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Institutional Analysis of Fish Consumption Improvement in Silo District

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Abstract
Fish consumption is essential for health as it is rich in protein, omega-3, vitamins, and minerals. Increasing fish consumption requires support from effective institutions, including government policies and distribution infrastructure. Innovations such as "*Catering Sehat*" (*Catering Sehat*) and *Gemarikan* (*Gerakan Memasyarakatkan Makan Ikan* or the Movement to Encourage Fish Consumption) aim to boost fish consumption by providing nutritious meals for families at risk of stunting. This study aims to identify the issues, the actors/institutions involved, the necessary programs and activities, and to analyze public and stakeholder perceptions of the regulations and institutions supporting fish consumption in Silo District, Jember Regency. The research was conducted from October to November 2024 using a quantitative method with questionnaires distributed to 100 pregnant women or mothers of children under two (*Baduta*) and five experts. Data analysis was performed using Interpretative Structural Modeling (ISM). The findings reveal that inadequate knowledge of fish's nutritional content, influenced by low education levels, is a key factor contributing to low fish consumption. All institutions – including the Fisheries Office, BAPPEDA, Health Office (*Dinkes*), DKPP, DP3AKB, the District Stunting Reduction Acceleration Team (TPPS), *Pemerintah Desa*, *Rumah Desa Sehat* (RDS), *Posyandu*, Non-Governmental Organizations, Community Leaders, and Public/ Private Universities – play a crucial role in promoting fish consumption. Efforts such as nutritional fulfillment, *Catering Sehat*, and *Gemarikan* programs are essential initiatives to enhance fish consumption.
Keywords: Fish Consumption, Institutions, *Catering Sehat*, *Gemarikan*, ISM

1. Introduction

Fish consumption plays a crucial role in maintaining a healthy diet, as fish is a source of animal protein rich in essential nutrients such as omega-3 fatty acids, vitamins, and minerals necessary for growth and overall health. However, despite the well-known benefits of fish consumption, the level of fish intake in many countries, including Indonesia, remains relatively low compared to other sources of animal protein, such as beef or chicken. This is in line with Khusun et al., (2022) opinion that animal protein intake in Indonesia mainly comes from eggs and poultry, while the consumption of beef and dairy products tends to be less. This is due to economic factors and the demand for animal protein (Anyanwu et al., 2023; Suryana et al., 2021). According to Ledi Ermansyah (2019) and Khoiriyah et al., (2024), while animal-based foods are vital for a balanced diet, not all households can access them due to limited purchasing power. Research shows that consuming fish supports children's growth and development by providing protein and micronutrients. Ulya et al. (2015) noted that children aged 1 to 3 are considered nutritionally vulnerable. Therefore, increasing fish consumption has become a priority – both for public health and the sustainable development of the fisheries sector.

In Silo District, fish consumption remains low due to the district's mountainous location, which is far from the sea, as well as the spread of myths about eating fish. For example, some believe that eating fish may cause children to develop a fishy smell, and pregnant women are discouraged from eating shrimp due to the belief that it will result in a complicated delivery, as the baby may move backward like a shrimp. Despite these challenges, Silo District has shown

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remarkable innovation, becoming the only village to implement the *Catering Sehat* (Health Catering) program, which provides nutritious meals for families at risk of stunting.

Institutional analysis is essential for increasing fish consumption, as institutions form a system of rules and structures that regulate the work of various parties in the fisheries sector. This includes government policies, the roles of research institutions, industry associations, educational institutions, and fish market structures. Each of these institutional elements plays a part in creating an environment that either supports or hinders efforts to boost fish consumption (Subakir A, Hubeis M, 2020). Developing effective institutional frameworks is not always straightforward, as there are many challenges, such as insufficient distribution infrastructure, fish prices that are unaffordable for some communities, and dependence on unsustainable fishing practices. Therefore, institutional analysis is crucial for identifying existing barriers and finding solutions to optimize the current institutional system to enhance fish consumption (Sokib et al., 2012).

