI	Description
Quality Aspects (X_1)	Qual-1	0.711	1.000/ 0.999	Significant/Fit
	Qual-2	0.642		Significant/Fit
	Qual-3	0.518		Significant/Fit
	Qual-4	0.738		Significant/Fit
Flexibility Aspects (X_2)	Fleks-1	0.511	0.994/ 0.968	Significant/Fit
	Fleks-2	0.706		Significant/Fit
	Fleks-3	0.696		Significant/Fit
	Fleks-4	0.693		Significant/Fit
Responsiveness Aspects (X_3)	Respon-1	0.601	0.990/ 0.940	Significant/Fit
	Respon-2	0.641		Significant/Fit
	Respon-3	0.619		Significant/Fit
	Respon-4	0.589		Significant/Fit
Efficiency Aspects (X_4)	Efisien-1	0.647	0.998/ 0.989	Significant/Fit
	Efisien-2	0.678		Significant/Fit
	Efisien-3	0.555		Significant/Fit
	Efisien-4	0.596		Significant/Fit
Supply Chain Performance (Y)	KRP-1	0.652	0.994/ 0.968	Significant/Fit
	KRP-2	0.526		Significant/Fit
	KRP-3	0.627		Significant/Fit
	KRP-4	0.713		Significant/Fit

Source: Data processed, 2016.

Based on the results in the table above, it can be explained that the value of goodness of fit index (GFI) is greater than 0.90 ($GFI > 0.90$) in the variable of quality aspects (X_1). Indicators Qual-4 (product quality improvement is required through educational / coaching) is a very important indicator in shaping the construct of quality with value of factor loading of 0.738. The value of goodness of fit index (GFI) is greater than 0.90 ($GFI > 0.90$) in the variable of flexibility aspect (X_2). Indicators Fleks-2 (farmers always able to serve the variations of market demand) is a very important indicator in shaping the construct of flexibility with value of factor loading of 0.706. The value of goodness of fit index (GFI) is greater than 0.90 ($GFI > 0.90$) in the variable of responsiveness aspect (X_3). Indicators-2 (farmers are able to response a complaint or the requirements of the market related to the quantity and quality of their products) is a very important indicator in shaping the construct responsive to the value of factor loading amounted to 0.641.

Then, the value of goodness of fit index (GFI) is greater than 0.90 ($GFI > 0.90$) in the variable of efficiency aspect (X_4). Indicators Efficient-2 (seaweed prices are suitable with the cost of production) is a very important indicator in shaping the construct efficiency with value of factor loading of 0.678. Value goodness of fit index (GFI) is greater than 0.90 ($GFI > 0.90$) in the supply chain performance variable (Y). Indicators KRP-4 (Flow of products and integrated information promote efficiency in operational cost) is a very important indicator in shaping the construct of supply chain performance with value of factor loading of 0.713.

Furthermore, the level of conformance testing on the structural equation model is based on a cut-off values as used in the confirmatory factor analysis (CFA). In addition, the results of testing the level of conformity to the structural model of this study were presented in the following table.

Tabel 5
The Results of Goodness of fit indices Overall Model

<i>Criteria</i>	<i>Cut-off Values</i>	<i>Results</i>	<i>Description</i>
Chi-Square	Expected small	265.618	Good
CMIN/DF	≤ 2.00	1.671	Good
GFI	≥ 0.90	0.834	Marginal
RMSEA	≤ 0.08	0.078	Good
CFI	≥ 0.95	0.829	Marginal
TLI	≥ 0.95	0.796	Marginal

Source: Data processed, 2016.

Results of testing on the criteria of a good models of the structural equation show that out of the six criteria, there are three criteria that would have qualified, while the three other criteria such as the value of GFI, CFI and TLI has not been good (marginal). However, based on the principle of parsimony (parsimony theory) when one has fulfilled the criteria, then the models can already be said to be good and do not need to be modified (Hair *et al.*, 2011). Then, the results of structural models of influence between variables in this study are presented in the following figure.

