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Using DEMATEL to Analyse the Causal Factors Influencing Students' Low Participation in Co-Curricular Activities in Higher Education Institutions in Malaysia

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ABSTRACT

This study examines the persistent issue of low student involvement in co-curricular activities (CCAs) at Malaysian Higher Education Institutions (HEIs). Despite the recognised importance of CCAs in developing "soft skills" and enhancing graduates' employability, the participation rate among students stands at only 54%. The objective of this research is to transcend mere symptomatic observations and elucidate the intricate causal relationships among institutional, academic, personal, and social barriers. The Decision-Making Trial and Evaluation Laboratory (DEMATEL) method is employed to observe the relationships between five major barriers: academic workload and time constraints, lack of motivation and awareness, financial and economic pressures, institutional and organizational barriers, and social and psychological factors. This method turns qualitative expert evaluations into a quantitative structural model and a causal diagram. The main "Cause Factors" in the system, as identified in the key findings, are Financial and Economic Pressures and Institutional and Organizational Barriers. On the other hand, Lack of Motivation and Awareness emerged as the predominant factor contributing to the effects, indicating underlying structural issues rather than distinct causes. The analysis reveals that institutional inefficiencies and financial constraints contribute to students feeling overwhelmed with work and diminish their intrinsic motivation. The results of this study point to a major change in how Malaysia approaches education. To truly get more people involved, HEIs need to focus on top-down structural changes, such as better scheduling for administrative tasks and more financial support, instead of just student-centered psychological interventions. To make sure that graduates are well-rounded and to close the skills gap in the Malaysian workforce, it is important to address these causal anchors.

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1. Introduction

Students' participation in co-curricular activities (CCAs) is becoming increasingly challenging in today's education system due to a combination of logistical and psychological factors. 84% of students are aware of the importance of co-curricular activities, but only 54% have regularly participated in them. One of the main reasons for this is that a lot of students do not find the choices engaging or applicable [1]. Moreover, participation is frequently stratified by socioeconomic status, as students from lower-income backgrounds encounter financial limitations and insufficient institutional funding for extracurricular programs [2,3]. In addition to logistical issues, internal factors such as low self-esteem, fear of being judged, and the "zero-sum" conflict, where students think that doing other things will hurt their grades, make it even harder for them to get involved [2,4].

In Malaysia, the lack of participation is made worse by a high-pressure academic culture and the widespread use of "shadow education" (private tutoring). Many Malaysian students cannot be involved in campus activities because they have too many extra classes and not enough time for fun or overall growth [5]. At the tertiary level, students regard co-curricular activities (CCAs) as sources of stress and increased workload; research indicates that numerous Malaysian undergraduates consider these activities as an additional burden that jeopardizes their Grade Point Average (GPA) and exacerbates fatigue [6,7]. Students have encountered distinct challenges, including language anxiety—in English-speaking clubs—and a perceived deficiency in administrative support for initiatives that may disrupt rigid academic timetables [7].

The main reason students do not want to get involved in extracurricular activities is because they are under more pressure to do well in school and get good grades. Many students see these activities as less important than their formal education, so they put lectures and tests ahead of their overall growth [8]. The increasing cost of higher education worldwide has compelled a substantial segment of the student population to engage in part-time employment. This "work-study" imbalance makes it difficult for students to do anything outside of school, since they have to spend all their free time earning money instead of enjoying campus life [9].

In Malaysia, the low level of participation is often blamed on both students' passive attitudes and problems with logistics. Research indicates that numerous Malaysian students adopt a "wait-and-see" mentality, frequently lacking intrinsic motivation to participate in activities unless they are compulsory or provide immediate academic credit [10]. Transportation problems and the way campuses are laid out geographically are also big problems, especially for students who live off campus and have trouble staying on campus after classes are over. The strong focus on the "Sijil Tinggi Persekolahan Malaysia" (STPM) or foundation-level mindset, which puts rote learning first, often continues into college, making people less interested in things that are not school-related [11].

The absence of engagement in co-curricular activities among Malaysian university students has profound consequences for their comprehensive development and future employability. Employers in Malaysia are putting more value on "soft skills" such as leadership, teamwork, and emotional intelligence than on academic credentials alone. This means that students who do not participate in campus activities often graduate with a "skills gap" that makes them less competitive [12]. Without the real-world experiences that clubs and societies offer, these students miss out on important chances to use what they have learned in social situations. This can make them less confident and less able to communicate well when they start working [13].