In-depth institutional analysis can uncover appropriate policies and strategies to address various obstacles in fish production and distribution. This approach also helps design more effective strategies for promoting fish consumption as part of a healthy diet. Consequently, institutional analysis becomes a vital element in efforts to sustainably increase fish consumption and improve community well-being. Arif and Pradini (2020) conducted a study on institutions, emphasizing the importance of stakeholder involvement in structuring and formulating fisheries institutions. They found that marketing institutions play a role by fostering mutually beneficial cooperation, and financial institutions support the fisheries industry by reducing the role of middlemen.

Research by Diamahesa et al. (2023) focused on preventing stunting by providing advice and education about the benefits of eating nutritious fish. The community can be educated about fish nutrition through training on making fish-based snacks, such as *kue kering* (fish cookies) using fresh anchovies. The outreach aims to refresh family knowledge, especially for *Posyandu* cadres, about the benefits of consuming nutrient-rich fish. This initiative also teaches techniques for making *Kue Teri* – a popular snack among children – as a healthy alternative.

Addressing the issue of stunting is urgent, as it directly affects Indonesia's future human resource capacity. This multidimensional problem remains a concern for many, with various proposed solutions. Unlike previous studies, this research involves experts with specialized knowledge in policymaking, particularly regarding the importance of fish consumption for families at risk of stunting. The study aims to identify the causes of low fish consumption, analyze the regulations and institutions involved, and explore the programs needed to enhance fish consumption.

2. Method

This study employs a quantitative research method to generate data and information regarding community fish consumption levels and identify factors strongly associated with fish consumption. Data collection techniques included questionnaires for several experts, as well as interviews with selected informants to strengthen expert assessments based on the completed questionnaires. The research stages consisted of developing a conceptual framework, formulating the problem, selecting sample instrumentation, collecting data, analyzing data, discussing findings, and drawing conclusions.

Data analysis was conducted using Interpretative Structural Modeling (ISM) software, following these steps: (1) The assessed elements were three components from Saxena's (1992) program, as outlined by Eriyatno (1996): constraints and problems, institutions/actors involved in program implementation, and program activities and requirements; (2) The sub-elements

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used included 6 sub-elements for constraints and problems, 12 sub-elements for institutions/actors involved, and 8 sub-elements for program activities and requirements; (3) Experts were asked to evaluate the relationships between each sub-element using a Likert scale: a score of 5 for Strongly Agree (always), 4 for Agree (often), 3 for Neutral (sometimes), 2 for Disagree (rarely), and 1 for Strongly Disagree (never).

The next stage involved comparative assessments using the VAXO symbols. These symbols describe the contextual relationships between two variables: V indicates a relationship from i to j but not in the opposite direction; A indicates a relationship from j to i but not in the opposite direction; X signifies a bidirectional relationship between i and j; and O indicates no valid relationship between the variables. ISM analysis helps map and structure abstract issues into more comprehensible forms, although careful interpretation of VAXO assessments is essential. The ISM process is divided into two main stages: Hierarchy Structuring and Sub-element Classification.

3. Results and Discussion

The results and discussion of this study focus on three key issues: constraints and problems, the institutions/actors involved, and the necessary programs and activities. This focus aligns with Saxena et al., (1992), who suggested that programs can be divided into nine elements. Based on the aggregation of expert opinions using the ISM technique, along with the consistency of questionnaire assessments, the analysis of constraints and problems related to increasing fish consumption in Silo District identified six sub-elements that have the potential to become major obstacles to the success of fish consumption programs (Table 1).

The hierarchical structure of constraints and problems in boosting fish consumption consists of four levels (Figure 1). The contextual relationships between the sub-elements are based on cause-and-effect links. Sub-elements at the highest level act as driving factors, triggering issues at the lower levels.

