INTRODUCING CLUSTERING MODEL FOR AUTO PARTS MANUFACTURING COMPANIES

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Abstract

The index of development of every country is measured by the amount of its industrialization. The comparative statistics show that the level of industrial GDP in developed countries is much higher than in Iran. The influence of automotive industry on the redevelopment of satellite sectors such as steel, rubber, Polymer, petrol and petrochemicals, electrical and electronics, ceramics and etc. is very high. In view of the fact that the cluster system defines a collection of united small and medium enterprises which are distributed in a particular region, these companies do face with global and local threats, and opportunities in manufacturing of their products. In particular, the auto industry as one of the most important sector in the region qualifies for the application of clustering method, in order to unify efforts of the SME companies. A suitable cluster model if carefully applied, can result in increasing output and quality of parts, decreasing overhead costs, specialization of skills, increase of employment, equal opportunities and etc. This paper represents a thorough study of all SME's for auto parts manufacturers in North West province of Azerbaijan. On the basis of these finding and the studies carried out, a suitable Cluster model within UNIDO requirements has been devised and developed, to suit the needs of all SME's auto parts manufacturers in the region. The paper discusses and analyses the cluster model in details.

Keywords: Cluster model, Auto Parts, SME, SWOT analysis, BDS, Action Plan, and Core Actors.

1. Introduction

Various research programs are being conducted by many various specialists and economist about "how small and medium companies can efficiently contribute toward industrial and economical developments in their regions"? Our finding and conclusion is that: while SME companies are each other's natural competitors, they are also members of an independent and internal network, which have potentials in jobs creation and providing an environment for self- development, innovation in introducing new technologies. However Those interesting and promising methods can be applied to the development of SME maybe considered are: clustering technique, networking and jointing methods.

One important definition of cluster by Schmitz (1998) refers to it as: "The geographical concentration of institutes and companies relate to each other in one specific cluster". In another definition of cluster system, Altenberg & Estammer (Ibid), considers Measurable variable of the system and offers the following definition: cluster system is a relatively Large collection of SME companies in a particular geographical location in which they each posses special skills and capabilities, and they have inner- company business activities. Most important research programs conducted in this area and their results are; In findings of schmits & Nadvi (1994) in their study of cluster-system in developing countries, it has been concluded that the development of cluster mechanism in each industry is quiet different from one another.

Those Large and medium companies which were participated in cluster approach in developing countries have been in the leading edge and have had a great effect in the formation of the system. However lack of inner- company relations between large and most small enterprises active at the lower end of the business, is evident. In another investigation carried out by Michell Albu & Beel, Martin (1999) in the subject of cluster system, the author emphasises considering knowledge and education as the axis for development and implementation of the approach by industries as one of the main vital initial activity.

They have investigated into the introduction of a framework where various knowledge and better understanding of the benefits of the cluster method can easily be achieved. In another study carried out in India by Rosa & Michell Clara (2000), it was concluded that,

1) Between the development programs of cluster systems and promotion of service industry for job creation, there is a synergetic link.
2) The supporting institutes of small companies within a cluster system can have better business activities.
3) The support and effective governmental policies can create a suitable environment for needed skills in private businesses, promoting corporation, offer useful information and consultancy, establish practical, educational and research programs and strategic

developments for mainly companies which can set the ground work for a continus development and innovations.

1.1. IRAN car production condition in the world.

The world car production in 2005 has been 60,000,000 units from which 900,000 units correspond to IRAN in the same year. The latest world car production ranking is as follows (sapco,2005):

1- USA General Motors Company car production: 9,097,000.
2- TOYOTA Company car production: 7,338,000.
3- FORD Company car production: 6,497,000.
4- RENULT-NISSAN Company car production: 6,110,000.

Iran's two biggest car production companies (Iran-Khodro & SAYPA) rested in the 20 & 26 ranks per year of the world car production ranking through manufacturing 553,000 and 413,000 units. These two companies were in the most profit making companies atleast with 10%& 18% annual profit, respectively .
The car production growth rate is shown in Table1.

Table1. The car production growth rate has shown increase of 16.5% in 1999 to 41.4% in 2003

Year	Production number (1000 units)	Growth rate (percent)
1999	240000	16.5
2000	297000	23.8
2001	379000	27.6
2002	532000	40.4
2003	752000	41.4
2004	902000	19.8
2005	1004000	11
2006	1100000	10

1.2. The world general challenge of car industry

1) The free capacity .