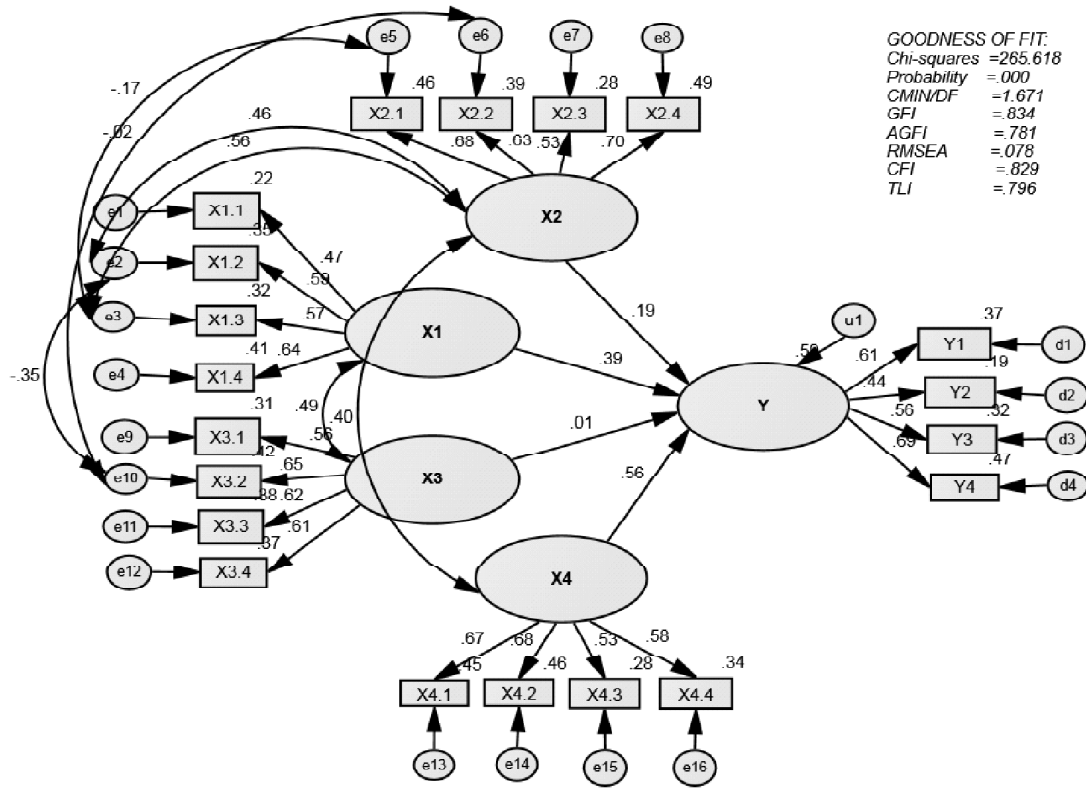


Figure 2: The Results of Structural Model Test

Based on the figure above, it can be presented the results of hypothesis testing as presented in the following table.

Table 6
 Results of Research Hypothesis Test

Exogenous Variable	Endogenous Variables	Standardized Coefficient	Prob.	Description
Quality Aspects(X_1)	Supply Chain Performance	0.389	0.024*)	Significant (H1, accepted)
Flexibility Aspects (X_2)	Supply Chain Performance	0.186	0.147	Not significant (H2, Rejected)
Responsiveness Aspects (X_3)	Supply Chain Performance	0.010	0.945	Not significant (H3, Rejected)
Efficiency Aspects (X_4)	Supply Chain Performance	0.561	0.000*)	Significant (H4, accepted)

*) significant at $\alpha \leq 0,05$

Source: Data processed, 2016.