Table 1. Sub-elements of Constraints and Problems

| No	Sub-elements of Constraints and Problems	Code
1	Low economic status of the community	A1
2	Low fish consumption habits	A2
3	Weak coordination and collaboration between institutions and stakeholders	A3
4	Perception that fish is more expensive than other animal protein sources, such as chicken and eggs	A4
5	Limited understanding of fish's nutritional value due to low education levels	A5
6	Large family size with diverse needs beyond fish consumption	A6

In Table 1, the matrix of sub-elements of constraints and problems (Figure 1b) shows that the sub-elements of low economic status of the community (A1), low fish consumption habits (A2), the perception that fish is more expensive than other animal protein sources such as chicken and eggs (A4), and large family size with diverse needs beyond fish consumption (A6) are positioned in Sector III (Linkage). This indicates that these sub-elements must be carefully managed, as they act as dependent variables heavily influenced by independent variables. In this context, the linkage sector relies significantly on the independent sub-elements. On the other hand, weak coordination and collaboration between institutions and stakeholders (A3) falls under Sector II (Dependent), meaning it serves as a dependent variable

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influenced by other sub-elements. The key determinant within the system related to constraints and problems in increasing fish consumption in Silo District is the limited understanding of fish's nutritional value due to low education levels (A5), which is categorized in Sector IV (Independent). This suggests that sub-element A5 functions as an independent variable, playing a role in shaping interactions among other sub-elements. This is in line with several studies which state that family feeding patterns are strongly influenced by a mother's education level – the better the mother's education, the more effective the parenting, especially in providing proper nutrition for toddlers , (Furoidah et al., 2023; Numaliza & Herlina, 2018; Santoso et al., 2005).

The hierarchical model diagram of sub-elements of constraints and problems in increasing fish consumption in Silo District highlights that the key sub-element is the limited understanding of fish's nutritional value due to low education levels (A5). At the second level of the hierarchy are low economic status (A1) and low fish consumption habits (A2). The third level includes the perception that fish is more expensive than other animal protein sources (A4) and large family size with diverse needs (A6). The fourth level faces a major challenge related to weak coordination and collaboration between institutions and stakeholders (A3). Based on the hierarchical structure of constraints in increasing fish consumption in Silo District, effective educational strategies are needed to raise public awareness about the health benefits of fish consumption (Subakir A, Hubeis M, 2020).

Figure 1
(a) Hierarchical Structure and (b) Classification of Constraints and Problems in Increasing Fish Consumption
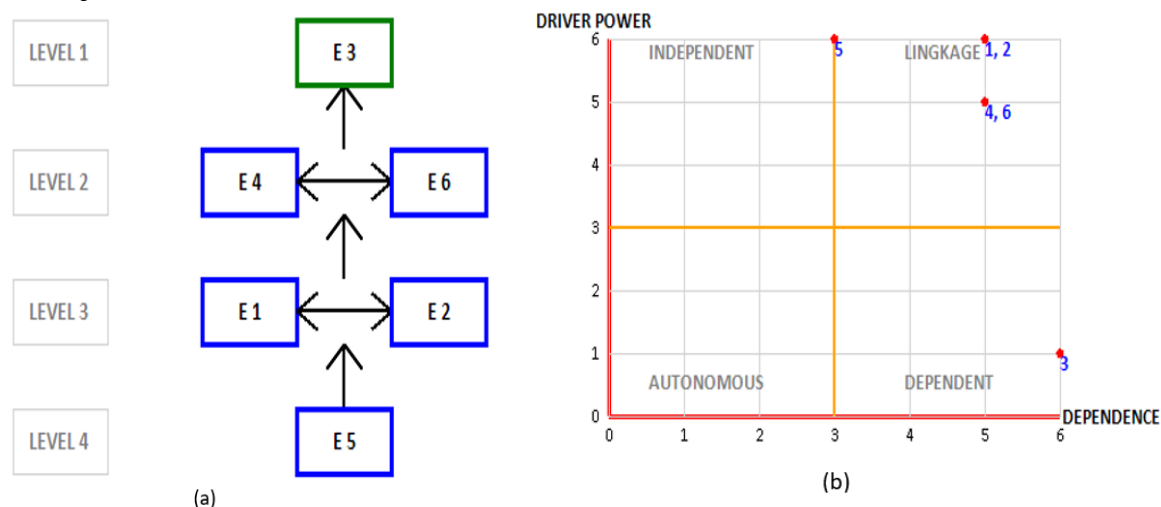
In Figure 1, the institutional/actor elements can be broken down into 12 sub-elements, each with the potential to serve as key institutions/actors in the fish consumption improvement program in Silo District (Table 2). The hierarchical structure of the involved institutions/actors consists of a single level (Figure 2). The contextual relationships between institutional sub-elements, where one institutional element drives another, are illustrated in Figure 2.