From 1990 to 2006 the actual car production and mounting, has been less than their full capacity. The car production capacity was 58,000,000 units in the 1990, while the total assembled cars has been 45,000,000 units. This trend has been continued up to 2006

2) The markets saturation :

In 1990s, demands for cars, generally occurred in the new markets, and in the North America, Europe and Japan were fixed and decreased capacities up to 2005 and the forecast for 2010 is decreasing as well.

3) Decreasing of the car industry profitability.
4) Increasing of the customers' desire and their tendency about variety.
5) The quick change of the technologies and adaptation necessity and exploiting them before the other competitors.
6) The environmental and fuel consumption problems.

The car industry in general has achieved a total sales of about $1580 billion in 2004. That covers about 3.7% of global gross production and the 10% of the world trade values.

The value chain analysis indicate that if we suppose the car total value addition to be 100, then 43.5% & 25% of which can be acquired from car parts production and car production companies.

2. The auto-parts industry in IRAN

The best blossoming time in the IR-IRAN auto parts manufacturing industry, could have been ten years ago from 1969 to 1979 that unfortunately didn't happen. During this period more than 1,000,000 units car were produced and imported to the country. More than 60% of auto parts needs were imported in the form of CKD and used in the cars parts mounting processes.

The reasons that resulted this condition was due to:

1) The oil price leaping increment in 1973-1974 that increased the state currency income about 400%.
2) The motto: "every Iranian one PAYKAN" That was considered as a reference point of the state consumption and caused the car parts to be imported quickly and the cars to be delivered to the customers.
3) As statistics and documents state: the car imports increased from 5,000 in 1969 to 65,000 in 1977. The cars mounting & manufacturing industry increased from 24,000 to 100,000 at the same period of time.

But after Islamic revolution occurrence in IRAN the car production during twelve years (1978-1990) decreased to 92% and the establishment of the "car policy making committee" in 1990 and approval of the car legislation in 1992 led to the idea that the domestic car parts production sites should be consolidated, with management & supervision of the state two giant car production companies: Iran-Khodro & SAYPA. This policy led to the establishment of two mega-suppliers under the name of SAPCO and SAZE GOSTAR (the car parts designing, engineering & supplying company), so that the PAYKAN related imported parts reached from 60% in 1990 to the zero percent in 1998. For the Peugeot the same amount decreased below 40% in the same year.

2.1. Benefits of a cluster approach to Businesses

1) It can simplify access to financial and home resources.
2) The investment funds can be allocated more efficiently into a fewer processes, with reduced risks
3) A cluster approach can be a step stone for small businesses development programs.
4) In a cluster system, member companies can minimize investment on skilled human resources.

2.2. The cluster and its major stakeholders

- **Core actors**

Auto parts cluster of tabriz has more than 450 firms that its including stakeholder are as follows:

More than 250 principal firms include foundries (25 firms), forging factories (16 firms), machining units (183 firms) and sheet metal forming units (11 firms). From these manufacturers 61 firms are micro (1-9 employees), 118 small (10-49 employees), 25 medium firms (50-149 employees) and 4 large firms (more than 150 employees).

The yearly turnover of industrial units within the cluster is one billion $US. Of which approximately 40% is generated by Tractor Manufacturing Co. and its satellite industrial units. Of the same turnover 56.5% is generated by internal units in the cluster and 39% is generated by the external activities outside the cluster. The remainder 4.5% of turnover is generated from export of the products.

- **Other stakeholders**

Beside the principal firms, there are more than 150 other stakeholders, which can be classified within four groups:

1) BDSs providers

Business development service providers are comprised of 40 firms, between them 7 mould designers, pattern makers (6 firms), gage and fixture designer and manufacturers that are used in machining units (11 firms). Moreover there are 4 metallurgical and 3 well equipped metrological laboratories that provide complementary services for mechanical, metallurgical and geometrical characteristics measurements of manufactured parts in small and medium firms. For system designing and auditing services there are 5 firms, that get some subsidies from support institutions, collaborate well with principal firms.