Based on the results above, it can be seen that there are two hypothesis was accepted, and the two hypotheses were rejected. Hypothesis 1 proposed in this research was the quality aspects have a significant

influence on the the supply chain performance. The value of path coefficients of 0.389 with a probability value (prob.) of 0.024 which was smaller than value of $\alpha = 0.05$. These results indicate that the hypothesis is accepted or supported by empirical facts. These results indicate that aspect of quality can lead to the better performance of the supply chain. The results of this study are consistent with Chopra and Meindl (2004) that full involvement all member in the supply chain system either directly or indirectly can meet consumer demand. The supply chain is not only related to manufacturing and suppliers, but also involves the transportation, warehouses, retailers, and customers themselves. Kotler (2012) says that the quality is very important thing in supporting and building consumer confidence and it is also the most fundamental thing in producing customer satisfaction (Irmawati, 2007)

Then, the second hypothesis was the flexibility aspects have a significant influence on the the supply chain performance. The value of path coefficients of 0.186 with a probability value (prob.) of 0.147 which is greater than the value of $\alpha = 0.05$. These results indicate that aspect of flexibility can produce better supply chain performance. The results of this study are consistent with the Swafford *et al.* (2006) organizational flexibility can provides the capability to the organization to embed the changes in the marketplace and exploit market opportunities with speed and quickness.

Hypothesis 3 proposed in this research was the responsiveness aspects have a significant influence on the the supply chain performance. The value of path coefficients of 0.010 with a probability value (prob.) of 0.945 which is greater than the value of $\alpha = 0.05$. These results indicate that aspect of responsiveness can lead to supply chain performance, but it has not been given a significant impact. These findings support opinion that purpose of the supply chain was achieved customer satisfaction. So, companies should be response the customers need. Supply chain includes four essential processes namely: obtaining customer orders, obtaining raw materials, supporting components from suppliers, manufacturing and fulfilling customer orders (Lee, 2002; Jie *et al.*, 2008; Sun and Hsiang hsu, 2009; Heizer and Render, 2010).

Furthermore, hypothesis 4 proposed in this research was the efficiency aspects have a significant influence on the the supply chain performance. The value of path coefficients of 0.561 with a probability value (prob.) of 0.000 which is smaller than the value of $\alpha (0.000 < 0.05)$. These results indicate that aspect of efficiency can produce better performance of the supply chain. Supply chain performance measurement aims to support and evaluate of performance and also determine future action on the strategic level, tactical and operational (Pujawan, 2005). Related to measurement of supply chain performance, (Bowersox *et al.*, 2000) says that in order to expand the flow of goods and information there are six critical points used to achieve an integrated supply chain, namely: 1) integration of customers, 2) integration of internal, 3) integration of supplier, 4) integration of technology and planning, 5) integration of measurement, and 6) integration of the relationship among members.

The results of this study also supports Irmawati (2007) and also Munizu *et al.* (2016) that variable of marketing plan such cost efficiency would provides the greatest influence on strategy of supply chain in an organization. In the supply chain context, customer satisfaction variables have a greatest influence on the performance of companies in Indonesia.

5. CONCLUSIONS

In conclusion, the quality aspects have a significant influence on the performance of the supply chain. Efficiency aspects have a significant influence on the performance of the supply chain. However, aspects

of flexibility and responsiveness have no significant effect on the performance of the supply chain. This is an indication that the manufacturer of seaweed business is not flexible and responsive to variations of market demand. The implications of these research suggest to actors of seaweed business (farmers / group members / group leader) should pay attention to the importance of the quality aspect, flexibility, responsiveness, and efficiency in producing seaweed. Then, aspect of flexibility and responsiveness must be improved continuously, because their implementation was still inadequate. Farmers of seaweed as a part of a supply chain system must be more flexible and they have to able to respon any changes in market demand quickly. Development of seaweed business in Takalar Regency must support of Local government (LG). Both the policies and programs which is formulated and implemented by government should be support seaweed businesses. In other words, the local government must have a strong commitment to supporting the business development of seaweed in Takalar District of Indonesia.

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