This institutional structure highlights the critical role of stakeholders, including the Fisheries Office (B1), Regional Development Planning Agency (BAPPEDA) (B2), Health Office (B3), Food Security and Livestock Office (B4), Women's Empowerment, Child Protection, and Family Planning Office (DP3AKB) (B5), the District Stunting Reduction Acceleration Team (TPPS) (B6), *Pemerintah desa* (B7), *Rumah Desa Sehat* (RDS) (B8),

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Posyandu (B9), Non-Governmental Organizations (B10), Community Leaders (B11), and Public/Private Universities (B12). These 12 actors (institutions) represent the Jember Regency Government and, if effectively consolidated, can significantly enhance fish consumption efforts. These sub-elements fall under the linkage sector, indicating that each sub-element in this sector must be carefully assessed to measure the success of institutional analysis in improving fish consumption in Silo District. This is crucial as these sub-elements influence one another, and the feedback from these interactions has the potential to amplify the overall impact.

Table 2.
Sub-elements of Institutions/Actors

No	Sub-elements of Institutions/Actors	Code
1	Fisheries Office of Jember Regency	B1
2	Regional Development Planning Agency (BAPPEDA) of Jember Regency	B2
3	Health Office of Jember Regency	B3
4	Food Security and Livestock Office of Jember Regency	B4
5	Women's Empowerment, Child Protection, and Family Planning Office of Jember Regency	B5
6	District Stunting Reduction Acceleration Team (TPPS)	B6
7	*Pemerintah desa* (Village Head)	B7
8	*Rumah Desa Sehat* (RDS)	B8
9	Integrated Health Service Post (**Posyandu**)	B9
10	Non-Governmental Organizations (NGOs)	B10
11	Community Leaders/Public Figures	B11
12	Public/Private Universities	B12

In Table 2, the analysis of key elements within the hierarchical structure model shows that institutional actor sub-elements are positioned at Level 1. This analysis suggests that the success of the fish consumption improvement program in Silo District does not rely solely on the role of one or two institutions but rather on the coordination and collaboration among all institutions involved. Based on the hierarchical structure of institutions/actors in efforts to increase fish consumption in Silo District, there is a need to develop appropriate policy formulations that support the growth of the fisheries sector and promote fish consumption. The Fisheries Office plays a crucial role in outreach programs aimed at enhancing public understanding of the nutritional benefits of fish consumption (Amanah, 2018; Qaffi & Amir, 2024; Rosiah et al., 2018). These educational initiatives may include fish preparation methods, selecting nutritious fish, and the importance of fish as part of a balanced diet. The Health Office focuses its outreach programs on the health benefits of fish, helping communities recognize the nutritional value of fish consumption and encouraging behavioral changes. The Health Office can integrate fish consumption into existing health programs, such as nutrition programs for toddlers and pregnant women, which are essential for supporting child development and maternal health. Furthermore, collaboration with non-governmental organizations, the private sector, and local communities is vital for expanding the reach of programs and the GEMARIKAN campaign (Movement to Encourage Fish Consumption). Additionally, continuous monitoring and evaluation of these programs should be conducted to provide feedback and improve policies based on the outcomes achieved.

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Figure 2
(a) Hierarchical Structure and (b) Classification of Institutions/Actors

(a)