2) Backward linkage

Raw materials used in the cluster are supplied by 30 firms that comprised of 12 steel rollers who provide steel rod for forging and machining units and steel sheet, plate and strip for sheet material forming companies. Chemical materials are sourced from 5 specialized sellers that are active in the cluster. Refractory materials used either directly by the cluster firms or indirectly by the furnace manufactures are purchased from local dealers (4 firms) or from a refractory materials producing Co, established in Isfahan. 5 scrap sellers gather this kind of materials from forging, machining, sheet metal forming and others units and deliver them to the foundries and casting units.

All equipments such as machine tools, heating and melting furnaces, forging presses,… are procured from 49 dealers from which 18 are machine tool sellers, one machine tools manufacturer, 4 firms forging equipments sellers, 6 different kinds of furnace manufacturers and 20 cutting tools sellers that sale their goods to the machining units point because of shortage of high quality

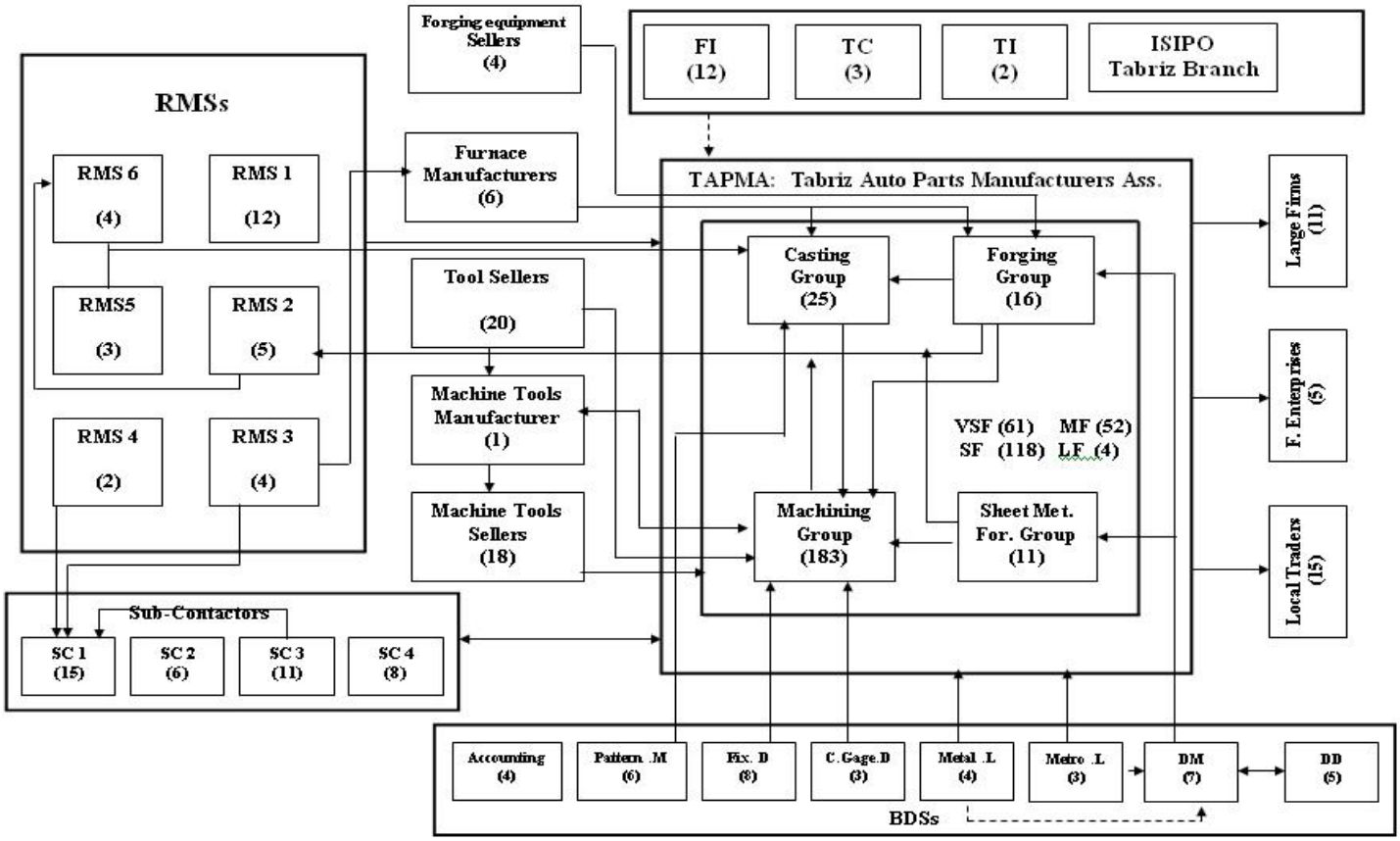
cutting tools in the region, the machining units have some difficulties to procure this kind of tools.