Moreover, the lack of participation in co-curricular activities significantly affects student health and social integration. In a multicultural society such as Malaysia, campus activities are an essential platform for "inter-ethnic interaction" and the cultivation of social cohesion; neglecting these spaces may lead to social isolation and a constricted cultural perspective [14]. Studies also show that

students are more likely to become burned out and stressed because they do not have the healthy "work-life balance" and peer support networks that come from being involved in extracurricular activities [15]. This imbalance not only harms their mental health, but it can also ironically cause them to lose interest in school and loyalty to the institution over time.

To address the issue of low participation in extracurricular activities at Malaysian colleges and universities, schools are adopting a multi-pronged approach that combines digital innovation with curriculum revisions. One main solution is to make Service-Learning Malaysia-University for Society (SULAM) a permanent part of the academic system. This way, students can earn academic credit and learn real-world soft skills at the same time [16]. Also, universities are using gamification and digital reward systems, such as leaderboards, digital badges, and activity points, to boost students' intrinsic motivation and give them a structured sense of achievement that fits with what they are interested in [17]. Institutions can better meet students' needs for time and interests by improving facility management and offering a wider range of activities, including short-term, low-commitment volunteerism [18].

Thus, the objective of this research is to transcend mere symptomatic observations and elucidate the intricate causal relationships among institutional, academic, personal, and social barriers. Low participation of students in co-curricular activities at Malaysian higher education institutions is affected by a complex interplay of academic, personal, and institutional factors. Students' decisions on whether or not to participate are influenced by their academic workload, lack of motivation, limited institutional support, peer pressure, self-confidence, and perceptions of career relevance. To address these issues, universities, teachers, and policymakers in Malaysia can increase student participation and help students become well-rounded graduates by enhancing institutional support, raising awareness of the benefits of co-curricular activities, and integrating these activities into academic and career development programs.

2. Methodology

This study used the DEMATEL method. The Decision-Making Trial and Evaluation Laboratory (DEMATEL) method represents a sophisticated structural modeling technique originally developed by the Science and Human Affairs Program of the Battelle Memorial Institute of Geneva between 1972 and 1976 to analyse complex world problems [19]. This method has evolved into a powerful multi-criteria decision-making tool that enables researchers to visualize the causal relationships among factors in complex systems through the construction of structural models and impact-relation maps [20]. The fundamental premise of DEMATEL lies in its ability to transform qualitative assessments into quantitative indices, thereby revealing the interdependencies and feedback mechanisms among system elements [21]. Unlike traditional analytical methods that assume independence among criteria, DEMATEL acknowledges the intricate interrelationships and mutual influences that characterize real-world decision-making scenarios, making it particularly valuable for identifying key factors and understanding their direct and indirect effects on other elements within a system [22]. The method has been extensively applied across diverse domains including supply chain management, environmental assessment, technology evaluation, and organizational performance analysis, demonstrating its versatility and robustness in handling complex decision problems [23,24].

2.1 DEMATEL Procedural Framework

The implementation of DEMATEL follows a systematic five-step procedure that transforms expert judgments into structural matrices revealing causal relationships. The first step involves establishing a direct-relation matrix through expert evaluation, where participants assess the degree of direct influence between each pair of factors using a predetermined scale, typically ranging from 0 (no influence) to 4 (very high influence) [25]. The second step normalizes the direct-relation matrix by dividing each element by the maximum row sum, ensuring all values fall within a standardized range [26]. The third step calculates the total-relation matrix by incorporating both direct and indirect effects through matrix manipulation, specifically using the formula $T = X(I - X)^{-1}$, where X represents the normalized direct-relation matrix and I is the identity matrix [27]. The fourth step computes the prominence and relation indices by calculating the sum of rows (D) and columns (R) of the total-relation matrix, where $D + R$ indicates the prominence of each factor in the system, while $D - R$ distinguishes between cause factors (positive values) and effect factors (negative values) [28]. The fifth step involves constructing a causal diagram by plotting these indices on a two-dimensional graph, with the horizontal axis representing prominence and the vertical axis representing relation, thereby providing a visual representation of the structural model that facilitates decision-making and strategic planning [29,30].