(b)
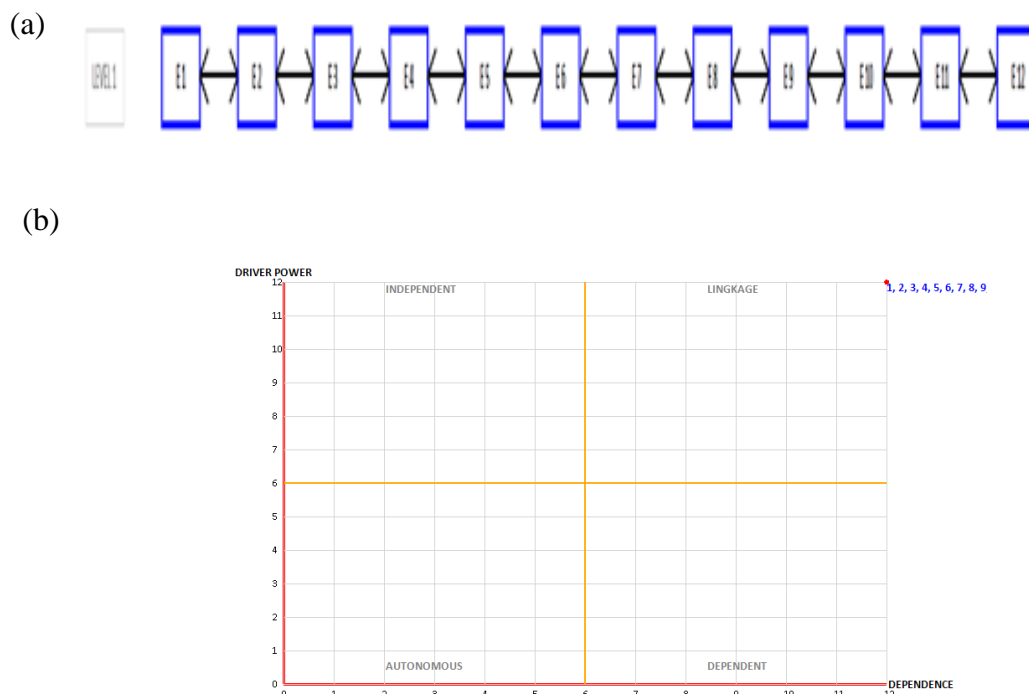
Based on the analysis in figure 2, several activity and program requirement elements directly and indirectly influence the increase in fish consumption in Silo District. These elements are broken down into eight sub-elements, as shown in Table 3. Furthermore, these elements are organized into a hierarchical structure of needs for improving fish consumption, consisting of a single level, as presented in Figure 3.

Table 3.
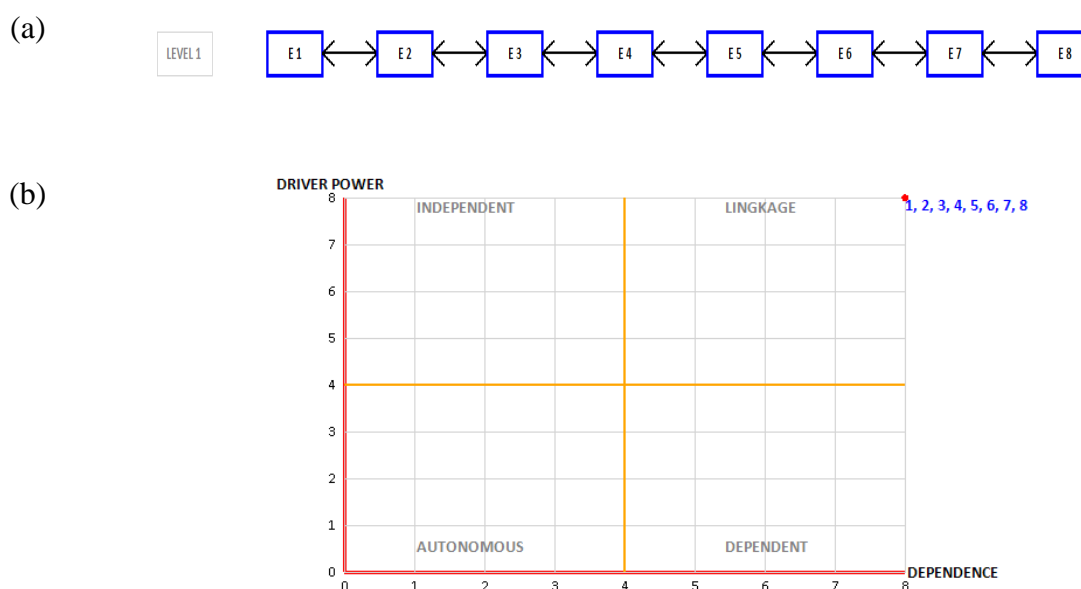*Sub-elements of Program and Activity Requirements*