3) Forward linkage
The products of the cluster are normally sold to the 31 firms, such as public or semi-public large firms|(11 enterprises), local dealers(15 traders) and foreign enterprises (5 companies). 95% of the cluster's products are delivered to the regional and national large firms.

4) Institutions
Amongst other stake holders, there are 12 financial institution that support SMEs by providing necessary loans for physical development, equipments and raw materials purchases. But the linkage, due to bureaucratic conditions, is weak.

Formal education and short term training of labors is effectuated respectively in one vocational school and 3 training centers. Although the linkage between these institutions and cluster's firms is good, but because of limited capacity of these training centers, industrial market demand to trained labors is not accomplished and the majority of worker are trained on site.
45 firms constitute existing sub-contractors in the cluster, mainly heat treaters (15 firms), shot blasters (6 firms), cutters (11 firms) and coating and finishing units (8 firms).All analytical segments are shown below as current cluster map.

(Map-1): CURRENT CLUSTER MAP



3.Business Segments Analyzing.

3.1. Casting

3.1.1. Raw Materials

Raw Materials of casting sector can be discussed in 4 categories as follows:
1) Recycled waste cast iron about 10% of raw materials of casting units are supplied from recycled waste materials which is produced in every casting units, and vary depending on technology level & process management in the unit.

2) Scrap
It is supplied from local machining, forging, sheet metal forming units indirectly which is 50 percent of raw materials.

3) Ingot
It constitutes 40% of casting unit raw materials..

3.1.2. Technology

Except one casting company which is established 2 years ago and applies induction furnace equipment for melting, the other units are equipped with pit & rotary furnace.

The main cause of technological problems, within the casting firms is lack of qualified and educated human resources and also skilled workers.

3.1.3. Products and Market

Although there is no statistics data on amount of consumption and variety of consumers, our study shows that the capacity of existing foundries within the cluster is not sufficient to respond the regional demands. So all foundries work with full capacity and remainder needs are supplied from outside of cluster.

4. Forging

4.1. Raw Materials

The Raw materials in this segment are steel rod & a little chemical substances that here is Die Coat.

The principal producer of Steel Rod in Iran is Yazd steel company. Also few other producers exist over the country such as Isfahan & Ahvaz steel factories with low quality steel rod productions as small part of their business.

In addition some traders import this kind of raw material from Russia and Ukraine.

4.2. Products & Market

The products of this group of firms are forged industrial parts that are delivered to the machining units as semi-fabricated components such as:crank shaft, connecting rod, steering arm, different kind of gears, the %25 out put of this segment are delivered to the large companies like IRANKHODRO & SAIPA and their satellites companies, directly or indirectly.

Other main buyers are IRAN TRACTOR Manufacturing Co., IDEM CHARKHESHGAR (Gearbox producer) which are large firms located within the cluster & covers more than %70 of total products.

5. Machining

5.1. Raw Materials

There are 3 main types of raw materials for machining enterprises: steel rod, cast, and forged semi-fabricated products.

Steel rods are purchased from local steel sellers or representative of producer companies.

The production capacity of local casting firms is not sufficient to respond all needs of machining units. So more than 50 percent of demands is sourced from outside the cluster.

5.2. Products and Market

There are 183 machining and sub-assembling firms that many of them do only machining and some others practice both. From those, 53 firms are micro, 91 firms are small, 35 units are medium and 4 large companies.

6. Value chain analysis

The value chain analysis for different production processes, which are presented in the pervious sections, depending on the nature of process and technology used is different. The tables 2 and 3 show the value chain analysis, for important processes that are active within the cluster.