2.2 Step in DEMATEL

Table 1

Step 1	Step 1: Generate the direct relation matrix To identify the model of the relations among the n criteria, an $n \times n$ matrix is first generated. The effect of the element in each row is exerted on the element of each column of this matrix. If multiple experts' opinions are used, all experts must complete the matrix. Arithmetic means all of the experts' opinions are used and then a direct relation matrix X is generated. $X = \begin{bmatrix} 0 & \cdots & x_{n1} \\ \vdots & \ddots & \vdots \\ x_{1n} & \cdots & 0 \end{bmatrix}$
Step 2	Compute the normalized direct-relation matrix To normalize, the sum of all rows and columns of the matrix is calculated directly. The largest number of the row and column sums can be represented by k. To normalize, it is necessary that each element of the direct-relation matrix is divided by k. $k = \max \left\{ \max \sum_{j=1}^n x_{ij}, \sum_{i=1}^n x_{ij} \right\}$ $N = \frac{1}{k} * X$
Step 3	Compute the total relation matrix After calculating the normalized matrix, the fuzzy total-relation matrix can be computed as follows: $T = \lim_{k \rightarrow +\infty} (N^1 + N^2 + \cdots + N^k)$ In other words, an $n \times n$ identity matrix is first generated, then this identity matrix is subtracted from normalized matrix and the resulting matrix is reversed. The normalized matrix is multiplied by the resulting matrix to obtain the total relation matrix. $T = N \times (I - N)^{-1}$
Step 4	Set the threshold value The threshold value must be obtained in order to calculate the internal relations matrix. Accordingly, partial relations are neglected and the network relationship map (NRM) is plotted. Only relations whose values in matrix T is greater than the threshold value are depicted in the NRM. To compute the threshold value for relations, it is sufficient to calculate the average

	values of the matrix T. After the threshold intensity is determined, all values in matrix T which are smaller than the threshold value are set to zero, that is, the causal relation mentioned above is not considered. In this study, the threshold value is equal to 1.8150
Step 5	Final output and create a causal diagram The next step is to find out the sum of each row and each column of T (in step 3). The sum of rows (D) and columns (R) can be calculated as follows: $D = \sum_{j=1}^n T_{ij}$ $R = \sum_{i=1}^n T_{ij}$ Then, the values of D+R and D-R can be calculated by D and R, where D+R represent the degree of importance of factor i in the entire system and D-R represent net effects that factor i contributes to the system.

3. Results

Finding 1: Average Direct Relation matrix

Table 2

The average direct-relation matrix is computed by averaging all expert input matrices

	Academic Workload and Time Constraints	Lack of Motivation and Awareness	Financial and Economic Pressures	Institutional and Organizational Barriers	Social and Psychological Factors
Academic Workload and Time Constraints	0.0000	0.2206	0.1765	0.2059	0.2353
Lack of Motivation and Awareness	0.2059	0.0000	0.1912	0.2206	0.2647
Financial and Economic Pressures	0.2353	0.2353	0.0000	0.2206	0.2353
Institutional and Organizational Barriers	0.2500	0.2647	0.2059	0.0000	0.2206
Social and Psychological Factors	0.2206	0.2794	0.2059	0.2059	0.0000

Table 2 shows the Average Direct-Relation Matrix in a DEMATEL (Decision-Making Trial and Evaluation Laboratory) framework. It measures how strongly five major barriers to co-curricular participation in Malaysian Higher Education Institutions affect each other. A thorough examination indicates that Social and Psychological Factors, along with Institutional and Organizational Barriers, constitute the principal drivers of influence, notably affecting "Lack of Motivation and Awareness," which exhibit the highest recorded values in the matrix (3.8000 and 3.6000, respectively). This suggests that students' intrinsic motivation is not an isolated phenomenon but is considerably hindered by external institutional frameworks and societal pressures. Moreover, Institutional and Organizational Barriers significantly impact "Academic Workload and Time Constraints" (3.4000), indicating that administrative scheduling or program requirements are principal contributors to students' perceived time poverty. The ramifications of this data for Malaysian research trends indicate a departure from attributing student apathy as the primary cause; rather, the DEMATEL

analysis elucidates a multifaceted causal network wherein institutional inefficiencies and psychological stressors function as "dispatchers" that incite disengagement. To effectively get students involved, Malaysian universities need to focus on structural reforms and mental health support in their policies. These are the things that have the most power over the whole system of barriers.