No	Sub-elements of Program and Activity Requirements	Code
1	Nutritional Fulfillment Efforts	C1
2	Nutritional Improvement Efforts	C2
3	*Catering Sehat*	C3
4	***Gemarikan*** Socialization (Movement to Encourage Fish Consumption)	C4
5	Strengthening the ***Gemarikan*** Program through Synergy with Government Agencies, Non-Governmental Organizations, and/or Community Organizations	C5
6	Training on Fish Product Diversification for Housewives	C6
7	Training on Fish Farming in Tarpaulin Ponds	C7
8	Balanced Nutrition Education	C8

Table 3, the ISM structure reveals that all sub-elements of program activities and requirements – nutritional fulfillment efforts (C1), nutritional improvement efforts (C2),

Catering Sehat (C3), *Gemarikan* socialization (Movement to Encourage Fish Consumption) (C4), strengthening the *Gemarikan* program through synergy with government agencies, non-governmental organizations, and/or community organizations (C5), training on fish product diversification for housewives (C6), training on fish farming in tarpaulin ponds (C7), and balanced nutrition education (C8) – are categorized under the Linkage sector. This indicates that a thorough assessment of needs within this sector is crucial, as any action taken on the variables in the Linkage sector will affect other variables. The feedback from these interactions has the potential to amplify the impact within Sector III or Linkage, while also holding significant driving power. Several sub-elements in this sector exhibit strong driving forces but are also highly dependent on other variables.

Figure 3
(a) Hierarchical Structure and (b) Classification of Program and Activity Requirements

In Table 3, ISM structure shows that all sub-elements of program activities and requirements – nutritional fulfillment efforts (C1), nutritional improvement efforts (C2), *Catering Sehat* (C3), *Gemarikan* socialization (Movement to Encourage Fish Consumption) (C4), strengthening the *Gemarikan* program through synergy with government agencies, non-governmental organizations, and/or community organizations (C5), training on fish product diversification for housewives (C6), training on fish farming in tarpaulin ponds (C7), and balanced nutrition education (C8) – are positioned at Level 1. This means that all these sub-elements serve as foundational elements or initial factors that do not depend on other elements within the system. According to Andriyani et al., (2022), a solution to address the lack of knowledge about the nutritional value of fish and fish product diversification is to implement socialization programs. These programs aim to shift mindsets and enhance public understanding of the importance of consuming fish as a vital source of nutrition for growth, health, and intelligence (Andhikawati et al., 2021; Dewi et al., 2018; Rahma et al., 2024). Proper nutritional fulfillment is key to promoting public health. Fish is a food source rich in essential nutrients, including protein, vitamins, and minerals crucial for child development and overall

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health. Nutritional fulfillment programs should consider not only the quantity but also the quality of nutrition. By incorporating fish into daily meals, individuals can access high-quality sources of nutrients.

4. Conclusion

The findings of this study conclude that low education levels are the primary factor hindering efforts to increase fish consumption in Silo District. Furthermore, all actors and institutions involved play equally important roles, with no single party holding greater authority in formulating policies or making decisions related to improving fish consumption in the region. The institutions and actors include the Fisheries Office, BAPPEDA, Health Office, Food Security and Livestock Office, Women's Empowerment, Child Protection, and Family Planning Office, *Pemerintah desa*, *Rumah Desa Sehat* (RDS), *Posyandu*, Non-Governmental Organizations, community leaders or public figures, as well as public and private universities.

The programs needed to boost fish consumption involve various initiatives, such as nutritional fulfillment and improvement efforts, the provision of *Catering Sehat*, and the socialization of the *Gemarikan* program (Movement to Encourage Fish Consumption). Additionally, strengthening the *Gemarikan* program is carried out through collaboration with government agencies, non-governmental organizations, and community groups. Other programs include training on fish product diversification for housewives, fish farming training using tarpaulin ponds, and balanced nutrition education.

Author Contributions
Selamet, M.A.: Conceptualization, methodology, formal analysis, investigation, resources, data curation, writing original draft preparation. Yuliana, E.: Conceptualization, methodology, validation, writing review and editing, visualization, supervision. Rusdiyanto, E.: Conceptualization, methodology, validation, writing review and editing, visualization, supervision.

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