Table 2. Value chain analysis for casting units with rotary melting furnaces.(The value addition appraisal is based on casting parts weighting from 2Kg up to 25Kg)

Step	Activity	% Value addition
1	Raw materials	35.65
2	Melting	5.75
3	Moulding	13.6
4	Refining	2.5
5	Pouring	21.0
6	Cleaning (Shake out)	1.0
7	Raiser and gate cutoff	1.0
8	Heat treatment	9.8
9	Shot Blasting	0.7
10	Surface Finishing	0.5
11	Inspection	1.0
12	Packing	1.0
13	Charges	6.5
Total		100

Table 3. Value chain analysis for sheet metal forming units

Step	Activity	% Value Addition
1	Technology	1.0
2	Die making	4.0
3	Raw material	69.0
4	Blanking	3.0
5	Forming steps	4.0
6	Debarring	0.5
7	Degreasing and washing	0.5
8	Coating(if any)	1.5
9	Inspection	0.5
10	Packing	0.5
11	Energy	0.5
12	Charge	15.0
Total		100

8. SWOT Analysis

Strengths: - Low energy cost. - Existence of technology for different production processes. - Low labor cost. - Availability of high infrastructural facilities. - High demand in local market. - Availability of raw material. - Existence of educational Institutions and Training centers. - Recognition of cluster in the national market. - Presence of technical BDS. - Presence of large enterprises in the cluster. - Availability of graduated human resources.	**Opportunities:** - Positive trend of privatization. - Entry to WTO. - High demand of vehicle parts. - Project for "Tabriz Auto-Parts Technology Park" establishment. - Growing potential of local and national market. - Capability of exploring international market for exporting the SMEs products
Weakness: - Lack of technology for economy of scale production. - Lack of trust among principal firms. - Lack of market intelligence and corresponding BDS provider. - Low level of equipments modernization. - Financial problems, resulted from delayed customers payment. - Lack of strategy. - Low level of export. - Low level of management and administration knowledge (All managers are owners). - Absence of R&D. - Lake of quality system in most of SMEs within the cluster. - Absence of tiering system within the cluster. - Limited number of assembling units.	**Threats:** - Emergence of other similar clusters. - International competitors coming and growing up such as China, India, Brazil, etc. - Uncertainty and fluctuation in domestic market. - Membership of Iran in WTO, which may cause a shakeout in the domestic market.

9. Cluster Vision

Developed vision for this cluster is:

"To emerge as a world class cluster in engineering and fabrication of auto components in the global market by the year 2015"

10. Strategy setting

- Human resources development.
- Focusing on export market.
- Customers diversification.
-Technology upgrading with special attention to rapid prototyping and economy of scale production.
- Trust building among the cluster stakeholder.
- Providing facilities and proper conditions to conform to international market requirement.
- Establishing quality system in SMEs.

11. Action plan

11.1. General Action Plan for all firms

- A series of Seminars and Work shops should be organized for awareness creation of SMEs owners about management, technology upgradation and quality.
- The project of establishment of ‹‹Tabriz Auto-Parts Technology Park›› is at present ongoing with governmental support where different private BDS providers will be installed to help SMEs .Meeting and forums should be organized to inform SMEs about services that will be provided at this park.
- Sourcing of finance, from governmental institutions, to support training in the areas of skill upgradation, quality management system installation.
-Encouraging private sector for formation of deferent BDSs providers such as global market intelligence, rapid prototyping, rubber and polymer laboratory and mechatronic and automation laboratory.
- Diversification of domestic customers.
- Working on ISO/TS installation in the firms.

11.2 Action plan for casting firms

- Common purchase of scrap.
- Safe working practices.
- Sourcing of finance for modernization of production line.
- Creation of some consortiums of common investment on establishment of larger firms with modern equipments and system.
- Creation of a network for establishment of "pattern making unit" with advanced equipments and instrumentation that work with CAD/CAM system.

11.3. Action plan for forging firms

- Safe working practices.
- Networking for common purchase of steel rod and other inputs.
- Creation of common BDS provider for die designing and forging technology development, using modern soft ware.
- Diversification of domestic customers like rail way industry, oil and petrochemical industries, construction industry.
- Creation of BDS provider for machinery maintenance and services.