Finding 2: Normalized Direct-Relation Matrix (X)

Table 3

The matrix is normalized so that the maximum row or column sum equals 1

	Academic Workload and Time Constraints	Lack of Motivation and Awareness	Financial and Economic Pressures	Institutional and Organizational Barriers	Social and Psychological Factors
Academic Workload and Time Constraints	0.0000	0.2206	0.1765	0.2059	0.2353
Lack of Motivation and Awareness	0.2059	0.0000	0.1912	0.2206	0.2647
Financial and Economic Pressures	0.2353	0.2353	0.0000	0.2206	0.2353
Institutional and Organizational Barriers	0.2500	0.2647	0.2059	0.0000	0.2206
Social and Psychological Factors	0.2206	0.2794	0.2059	0.2059	0.0000

The matrix shown here is the Normalized Direct-Relation Matrix in a DEMATEL (Decision-Making Trial and Evaluation Laboratory) framework. It shows how much each barrier to co-curricular participation affects the others directly. A thorough examination indicates that "Social and Psychological Factors" constitutes a major influencing factor, notably impacting "Lack of Motivation and Awareness," which holds the highest singular value in the table (0.2794). "Institutional and Organizational Barriers" also have a big effect on "Lack of Motivation and Awareness" (0.2647) and "Academic Workload" (0.2500). This suggests that structural problems in Malaysian Higher Education Institutions (HEIs) often make students feel like they have less time and more mental obstacles. On the other hand, "Financial and Economic Pressures" have a fairly consistent but moderate effect on most other categories. This suggests that they are a consistent source of stress rather than a variable catalyst. The data suggest that addressing low participation in Malaysia necessitates more than merely alleviating workloads; it requires a fundamental transformation in institutional support and psychological engagement, as these elements serve as principal "dispatchers" of influence that induce demotivation. By understanding these causal connections, researchers can move beyond merely examining the symptoms and concentrate on the fundamental structural and social factors that hinder students from participating in all facets of campus life.

Finding 3: Total Relation Matrix

Table 4

$T = X(I - X)^{-1}$ captures both direct and indirect influences between factors

	Academic Workload and Time Constraints	Lack of Motivation and Awareness	Financial and Economic Pressures	Institutional and Organizational Barriers	Social and Psychological Factors
Academic Workload and Time Constraints	1.5513	1.8616	1.5178	1.6440	1.8129
Lack of Motivation and Awareness	1.7912	1.7562	1.5890	1.7193	1.9042
Financial and Economic Pressures	1.8751	2.0149	1.4845	1.7804	1.9519
Institutional and Organizational Barriers	1.9042	2.0551	1.6722	1.6184	1.9631
Social and Psychological Factors	1.8414	2.0187	1.6346	1.7487	1.7380

Table 4 displays the Total Relation Matrix from a DEMATEL analysis. This matrix indicates both direct and indirect relationships between factors that affect low student participation in Malaysian Higher Education Institutions. An in-depth examination of the data indicates that "Institutional and Organizational Barriers" and "Social and Psychological Factors" have the most significant overall impact on the system, especially "Lack of Motivation and Awareness," which registers the highest values (2.0551 and 2.0187). This means that the lack of motivation in students is mostly caused by problems with the system and social pressures from outside the school. The relatively high and uniform values across the matrix (mostly between 1.5 and 2.0) also point to a high level of interdependence, which means that no one factor can be fixed on its own. This highlights a significant transformation in research trends in Malaysia: effective interventions must transcend the focus on "Academic Workload" (which serves as a major mediator at 1.9042) and instead emphasize the structural "dispatchers"—the institutional and social factors—that sustain the entire cycle of low engagement. This data indicates that the causal framework of student participation in Malaysia is primarily influenced by the institutional environment, positioning administrative reform as the principal mechanism for behavioural transformation.