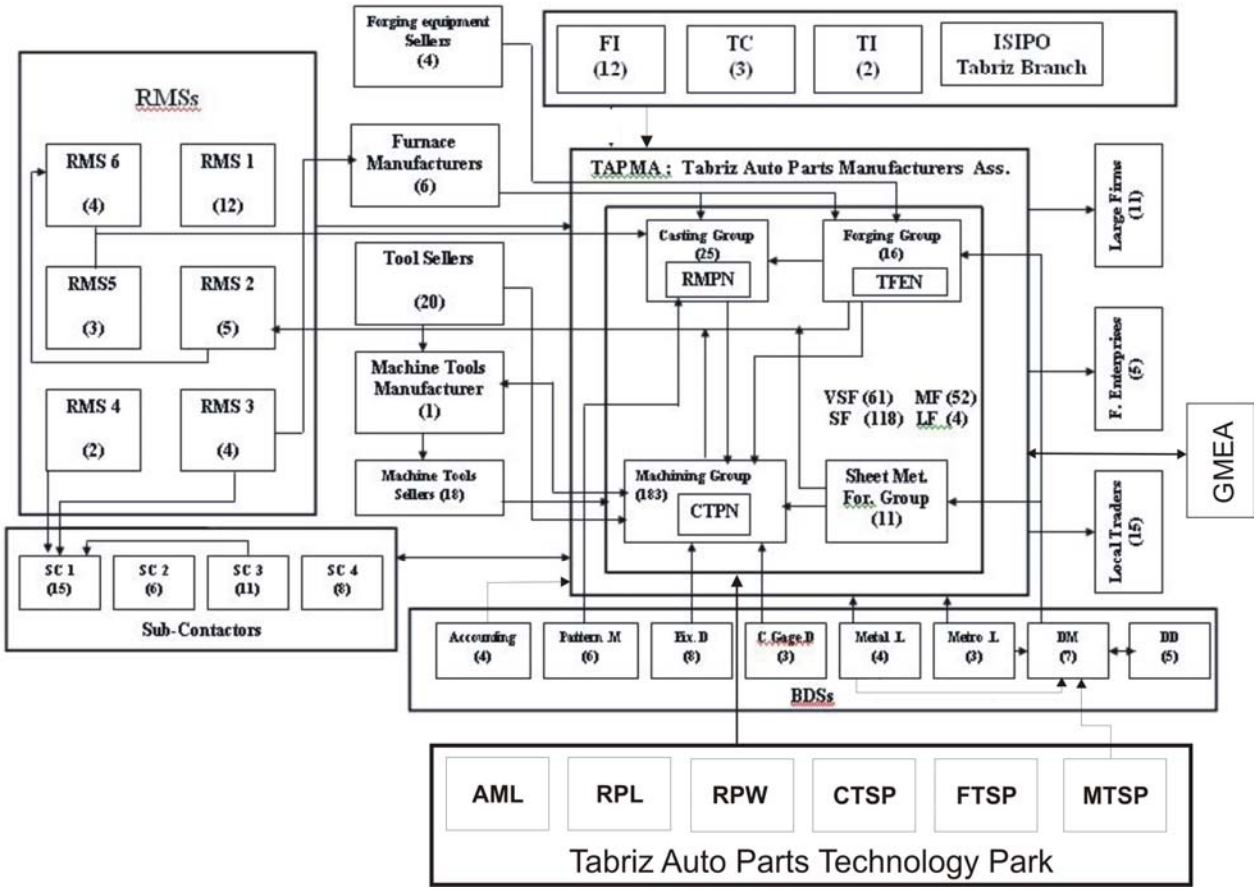
11.4. Action plan for machining firms

- Safe working practices
- Networking for common purchase of cutting tools and other inputs.
- Creation of a BDS provider for developing machining technology for economy of scale production.
- Creation of some consortium for common investment establishment of assembly producing firms.

12. Conclusion

Industrial cluster's model as an industrial strategy for development of small & medium enterprises in every segment such as Economical, Industrial, Agricultural and business, can lead to empovernment and improvement of less developed and undeveloped countries enterprises. This model can help to increase efficiency, upgrade quality, increase competency and entrance into global markets, on the basis of building adequate cultural infrastructures as: participation and co-operation between firms. This model is on the basis of "UNIDO" methodology, and can be used at national and global level.

Future cluster map



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