Finding 4: Analysis Results

Table 5

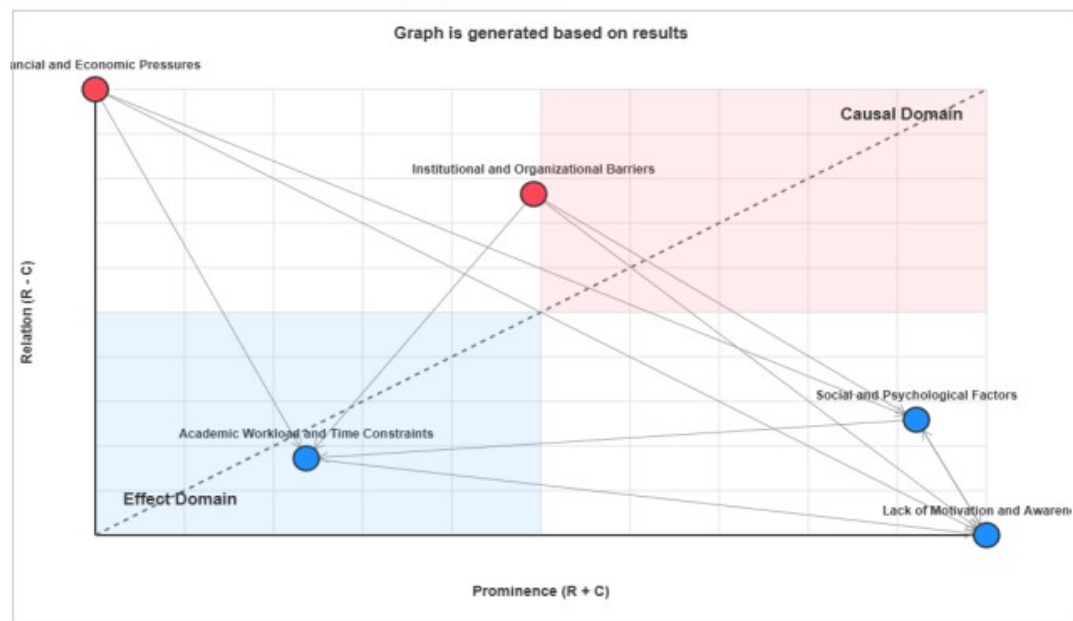
Threshold Value: 1.8150 | Total Experts: 5 | Total Factors: 5

Factor	R (Influence)	C (Influenced)	R+C (Prominence)	R-C (Relation)
Academic Workload and Time Constraints	8.3877	8.9631	17.3508	-0.5755
Lack of Motivation and Awareness	8.7599	9.7065	18.4664	-0.9466
Financial and Economic Pressures	9.1067	7.8981	17.0048	1.2086
Institutional and Organizational Barriers	9.2130	8.5108	17.7237	0.7022
Social and Psychological Factors	8.9813	9.3700	18.3513	-0.3887

Table 5 shows the Final Impact Degrees (R and C), Prominence ($R+C$), and Relation ($R-C$) values. These are the final results of the DEMATEL analysis that help us understand how students participate in Malaysian Higher Education Institutions (HEIs). A thorough examination of the Relation ($R-C$) values reveals Financial and Economic Pressures (1.2086) and Institutional and Organizational Barriers (0.7022) as the principal Cause Factors, signifying they are the fundamental drivers exerting a net influence on the entire system. On the other hand, Lack of Motivation and Awareness are the most important Effect Factor. It has the highest Prominence (18.4664) but a very negative relation value (-0.9466), which means it is the last symptom that is affected by the other variables. Additionally, Social and Psychological Factors and Academic Workload exist within the effect domain, serving as mediators influenced by institutional and financial origins. These results indicate a substantial transformation in research trends as they propose that minimal co-curricular involvement in Malaysia is a structural concern rather than a deficiency in student interest. Consequently, for higher education institutions to successfully enhance participation, strategic interventions must focus on the "Cause" group, specifically solving institutional obstacles and financial constraints, as these elements hold the causal influence necessary to naturally reduce student academic stress and rejuvenate motivation.

Finding 5: Final Output

Network Diagram (Prominence vs Relation)



Influence Diagram

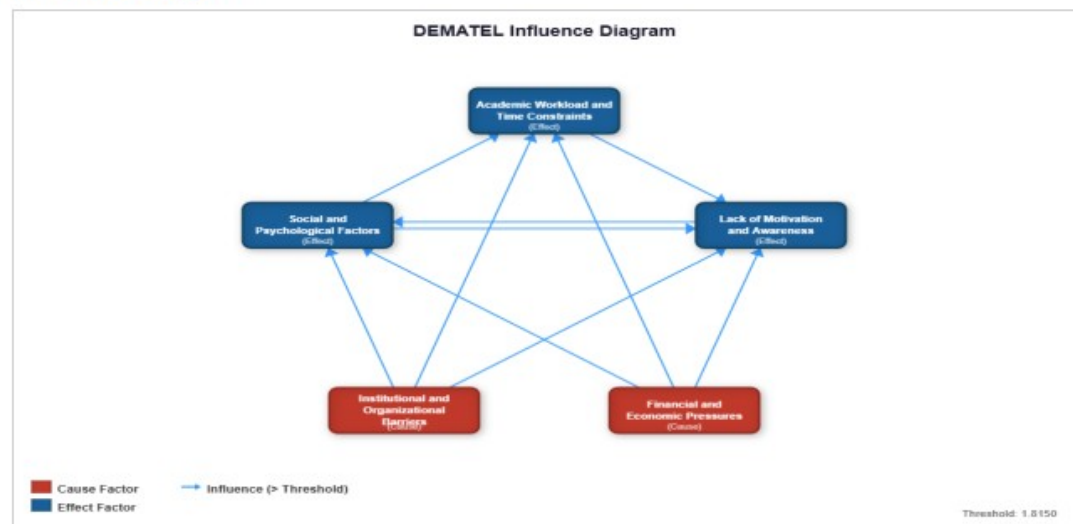


Fig. 1 and 2 Network Diagram (Prominence vs Relation) & DEMATEL Influence Diagram

The diagrams show how low participation in co-curricular activities at Malaysian Higher Education Institutions (HEIs) is caused by the interaction between structural drivers and their effects. The Network Diagram (Prominence vs. Relation) puts "Financial and Economic Pressures" and "Institutional and Organizational Barriers" in the Causal Domain. This means that these are the main "dispatcher" factors that control how the system works. On the other hand, "Lack of Motivation and Awareness," "Social and Psychological Factors," and "Academic Workload" are in the Effect Domain, which means they are "receiver" factors that show the underlying causes. The Influence Diagram makes these connections clearer by using directional arrows to show that financial and institutional pressures have the most effect on student motivation and time constraints. These insights indicate a notable trend in Malaysian educational research: tackling low participation necessitates a top-down approach that alleviates administrative and economic barriers, rather than exclusively concentrating

on student-centered psychological interventions. By focusing on the causal anchors found in the red nodes, HEIs can make the system work in a way that naturally encourages more participation and lessens the academic pressures that are currently keeping students from getting involved.

4. Conclusions

In conclusion, the goal of this study was to examine the ongoing problem of low student participation in co-curricular activities (CCAs) at Malaysian Higher Education Institutions (HEIs) by highlighting the complicated causal links between different institutional, academic, personal, and social barriers. The research employed the Decision-Making Trial and Evaluation Laboratory (DEMATEL) method by transforming qualitative expert opinions into a quantitative structural model looking at five main barriers: academic workload, motivation levels, financial pressures, institutional obstacles, and social-psychological factors. The results showed a clear difference between "Cause Factors" and "Effect Factors." Financial and Economic Pressures and Institutional and Organizational Barriers were found to be the main dispatchers affecting the whole system. On the other hand, Lack of Motivation and Awareness came out as the most important effect factor. This means that student apathy is a sign of deeper structural and financial problems, not just a single cause.

The study finds that to address low engagement, Malaysian education policy needs to change from focusing on individual psychological interventions to forming structural changes from the top down. By focusing on the "Cause" group—institutional barriers and financial problems—universities can naturally reduce students' academic stress and boost their intrinsic motivation. This will help close the skills gap in the national workforce. The study indicates that institutional inefficiencies directly cause people to feel they do not have enough time and cause students to be less interested in school. In conclusion, the results indicate that creating an environment that supports well-rounded graduates depends on better administrative scheduling and more financial support. This makes structural reform the most important way to change behaviour on campus.

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